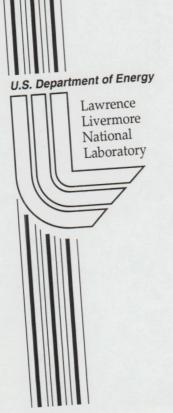
UCRL-MI-140126

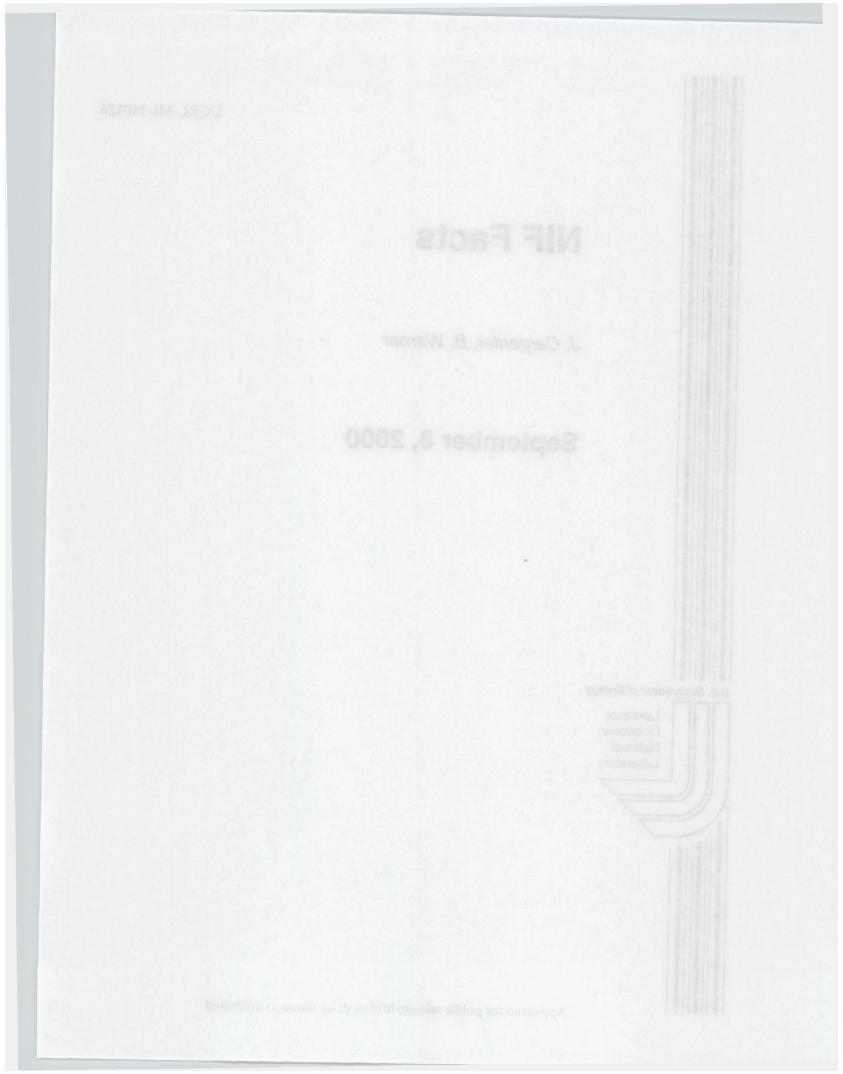
NIF Facts

J. Carpenter, B. Warner

September 8, 2000



Approved for public release; further dissemination unlimited



DISCLAIMER

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or the University of California, and shall not be used for advertising or product endorsement purposes.

This work was performed under the auspices of the U. S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

DISCLAIMER

This document was prepared as an account of work sponemed by an againsy in the Covernment. Neither the United States Covernment nor the University of California nor any of their employees, makes any warranky, express or implied, or assumes any legal liability of responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infininge privately owned rights. Reference heaten to any specific commendal product, process, or service by trade name, trademark, manufacturer, or otherwise, does not processantly consistents or imply its endorscence), recommendation, or inverting by the United States increased product, process, or service by trade name, trademark, manufacturer, or otherwise, does not becessantly consistents or imply its endorscence), recommendation, or inverting by the United States recommendation or the University of California. The views and opianons of authors expressed herein do not recommend to the University of California. The views and opianons of authors expressed herein do not recommend to the University of California. The views and opianons of authors expressed herein do not recommend to the University of California. The views and opianons of authors expressed herein do not recommend to any state or reflect those of the United States Covernment or the University of California, and

This work was performed under the auspices of the U. S. Department of Energy by the Converse of the U. S. Department of Energy by the Converse Sector Sector

NIF FACTS

Purpose



The National Ignition Facility (NIF) will use the world's largest laser to compress and heat BB-sized capsules of fusion fuel to thermo-nuclear ignition. NIF experiments will produce temperatures and densities like those in the Sun or

in an exploding nuclear weapon. The experiments will help scientists sustain confidence in the nuclear weapon stockpile without nuclear tests as a unique element of the DOE's Stockpile Stewardship Program and will produce additional benefits in basic science and fusion energy.



The Buildings

- NIF is 704 feet long, 403 feet wide, and 85 feet tall about the size of a football stadium—and will consist of three connected buildings:
 - Optics Assembly Building (OAB)
 - Laser Building (LB)
 - Target Area Building (TAB)
- The \$250 million, 7-acre NIF building complex is on schedule and within allocated budget (the laser and support equipment are behind schedule). The OAB and central plant construction is complete; the LB is more than 95% complete, and the TAB is due for completion in May 2001.
 - Concrete poured: 73,000 cubic yards
 - Steel and rebar put up: 12,700 tons
 - Earth moved: 210,000 cubic yards

The state of NIF construction early in 2000.

The Laser System

- The 192 laser beams of NIF will generate
 - A peak power of 500 trillion watts, 1000 times the electric generating power of the U.S.
 - A pulse energy of 1.8 megajoules.
 - A pulse length of three to four billionths of a second.
- Optical components: 7500 large laser slabs, lenses, mirrors, and crystals More than 15,000 small optical components.
- Precision optics: total area of 33,000 square feet (3/4 of an acre). More than 40 times the total precision optical surface area in the world's largest telescope (Keck observatory, Hawaii).
- Laser beams: 16" by 16" beams of infrared laser light (1-micron wavelength). The infrared beams are converted to ultraviolet beams (0.35-micron wavelength) at the target chamber.
- Laser pulse amplification
 - In the master oscillator room, the initial pulse is amplified 10,000 times, then split 192 ways.
 - In the preamplifier module, each propagated pulse is amplified 20 billion times, then split 4 ways.
 - In the main laser system, each propagated pulse is amplified 15,000 times.
 - Total amplification = 3 quintillion (3 billion billion).

Laserand Optical System Cleanliness

- The high optical intensities of inertial confinement fusion (ICF) lasers require the laser beampaths and optics to have a clean environment for reliable operation.
- NIF cleanliness requirements for optical assembly areas are 10 to 100 times less stringent than current semiconductor fabrication plants.
- There are 400,000 square feet of structural surfaces in the NIF laser and beampath that require precision cleaning.

The Target System

• The target is contained inside a 30-ft-diameter, 1 million-pound aluminum/concrete target chamber, which resides within the 6-ft-thick concrete walls of the TAB.

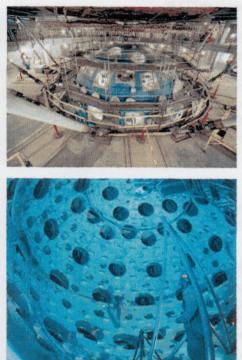


Photo taken inside the target chamber.

- In the 700 NIF experiments per year, target material will typically reach temperatures of 100 million degrees and densities 20 times that of lead, or 200 times that of water.
- NIF ignition targets consist of a cylinder of gold about the size of a cold capsule, within which is a BB-sized plastic sphere containing fusion fuel.
- During laser illumination, the BBsized sphere is compressed to one-thirtieth of its original diameter before it ignites.

The NIF/ICF Program

- NIF experiments within the Stockpile Stewardship Program measure properties of materials and phenomena that occur at the extreme temperatures and pressures in nuclear weapon explosions so that weapon scientists can model, predict, and resolve problems that may be found in aging stockpile weapons without resorting to nuclear tests.
- Basic scientific experiments will help astrophysicists understand the phenomena occurring deep within stars or at the instant the universe was created.
- Inertial fusion processes will be extensively studied on NIF. This will increase the likelihood of the development of fusion energybased power plants.

Procession equiter foreit ania of 22.
Procession equiter foreit ania of 23.
Procession equiter foreit ania of 24.
Procession (20%) of equiter 21%.
Procession foreits and foreits and foreits of equiter and forei

Major Industrial and Institutional Participants

Allied Signal (Honeywell) AstroPak AT&T Corning Glass **Cleveland Crystals** EG&G Eastman Kodak **Emerson Electric** General Tool Company Hensel Phelps Hova Iacobs **Johnson Controls** Maxwell Laboratories Neilsen Dillingham PDM Ralph M. Parsons SAIC SVG Tinsley Schott Glass Spectra-Physics TRW Titan-Pulse Sciences Inc. **Zygo** Corporation Los Alamos National Laboratory Sandia National Laboratory University of Rochester/LLE Argonne National Laboratory

Questions concerning the National Ignition Facility at LLNL should be directed to the LLNL Public Affairs Office, (925) 422-9919.

UCRL-MI-140126 08/21/00

to the materiased system, onch programmed guide is antiphiled 15,000 their lotal acaptification = 8 quintiliem (5 bitlion bitlion).