
Livermore Laboratory vindicated on x-ray laser

The campaign to prove that the laboratory's extraordinary successes were a fraud, has been blown out of the water by a new government report. Carol White reports.

As we reported in the May 30 issue of this magazine, a very nasty smear campaign has been conducted against Lawrence Livermore Laboratory, as part of the ongoing effort by the pro-Soviet lobby in the United States to wreck U.S. defense capabilities. In June, the U.S. General Accounting Office (GAO) released a report clearing the laboratory of charges that it had deliberately attempted to defraud the government, by exaggerating claims for its x-ray laser experiment.

The laboratory was accused, by both the *Los Angeles Times* and *Science* magazine, of falsifying its startling success in focusing nuclear-pumped x-ray lasers. Their attack followed upon an article which appeared in the *New York Times* in November 1985, in which science correspondent William Broad leaked the news of the Livermore results.

In response to the *Los Angeles Times* allegations, Reps. Edward Markey (D-Mass.) and Bill Green (R-N.Y.) requested that the Department of Energy look into the matter. The DOE report clearing the laboratory of charges, was then submitted to the GAO for further review, to make doubly sure that the laboratory was not involved in a fraudulent attempt to gain funding.

From a certain point of view, the furor about the results was understandable, since they showed an amazing ability to focus lased x-ray beams. These results refuted once and for all the claims by incompetent critics of the Strategic Defense Initiative (SDI)—notably the congressional Office of Technology Assessment—that the x-ray laser would never work.

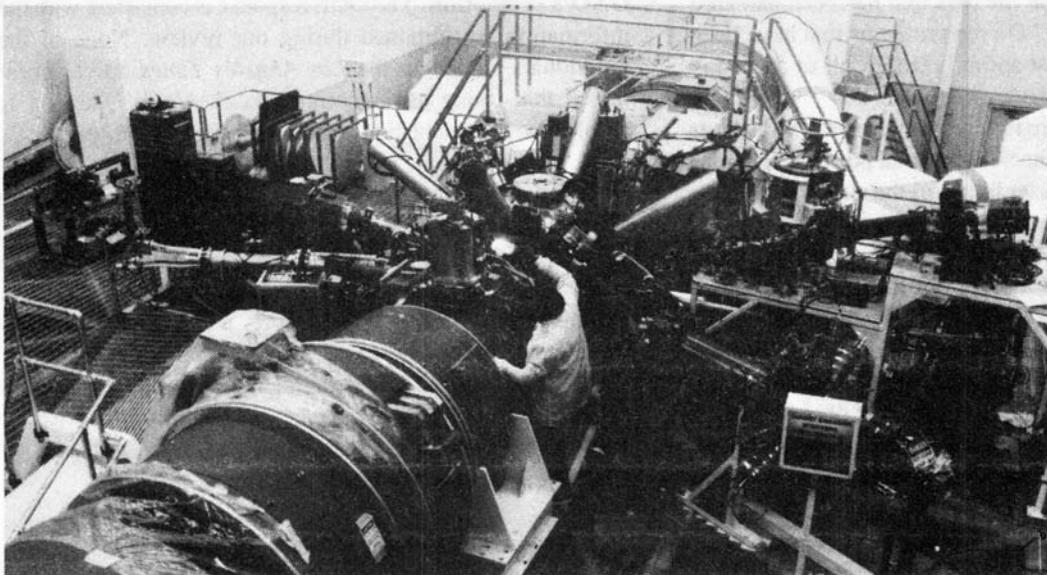
Ironically, it was the very success of the experiment which provided the pretext for the attacks upon Livermore. Such an intense lased beam was created, that the diagnostic instrumentation could not properly measure it. Follow-up tests confirmed the impressive results, as Dr. Edward Teller reported to the Senate on May 9 of this year.

As *EIR's* Charles Stevens wrote at that time: "Teller explained that U.S. experiments have shown that the nuclear powered x-ray laser, whose principle 'is established,' can be designed to send a beam a thousand miles with a spread of no more than five feet. This degree of focusing, which is thousands of times better than what SDI critics have claimed to be physically possible, means that a single x-ray laser device could destroy upwards of tens of thousands of nuclear warheads and missiles at any state of their trajectory."

Teller also confirmed the earlier statements by SDI Director Lt.-Gen. James Abrahamson, that the Soviet Union was between two and five years ahead of the United States in developing the x-ray laser. A side feature of the GAO report, is the admission that in the United States work on the nuclear-pumped x-ray laser is being hampered by strictures limiting the ABM defense system development to non-nuclear missile kills. As a result, work on the x-ray laser, despite the extreme promise of the results, is being mandated to "assess the potential of Soviet nuclear directed-energy work," rather than to give the United States this capability.

The whole tenor of Markey and Green's questions, is to reproduce press slanders against the SDI, and in particular the x-ray laser program. By raising the red herring of fraud on the part of the national laboratories, they are hampering the work of the labs, already starved of necessary funds.

Clearly, the x-ray laser is an essential part of an effective SDI configuration, but the reality is that the program is being held back by a combined operation. On the one hand, kinetic-energy-weapons development is absorbing the majority of funds available to the SDI, despite the fact that missile ABM systems have, at best, a limited application as point-defense weapons. On the other hand, President Reagan has placed the directed-energy-weapons side of the program in a str-



The Novette laser at Lawrence Livermore National Laboratory was used for the experiments which yielded a startling ability to focus lased x-ray beams.

Lawrence Livermore

it jacket, with the stricture that only non-nuclear ABM devices will be developed under the SDI.

It would be more appropriate to subject the pro-Soviet lobby on U.S. defense policy to investigation, than wasting the taxpayers' money and scientists' time by answering their false charges. The real fraud is the attempt by congressmen and the media to cover up the fact that the Soviets are vigorously pursuing their own anti-ballistic missile defense program, at the same time that they are using every means to persuade the United States to abandon the SDI.

We feel that it is a useful service to our readers to reproduce extensive excerpts from the GAO report, even though this version is an abridgment from a longer non-classified version. The report is addressed to Samuel Stratton, chairman, Subcommittee on Procurement and Military Nuclear Affairs, Committee on Armed Services, House of Representatives:

This briefing report responds to your May 14, 1986, request that we review the Department of Energy's (DOE's) answers to a series of questions raised by Representatives Edward Markey and Bill Green about the x-ray laser program which DOE is conducting for the Department of Defense's (DOD's) Strategic Defense Initiative Organization (SDIO). Many of these questions resulted from press reports, especially a November 12, 1985, *Los Angeles Times* article. During the period from December 1985 to April 1986, we reviewed selected aspects of the program to answer these same questions at the request of Representatives Edward Markey and Bill Green.

We provided a detailed classified briefing on the results of our review to Representatives Edward Markey and Bill Green on April 10, 1986. We also provided you and Representative Marjorie Holt with the same briefing on May 14, 1986.

Essentially, we found the x-ray laser program is a re-

search program with many unresolved issues. In our opinion, there was no "design flaw" in the diagnostic instrumentation as mentioned in the *Los Angeles Times* article. However, analysis of test data by Lawrence Livermore National Laboratory (LLNL) scientists raised questions about the accuracy of some experimental data. As a result, some diagnostic equipment was reconfigured. These unexpected measurement uncertainties are now much better understood. In our opinion, there was no need to delay the latest x-ray laser nuclear test. We also found that the x-ray laser program was not being arbitrarily accelerated. No tests in the atmosphere or space of the nuclear explosive driven x-ray laser are envisioned, according to LLNL officials.

Our evaluation of DOE's answers to the questions is included in the appendix. The answers that DOE provided to your Subcommittee are generally consistent with what we found during our review of selected aspects of the x-ray laser program. Classification restrictions limit the amount of detailed information we can present in this unclassified briefing report.

We performed our work at DOD's SDIO and at DOE's Office of Military Applications, LLNL, Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL). Also, we contacted members of the JASON group, which advises DOD and DOE on national defense scientific and technical issues. Our evaluation was based on a review of various x-ray laser program documents, reports, letters, and memorandums, as well as interviews with program managers, scientists, and reviewers. Most of our work was performed at LLNL. . . .

Answers to questions by Markey and Green

Question 1: How is the performance of the x-ray laser measured, and what is the nature of the design flaw that has been identified in the device mentioned in the press account? What

effect does the flaw have on the data that has been gathered on the x-ray laser program? Do the problems that have been identified relate only to last spring's test or all of the x-ray laser tests that have been conducted to date?

DOE's response: There are four properties of the x-ray laser that determine its performance: (a) the total power in the laser beam; (b) the color of the laser light; (c) the size or spreading (divergence) of the laser beam; and (d) when the laser beam turns on and how long it lasts. The measurement of these properties is a difficult task because of the nuclear environment and the high intensity, short timescale of the lasing process. There was no "design flaw" in these experimental measurements. The high intensity laser pulse interacts strongly with the measuring device during the time of observation. A scientific question was how accurately we could make the measurements and, thus, whether the quoted absolute power was correct.

GAO evaluation: The DOE response is consistent with the information we obtained during our review. We agree there was no "design flaw" as such, but cannot explain the basis for our conclusion in this unclassified document.

Question 2: In addition to the measuring device that has had these problems, examine what other instruments are used to gather data on x-ray laser experiments and explain what kind of information they provide.

DOE's response: The color of the laser light is determined by a variety of high-resolution spectrometers. These spectrometers measure the line energy and intensity of the lasing transitions and also measure detailed atomic physics of laser materials. The size of the laser beam is determined by a one-dimensional imaging instrument. The time history of the laser beam is determined by the same diagnostic that measures the total power. This instrument measures the temporal shape of the laser beam, when the laser beam turns on relative to the nuclear pumping source and how long the laser beam lasts.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review.

Question 3: The press reports indicate that tests show the x-ray experiment is lasing, but that tests do not provide sufficient information regarding the intensities such devices can achieve. Is this so? Please provide information on the kind of intensities determined to be necessary for the various military applications currently under consideration for an x-ray laser weapon and compare them to other candidate laser systems.

DOE's response: There is no controversy over whether x-ray lasing has been observed. The purpose of the ongoing research program is, among other things, to determine what intensities an x-ray laser can achieve.

X-ray lasers have several potential military applications including counterdefense, booster kill, post-boost vehicle kill, reentry vehicle kill and discrimination of reentry vehicle decoys. The technology requirements for each mission are different.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review. None of the individuals named in the *Los Angeles Times* article questioned that lasing has occurred. As shown in Question 1, absolute power calculation inaccuracies occurred in past tests.

Question 4: Reports suggest that while there have been some adjustments to the measuring device, further adjustments to the device (that would permit more accurate readings of the laser's intensity) could not have been completed until six months after what the press reports identify as the "Goldstone" test. Is this the case? Provide an assessment of the feasibility of temporarily delaying testing until these technical problems had been resolved.

DOE's response: See classified answers.

GAO's evaluation: Provided in classified briefing.

Question 5: Is it true that the schedule for x-ray laser experiments is going to be accelerated? What is the justification for this acceleration? Provide an assessment of the validity of this justification.

DOE's response: Since its inception the x-ray laser program has been operating on a resource-limited basis. Because of the impact a Soviet x-ray laser would have on United States Strategic Defense Initiative (SDI) architectures, the Fletcher Panel strongly recommended acceleration of the x-ray laser program. The only way we have of assessing the potential of Soviet nuclear directed energy work is to conduct such research ourselves. If information on weapon feasibility for the counterdefense mission is to be provided to the Strategic Defense Initiative Organization (SDIO) in a timely fashion, the program must be accelerated.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review. The Fletcher Panel recommended a technology-limited, not a resource-limited, program. The DOD and DOE officials we contacted stated acceleration is needed to provide data to SDIO in a timely manner.

Question 6: What is the overall funding for the x-ray laser in FY 1986? Please provide a detailed breakdown of the types of activities supported by these funds. Is there a strong scientific and technical basis for accelerating x-ray laser funding at this time?

DOE's response: The overall funding of the x-ray laser program and a breakdown of the activities and the amount of funds supported by the program are classified. The basis for accelerating nuclear directed energy weapons (NDEW) research is to assess adversary threat at the earliest possible date.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review.

Question 7: We have heard that the SDI Program Office has a program that will provide \$38 million in contracts to the

DOE weapons laboratories. Press reports indicate that these funds are being provided on a "reimbursement basis" for nuclear-related research. Is this so? What exactly will this money be used for? Will it support the x-ray laser program.

DOE's response: \$38 million in reimbursable funds are being made available from the SDIO. Of this \$38 million, the LLNL share is \$20 million. These reimbursable funds in the LLNL program will be used in areas of significant and legitimate Department of Defense (DOD) interests. Areas addressed by these funds are: systems analysis studies, weapon platform studies, and acquisition, pointing and tracking systems. These augmented funds potentially help to accelerate a more broadly based x-ray laser program.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review. In fiscal year 1986, \$38.0 million is being provided by the Military Interdepartmental Purchase Request process to be used for matters of interest to the DOD. Of this \$10.0 million is going to LLNL for the x-ray laser program. Only a small portion of the remaining \$18.0, going to LANL and SNL, is earmarked for the x-ray laser program. Detailed explanation of fund usage can not be provided in this unclassified document.

Question 8: We have also heard reports that there may be an additional \$62 million available in DOD accounts, either in the SDIO budget or elsewhere, to support additional x-ray laser tests in FY1986. Is this true? Just what will this money be used for? Are these additional funds fully justified?

DOE's response: The program is in a state where additional funds can be used to accelerate the rate of technical progress. If the additional \$62 million in funds available from the DOD can be transferred to the DOE, this money could be used to accelerate the rate of testing.

GAO's evaluation: The DOE response is consistent with the information we obtained during our review. DOD has proposed a one time \$62.0 million appropriation transfer to be divided between LLNL, LANL, and SNL. The majority of these funds, if approved, will go to LLNL to be used primarily for x-ray laser research. DOD and DOE officials we contacted told us these funds are needed to accelerate the x-ray laser program.

Question 9: The attached *Los Angeles Times* article indicates that several classified reviews of the x-ray laser program have called into question earlier claims for the weapon's success. The first of these critiques was issued as far back as August of 1984. According to the article, by last summer scientists from the Los Alamos Laboratory, the Livermore Laboratory, and the Jason group had all identified serious technical problems with this program. Please examine these internal reports and interview the individuals who prepared them. Provide an assessment of these critiques and their implication for further research on the x-ray laser program. Examine whether the officials responsible for managing the x-ray laser program took these criticisms fully into

account in their planning for future research and testing of this device.

DOE's response: In all the classified reviews held to date, there has been unanimous opinion that x-ray lasing has been demonstrated. In all the scientific and program reviews, the LLNL staff have used the most current and most accurate information available. Most of the scientific reviews have, in fact, been requested by LLNL in order to provide independent peer review of the results and progress. In all cases, we have accurately conveyed the current status of the x-ray laser program to all levels of government and the scientific community. No major disagreements with LLNL's presentation have been expressed. The outcome of the reviews have, in general, been enthusiastic support for the program as laid out by LLNL. The program management has always used the most current information to plan for the future research and testing of the x-ray laser. Since there is still much to learn about x-ray lasers, there have been changes in the underground tests and their associated experiments to address the physics and systems issues of an x-ray laser weapon. The ongoing internal and external review process has been a normal part of the program planning, and we have always tried to incorporate any suggestions we have received during the review process. We know of no example where a major scientific concern was not fully considered prior to the planning or execution of an under-

GAO's evaluation: The limited scope of our review and DOE's use of all inclusive terms does not allow us to express an opinion on the DOE response. However, we have no knowledge about the program that would cause us to question the accuracy of DOE's response based on our review of the x-ray laser program.

We interviewed all the individuals named as reviewers or critics in the *Los Angeles Times* article. These individuals were not outside or independent critics, but were program participants or peer reviewers. As such, they were offering constructive criticism. We also interviewed other individuals we identified as program reviewers.

Overall, the above individuals generally support the current x-ray laser program, but they have identified problems or issues which must be addressed. These issues were, or are, being considered by x-ray laser program managers.

LLNL officials also kept SDIO officials apprised of current program status. Program results were presented at a June 1985 briefing. When some of these results had to be modified, due to the measurement inaccuracies (see Question 1), another briefing was held in July 1985, at which time the revised data was presented.

Question 10: What explosive yields have been determined to be necessary for nuclear testing in support of research on the various military applications of an x-ray laser? According to current planning, at what point (if any) would explosive testing in the atmosphere or in space be needed?

DOE's response: See classified answers.

GAO's evaluation: Provided in classified briefing.