

# What Would the Lab Do In Case of a Complete Test Ban

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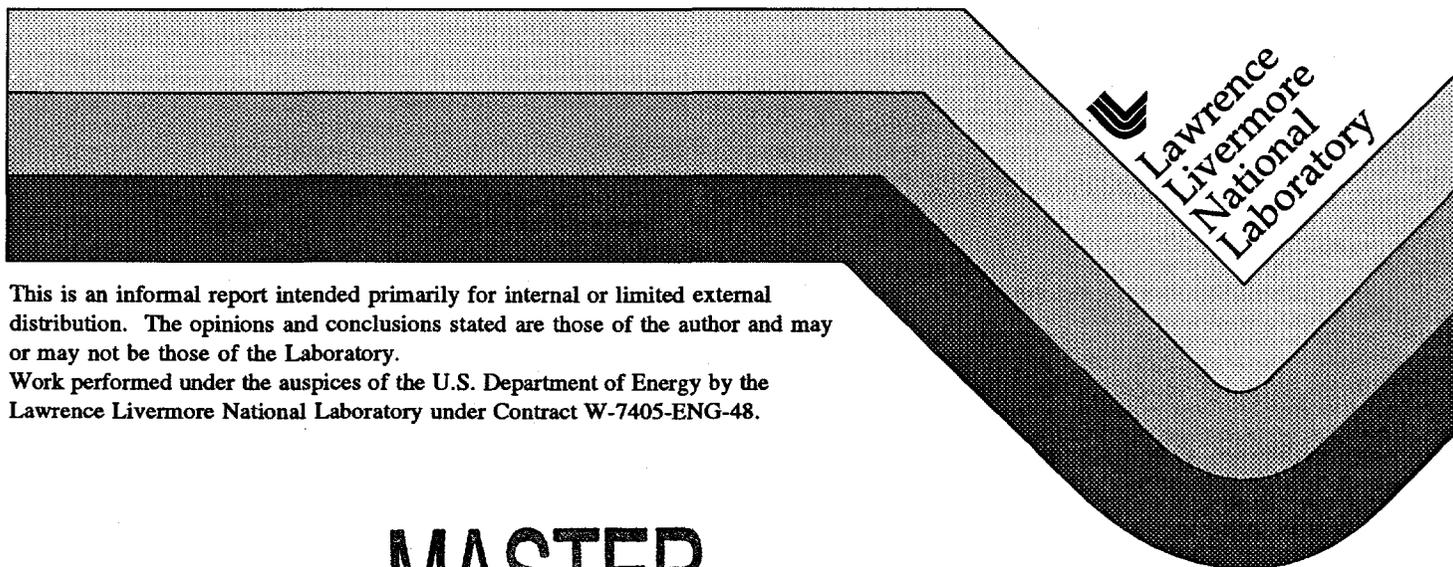
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July 7, 1971



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Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

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TO

U. S. ATOMIC ENERGY COMMISSION  
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THIS IS IN ANSWER TO THE QUESTION "WHAT WOULD THE LABORATORY DO IN CASE OF A COMPLETE TEST BAN?"

THERE ARE TWO PARTS TO THE ANSWER: WHAT WOULD IT DO IN THE WEAPONS FIELD, AND WHAT WOULD IT DO OUTSIDE THE WEAPONS FIELD?

1. IN THE WEAPONS FIELD

THE WEAPONS PROGRAM AT THE LABORATORY HAS FOUR MAJOR SUB-PROGRAMS AND THE DISCUSSION MAY BE BROKEN DOWN ACCORDING TO THESE SUB-PROGRAMS:

a. THE WEAPONIZATION AND MILITARY APPLICATIONS PROGRAM.

THIS PROGRAM WHICH HAS THE RESPONSIBILITY FOR CARRYING OUT THE LABORATORY'S OBLIGATIONS FROM PHASE 3 ON AND ALSO FOR PARTICIPATING IN PHASE 1 AND 2 DISCUSSIONS, AMOUNTS TO ABOUT A FIFTH OF THE LABORATORY'S TOTAL WEAPONS PROGRAMS; SOMETIMES AS MUCH AS A QUARTER. UNDER A COMPLETE TEST BAN, THE MAIN

BE BRIEF-ELIMINATE UNNECESSARY

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[REDACTED]

RESPONSIBILITY OF THIS PROGRAM WOULD BECOME THE MAINTENANCE OF THE STOCKPILE WHICH, AS TIME WENT BY, WOULD CONSIST INCREASINGLY OF OLDER ITEMS AND OLDER DESIGNS. PRESENTLY, PERHAPS 10% OF THE WEAPONIZATION PROGRAM IS INVOLVED IN STOCKPILE MAINTENANCE WITH THAT FRACTION DOUBLING OR TRIPLING WHEN AN EMERGENCY REPLACEMENT IS CALLED FOR. OVER THE YEARS, ONE WOULD EXPECT THIS FRACTION TO GO UP FROM ITS PRESENT AVERAGE LEVEL, ALTHOUGH BY HOW MUCH IS VERY DIFFICULT TO SAY. MORE INTENSIVE LONG-TERM MATERIALS AND MATERIAL-AGING STUDIES WOULD LIKELY BE UNDERTAKEN.

IN ADDITION TO THE CHRONOLOGICAL AGING OF THE STOCKPILE, THE WEAPONS DESIGNER WOULD HAVE TO CONTINUOUSLY REVIEW THE SURVIVABILITY OF THE DETERRENT STOCKPILE AGAINST <sup>POSSIBLE</sup> ~~THE~~ ENEMY DEFENSIVE SYSTEMS.

[REDACTED]

[REDACTED]

[REDACTED]

THE JOB OF MODIFYING OR FITTING NEW DESIGNS OF NUCLEAR WARHEADS INTO DIFFERENT DOD SYSTEMS WOULD GREATLY DECREASE SINCE CHANGES WHICH COULD BE MADE IN THE STOCKPILE OF NUCLEAR WARHEADS WOULD BE SHARPLY LIMITED. THE AMOUNT OF WORK WHICH CAN BE DONE UNDER A TEST BAN IN THIS AREA CLEARLY DEPENDS ON WHAT JUDGMENT IS MADE ABOUT HOW CONSERVATIVE CHANGES MUST BE TO BE ACCEPTABLE. IN MY OPINION, NUCLEAR PARTS SHOULD NOT BE CHANGED AT ALL AND THEREFORE THE CHANGES WOULD AMOUNT TO A REPACKAGING, WHERE THE MAIN ROLE PLAYED BY THE LABORATORY WOULD BE TO SEE ~~XX~~ TO IT THAT REPACKAGING DID NOT INTERFERE, TO THE BEST OF OUR CALCULATIONS, WITH NUCLEAR PERFORMANCE.

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PARTICIPATION IN PHASE 1 AND 2 DISCUSSION WOULD GO ON AS IT DOES NOW. THE LEVEL OF THIS WORK WOULD DEPEND ON THE DECISIONS OF THE DEPARTMENT OF DEFENSE CONCERNING NUMBERS AND KINDS OF NEW NUCLEAR WEAPONS SYSTEMS THEY WOULD WANT TO PUT INTO OPERATION, USING ESSENTIALLY EXISTING WARHEAD DESIGNS. SINCE NUCLEAR WEAPONS SYSTEMS ARE INITIATED FOR A VARIETY OF REASONS, INCLUDING CHANGES OF MISSIONS, CHANGES OF NONNUCLEAR TECHNOLOGY, AND CHANGES OF TACTICS, IT IS DIFFICULT TO ESTIMATE TO WHAT EXTENT THE DOD WOULD CARRY ON THIS ACTIVITY. OUR PARTICIPATION IN PHASE 1 AND 2 DISCUSSIONS OFTEN INVOLVES OUR CARRYING OUT NUCLEAR EXPERIMENTS TO OBTAIN RELEVANT DATA. THAT PART OF THE EFFORT WOULD OF COURSE TERMINATE.

SUMMARIZING, ONE WOULD EXPECT THAT THE PART OF THE LABORATORY DEVOTED TO WEAPONIZATION WOULD GO DOWN SO FAR AS ENGINEERING AND PHYSICS EFFORT ARE CONCERNED, BUT MIGHT WELL GO UP INSOFAR AS MATERIALS WORK IS CONCERNED. THE NET BALANCE IS SO SENSITIVELY DEPENDENT UPON DOD DECISIONS, THAT I CANNOT HERE ESTIMATE IT.

b. NUCLEAR DESIGN PROGRAM

THE MAIN JOB OF THE NUCLEAR DESIGN PROGRAM IS TO INVESTIGATE NEW NUCLEAR DESIGNS, BASIC PHYSICS QUESTIONS RELATING TO THEM, AND, TO SOME EXTENT, SOME OF THEIR EFFECTS. CLEARLY, THAT EFFORT WOULD SHARPLY DWINDLE. THERE WOULD BE TWO OR THREE YEARS OF FAIRLY

USEFUL WORK TO PUT IN, IN THE REPORT WRITING AND THE CALCULATION INTERPRETATION OF RECENT EXPERIMENTS. IT WOULD BE DIFFICULT TO KEEP FIRST-RATE PEOPLE ON THIS EFFORT, AND THEREFORE, MY GUESS IS THAT IT WOULD EVENTUALLY DIE DOWN SO FAR AS MAKING A SIGNIFICANT CONTRIBUTION TO THE STATE OF THE ART IS CONCERNED.

AN INCREASING FRACTION OF THE PEOPLE INVOLVED IN NUCLEAR DESIGNS COULD QUITE USEFULLY WORK ON ESTIMATING THE ~~EXTENT~~<sup>NATURE</sup> AND STRENGTH OF NUCLEAR ATTACKS WHICH MIGHT AFFECT THE VULNERABILITY OF PRESENT SYSTEMS IN A NUCLEAR ENVIRONMENT SUCH AS MIGHT BE PRESENT IN A SECOND-STRIKE SITUATION. THE LABORATORY HAS DONE SOME BUT NOT MOST OF THE WORK IN THAT AREA. IT COULD USEFULLY DO A GREAT DEAL MORE. IT COULD AND PROBABLY SHOULD ALSO EXTEND ITS EFFORT INTO DEVISING NUCLEAR SIMULATION TECHNIQUES TO DETERMINE THE VULNERABILITY OF MILITARY COMPONENTS TO NUCLEAR EFFECTS. SUCH AN EFFORT COULD BE QUITE LARGE. IT WOULD INVOLVE SOME NEW SKILLS, A TURNOVER OF PEOPLE, AND AGAIN, ITS EXTENT IS QUITE DIFFICULT TO ESTIMATE. IT COULD BE AS LARGE AS THE PRESENT NUCLEAR DESIGN EFFORT IF A SERIOUS ATTEMPT WERE MADE TO UTILIZE LABORATORY RESOURCES TO MAINTAIN THE INVULNERABILITY OF PRESENT MILITARY SYSTEMS. CERTAINLY, IN SUCH AREAS AS A PREDICTION OF FALLOUT, PREDICTION OF EMP, PREDICTION OF GEOMAGNETIC AND OTHER DISTURBANCES FROM VARIOUS KINDS OF BURSTS, THE PREDICTION OF EFFECTS OF DUST ON REENTRY VEHICLE, ETC., THE LABORATORY HAS A HEAD START, AND IN FACT, HAS USUALLY BEEN THE PLACE WHERE NEW CALCULATION<sup>S</sup> OR NEW EXPERIMENTAL TECHNIQUES WERE INITIATED ALTHOUGH THESE TECHNIQUES WERE USUALLY EXPLOITED ELSEWHERE.

[REDACTED]

IN ADDITION, THERE ARE AT THE LABORATORY, A NUMBER OF SCIENTISTS WHO HAVE DEVOTED SOME YEARS TO THE STUDY OF THE SEISMIC EFFECTS AND OTHER METHODS OF VERIFYING OR EVADING ~~THE~~ <sup>VERIFICATION</sup> OF NUCLEAR EXPLOSIONS, THOSE PEOPLE WOULD HAVE A CLEARLY EXPANDING ROLE UNDER A NUCLEAR TEST BAN. ~~\_\_\_\_\_~~

~~\_\_\_\_\_~~  
THE NUCLEAR DESIGN PROGRAM AMOUNTS TO ABOUT A THIRD OF THE TOTAL PROGRAM.

c. TEST PROGRAM

THE TEST PROGRAM WOULD CLEARLY SHARPLY DECREASE IN THE NEEDS PLACED ON IT AND IN ITS MANPOWER. SOME GROUPS WOULD HAVE TO BE RETAINED IF A READINESS POSTURE WERE TO BE MAINTAINED BUT THEY WOULD HAVE TO BE KEPT BUSY ON GENUINELY USEFUL SCIENTIFIC TASKS IF GOOD PEOPLE WERE TO BE KEPT ON BOARD. THE NUMBER OF TASKS WHICH ARE BOTH GENUINELY USEFUL AND CLOSELY RELEVANT TO READINESS-FOR-WEAPONS TESTING IS LIMITED. THEY WOULD INVOLVE IN PART INSTRUMENTATION DEVELOPMENT, IN PART ASTROPHYSICAL OR GEOPHYSICAL MEASUREMENT, AND IN PART (VERY LIKELY) WORK ON THE LASER-INDUCED IMPLOSIONS IF PERMITTED. DEVELOPMENT OF AUTOMATED DIGITAL DATA COLLECTION SYSTEMS, SUCH AS NADS, COULD BE CONTINUED AND APPLIED TO A VARIETY OF EXPERIMENTAL SYSTEMS. THIS COULD MAINTAIN A GROUP IN DIRECTLY RELATED AND USEFUL WORK. THE TOTAL EFFORT WOULD BE MUCH LESS THAN WHAT IS NOW NEEDED. THE TEST PROGRAM AMOUNTS TO BETWEEN A FIFTH AND A QUARTER OF THE TOTAL PROGRAM.

d. SUPPORTING RESEARCH

SOMEWHERE BETWEEN A FIFTH AND A QUARTER OF THE TOTAL WEAPONS PROGRAM IS DEVOTED TO SUPPORTING RESEARCH IN PHYSICS, COMPUTERS, CHEMISTRY, AND ENGINEERING. UNDER THE ASSUMPTION THAT THE U.S. WANTS TO MAINTAIN SOME CAPABILITY TO RESUME NUCLEAR WEAPONS DESIGN, MUCH OF THIS COULD AND SHOULD GO ON IN THE EVENT OF A TEST BAN TREATY. \_\_\_\_\_

\_\_\_\_\_  
OUR WORK IN NUCLEAR PHYSICS, OUR WORK ON HYDRODYNAMICS, ON TRANSFER THEORY, ON MATHEMATICAL METHODS SUCH AS MONTE CARLO METHODS, ALL SERVE A BROADER PURPOSE THAN NUCLEAR WEAPONS DESIGN AND ALSO ARE ESSENTIAL TO MAINTAIN SKILL IN THAT AREA. THESE PROGRAMS ARE LARGELY UNCLASSIFIED AND COULD BE USEFULLY EXPANDED, BUT WOULD, OF COURSE, NOT SUBSTITUTE FOR NUCLEAR DESIGN SO FAR AS ADVANCEMENT OF THE STATE OF THE ART IS CONCERNED.

WORK ON MATERIALS AS NOTED ABOVE WOULD HAVE TO EXPAND, IF ONLY IN CONNECTION WITH THE STOCKPILE. FUNDAMENTAL MATERIALS WORK IS GOING ON AT THE LABORATORY, IN BOTH PHYSICS AND CHEMISTRY, AND HAS TO DO WITH BEHAVIOR OF MATERIALS, BOTH UNDER NORMAL CONDITIONS OF STORAGE, AND ALSO UNDER EXPLOSION CONDITIONS.

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THE WORK ON COMPUTERS SYSTEMS SOFTWARE AND COMPUTER CODES WOULD DEPEND SHARPLY ON THE AMOUNT OF WORK WHICH THE PROGRAMMATIC PARTS OF THE EFFORT WOULD CARRY ON. IF THERE IS A GOOD SIZED PROGRAM IN MAINTAINING INVULNERABILITY, COUPLED PERHAPS WITH THE PLOWSHARE PROGRAM, THE LOAD ON COMPUTERS MIGHT REMAIN ABOUT WHERE IT IS NOW, SO FAR AS DEVELOPING NEW CODES AND NEW SOFTWARE IS CONCERNED. IF THERE IS ANY ATTEMPT MADE TO MODIFY NUCLEAR WARHEADS FOR NEW SYSTEMS, THE LOAD ON COMPUTERS COULD GO UP DRASTICALLY, AS PEOPLE ATTEMPTED TO FIND A SUBSTITUTE FOR TESTS. IT IS MY STRONG RECOMMENDATION, HOWEVER, THAT WE NOT FOLLOW THIS PATH AND THAT CHANGES IN NUCLEAR COMPONENTS NOT BE MADE. IN SPITE OF THIS RECOMMENDATION, I BELIEVE THAT IN THE COURSE OF TIME, PRESSURE TO MAKE SUCH CHANGES IN ORDER TO IMPROVE OR EVEN MAKE POSSIBLE CERTAIN NEW MILITARY SYSTEMS MAY BE DIFFICULT TO WITHSTAND. IN THAT CASE, THE DEMAND ON COMPUTERS WOULD GREATLY EXCEED WHAT IS THE CASE NOW.

2. OUTSIDE THE WEAPONS PROGRAM

BECAUSE WITHOUT TESTING THE AMOUNT OF NEW KNOWLEDGE WHICH CAN BE ACCUMULATED IN THE NUCLEAR EXPLOSION AREA IS QUITE LIMITED, AND BECAUSE THE IMPORTANCE OF ACCUMULATING THIS KNOWLEDGE WOULD CLEARLY BE DOWNGRADED IN THE MINDS OF PEOPLE INVOLVED, IT WOULD BE QUITE HARD TO MAINTAIN MORE THAN A SMALL GROUP OF EXPERTS ON THE RELEVANT FIELDS. THE GOALS OUTLINED IN THE FIRST PART OF THIS TWX WOULD HELP, BUT IN MY OPINION, THEY WOULD NOT BE ENOUGH. SOME NEW MAJOR PROJECT, IN AREAS WHICH MIGHT BE CLOSE

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TECHNICALLY TO THE AREA OF NUCLEAR EXPLOSION, SHOULD BE FOUND. THE LABORATORY'S PRESENT EMBRYONIC EFFORTS IN ATMOSPHERIC POLLUTION AND ATMOSPHERIC MODELING COULD HELP FORM THE SEED OF SUCH A PROJECT, BUT A GREAT DEAL WOULD REMAIN TO BE WORKED OUT, AND IN ANY CASE, THE PROJECT WOULD HAVE TO FULFILL NEEDS CLEARLY RECOGNIZED AND THE LABORATORY WOULD HAVE TO COMPETE IN FULFILLING THESE NEEDS WITH OTHER ORGANIZATIONS. I BELIEVE THAT THESE PROBLEMS COULD BE MET SUCCESSFULLY SO FAR AS EMPLOYMENT OF THE PEOPLE IS CONCERNED. THE NET RESULT SO FAR AS BENEFITS TO <sup>A</sup>NUCLEAR WEAPONS WOULD BE LIMITED TO MAINTAINING IN THIS <sup>LABORATORY</sup>~~NETWORK~~ A GROUP OF VERY QUALIFIED PEOPLE WHICH COULD BE CALLED UPON FOR CONSULTANCY, OR IF NEED BE, IN THE CASE OF ~~TEST~~ RESUMPTION.

THE NONNUCLEAR WEAPONS PROGRAMS PRESENTLY AT THE LABORATORY WOULD NOT BE STRONGLY AFFECTED BY THE NUCLEAR TEST BAN EXCEPT FOR PLOWSHARE, WHICH I PRESUME IS BEING DEALT WITH UNDER A SEPARATE HEADING. THE NONNUCLEAR WEAPONS PROGRAMS AT THE LABORATORY AMOUNT TO APPROXIMATELY 25% OF THE TOTAL AT THIS TIME.