

Weapons Proliferation

Postshot Activities of the Nth Country Experiment-April 1969
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GPO: 1969-O-27-240

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Lawrence Radiation Laboratory
UNIVERSITY OF CALIFORNIA
LIVERMORE

UCRL-50628

**POSTSHOT ACTIVITIES
OF THE Nth COUNTRY EXPERIMENT (U)**

David A. Dobson
Robert W. Selden
W. J. Frank

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POSTSHOT ACTIVITIES
OF THE Nth COUNTRY EXPERIMENT

FOIA (b) (3) - 42 USC 2162 (a) - RD DOE

Preface

W. J. Frank

This report is the fourth, and final, document about LRL's Nth Country Experiment.* It contains an edited transcript of the briefing given to a number of organizations in Washington and to the AEC Laboratories. The briefing was modified from time to time; the final version, as presented in the summer of 1968 to LASL, LRL, and Sandia, is given here. Since the introduction to the briefing contains most of the material usually found in a preface, I will not repeat it here.

A videotape was made of the briefing presented at LRL. This tape is in the LRL Instructional Television Library and is available to qualified viewers.

The Experiment was formally ended in September 1968, when some of the LRL staff met with the two Experimenters and discussed the Experiment "with no holds barred"—that is, with leading and comprehensive questions of the sort usually avoided at the briefings. All of the Nth Country's contributions to this report were submitted in writing before the September meeting.

An Epilogue by Robert Selden has been added to this report; he comments on the Experiment from his new point of view, after working almost half a year with the Laboratory's fission device design group.

*The other published documents on the Experiment are:
D. A. Dobson, D. N. Pipkorn, and R. W. Selden, The Nth Country Experiment, Lawrence Radiation Laboratory, Livermore, Rept. UCRL-50239 (December 1966) (Title: U; Report: SRD).

Summary Report of the Nth Country Experiment, W. J. Frank, Ed., Lawrence Radiation Laboratory, Livermore, Rept. UCRL-50249 (March 1967) (Title: U; Report: SRD).

The Nth Country Experiment: Supporting Documents, W. J. Frank, Ed., Lawrence Radiation Laboratory, Livermore, Rept. UCRL-50248 (October 1967) (Title: U; Report: SRD).

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Briefing on the Nth Country Experiment

[This section is the edited transcript of the Briefing as given in the summer of 1968.]

INTRODUCTION

W. J. Frank

Statement of the Problem

The phrase "Nth Country Problem" popularly refers to the design of a fission nuclear explosive by some small nation that wishes to create a stockpile of ten to twenty such weapons. After the Second World War it seemed to be widely believed that there was some secret to the atomic bomb that could be transmitted to another country on a few pieces of paper. A purloined set of official blueprints might indeed convey some basic facts about fission weapons. Most technical people, however, would feel that the transferral of knowledge and understanding is much more difficult, and at least as important a factor in the success of a design program.

The historical conditions for designing and building nuclear weapons are reasonably well known, but the exact minimum conditions have not been investigated very thoroughly. We decided to ignore the political problems caused by the Test Ban and Nonproliferation Treaties, as well as the first major technical problem, that of producing the nuclear materials. Instead, we looked at the second major technical problem: the invention or design of the nuclear weapon. To focus on this aspect, we limited the active participants to two or three physicists. Engineering and fabrication problems were ruled out, and

support functions (such as computations or experiments) were to be supplied by the Laboratory staff.

Ground Rules

We established the following ground rules for the Nth Country Experiment:

- The goal of the Experiment was to produce a credible nuclear explosive design with a militarily significant yield.
- The Experimenters were to have access to unclassified literature only.
- Any experiments carried out for them by their LRL support groups would also be based only on information and techniques available in the open literature.
- Since the Atomic Energy Act classifies most information about nuclear explosives as Restricted Data, regardless of whose auspices it is developed under, the Nth Country physicists received a Q clearance and worked inside the LRL fence.
- To avoid such well known security leaks as raised eyebrows or surprised expressions, we isolated the Experimenters from the rest of the Laboratory and required that all communications between them and the LRL Committee overseeing the Experiment should be in writing. All requests of the Experimenters and answers of the Committee were

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subsequently published in UCRL-50248.

- Although we recognized it might hinder the Experiment somewhat (and would certainly differ from a true Nth Country environment), we decided that the Committee and the support groups should never volunteer additional information or do anything except what was directly requested. (On occasion, in fact, we behaved like the New Englander who, when asked by the tourist, "Does this road go to Boston?" replied, "Yes," but neglected to point out that the tourist was headed in the wrong direction.)

The Physicists' Backgrounds

The three physicists who worked on the Experiment are typical of the Ph. D. physicists hired by LRL: they come without any training in hydrodynamics, neutron diffusion theory, the practical side of thermodynamics (such as equations of state for real materials), or even much knowledge about reactors. All three got their Ph. D. degrees in 1964:

- Dave Dobson
University of California (Berkeley)
Beta decay and nuclear magnetic moments;
- Dave Pipkorn
University of Illinois (Urbana)
Solid-state physics (Mössbauer effect);
- Bob Selden
University of Wisconsin (Madison)
Low-temperature physics (liquid helium).

History of the Nth Country Experiment


In the spring of 1964 Dobson and Pipkorn came to LRL as postdoctoral researchers. They agreed to work half time on the Experiment. In the spring of 1965, Selden came to the Laboratory as an Army research associate, and agreed to work on the Experiment full time. By the time the final design was submitted in December 1966, about three man-years of effort had been put into the program; almost half of it was spent working on the final report and other documentation. There was even the traditional last-minute yield prediction change, in February 1967, before the device had been "tested." Here are a few details of their final design:

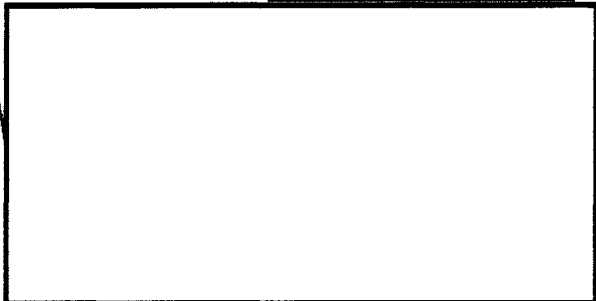
FOIA (b) (3) - 42 USC 2162 (a) - RD DOE

On April 10, 1967, the Committee gave a small party for the Experimenters to celebrate "N = 6"; we baked a small cake for the occasion, and inscribed it, "Welcome to the Club."

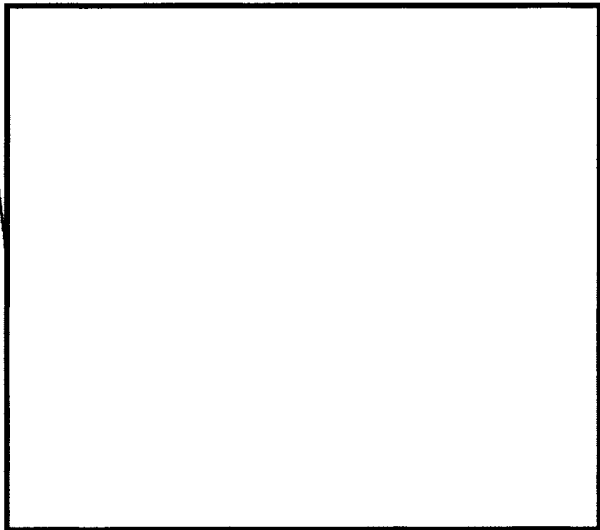
Since then, there have been a number of postshot activities. We have produced three reports: the Experimenters' final report, with all the physics in it (UCRL-50239); a smaller summary report, with the Committee's evaluation of the design (UCRL-50249); and a documentation report, with all the question-and-answer correspondence between the two groups (UCRL-50248). A briefing on the Experiment was developed; after initial tryouts at LRL and the Rand Corporation, it was presented to a number

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of agencies and organizations in Washington: the AEC Division of Military Application, the AEC Commissioners, the Defense Atomic Support Agency, the Military Liaison Committee, the Central Intelligence Agency, the Arms Control and Disarmament Agency, the State Department, the staff of the Joint Committee for Atomic Energy, the Senior Reviewers of the AEC, and the U. S. Intelligence Board. A fourth report [this one] will include a transcript of the briefing, plus an appendix listing all the questions asked at the briefings and giving the Experimenters' considered answers. 



A Guide for the Listener



2. Questions are acceptable with this proviso: we are still giving briefings

and wish to maintain the Experimenters in their current "unclassified" state. Your questions should not reveal or imply classified information.

3. The briefing has dropped much of the physics of the Experiment along the way, in favor of descriptions of the basic ideas, reasons for various decisions, and comments and observations on the Experiment from the designers' point of view.

4. After the Experimenters submitted their final report and received the test results, the Committee asked a number of questions to throw light on the other aspects of the Nth Country problem. Four of these have been included in this briefing.

5. Someone once commented that the classification level of our briefing was Unclassified—Restricted Data. According to the law, however, the information in this briefing, while derived from unclassified sources, is Secret—Restricted Data. The fact that this Nth Country Experiment, using only unclassified sources, has been performed is unclassified. The fact that it was successful is unclassified. But as many of you who have read classification guides might guess, almost any elaboration of these two statements with details of the Experiment is classified Secret—Restricted Data.

6. Only two of the Experimenters will present the briefing—Dave Dobson and Bob Selden.

[At this point, Dobson and Selden introduced themselves and continued the briefing in the form of a Huntley-Brinkley report.]

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THE Nth COUNTRY'S REPORT

D. A. Dobson and R. W. Selden

R. S. : We are happy to represent the Atomic Energy Commission of our Nth Country here today, and to describe how we designed a credible nuclear explosive with a militarily significant yield.

Our design was achieved with a very modest effort, and to illustrate this we would like to show you a sketch of me working in our Nth Country laboratory (Slide 1). This sketch was drawn for me by a psychologist friend at UCLA after she learned that I had gone to work at LRL. She had no idea how appropriate the cartoon was! We don't really mean to imply that the LRL staff who served as our laboratory support groups were no more help than a do-it-yourself kit and a black cat. The kit and the cat are simply representative of the nature of our work. The Experiment was truly a do-it-yourself project.

Our presentation is in six main sections. First, the evolution of the design, in which we will trace the chronology of the Experiment. Second, a description of our fission explosive design. Third, a brief discussion of our understanding of the physics of fission explosives. Fourth, our comments on the literature we used. Fifth, some thoughts about several other fission design possibilities after our design was tested. And last, a few remarks on some nontechnical factors affecting the Experiment.

Evolution of the Design

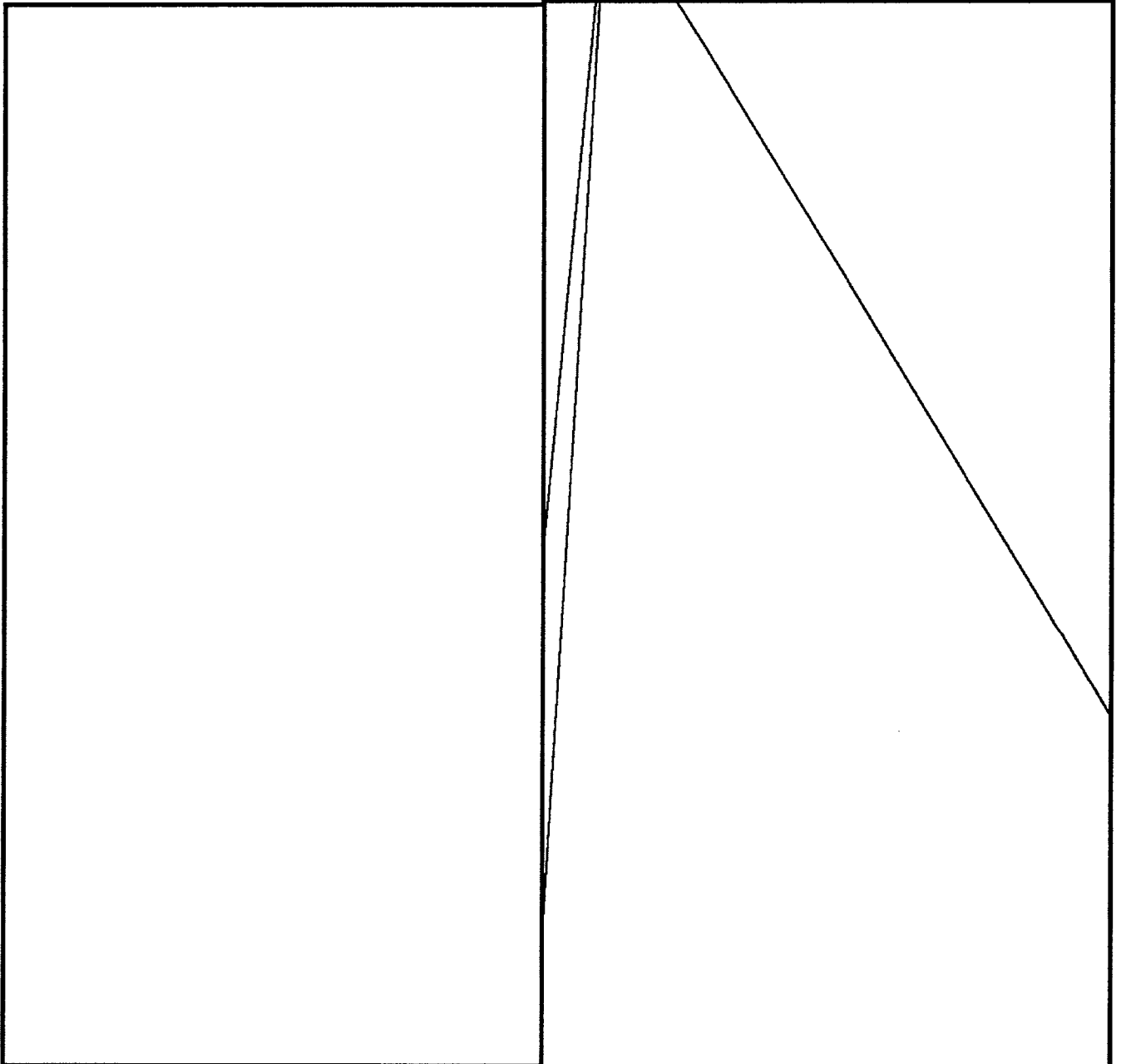
D. D. : Our task, as it was proposed to us in May of 1964, was to design a credible nuclear explosive with a militarily significant yield while having no access to classified information. To start with, we asked ourselves what a fission explosive consists of and how it works.



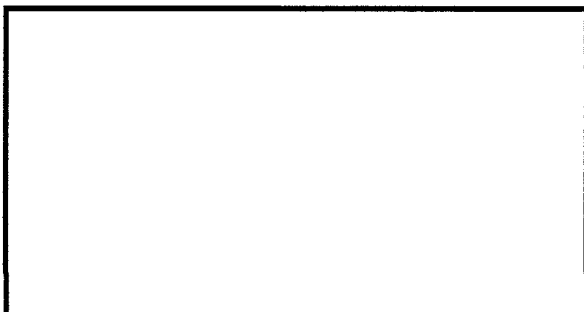
Slide 1. Sketch of the Nth Country's laboratory.

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The design we envisioned (which we now refer to as our Basic Concepts Design) had the following components:



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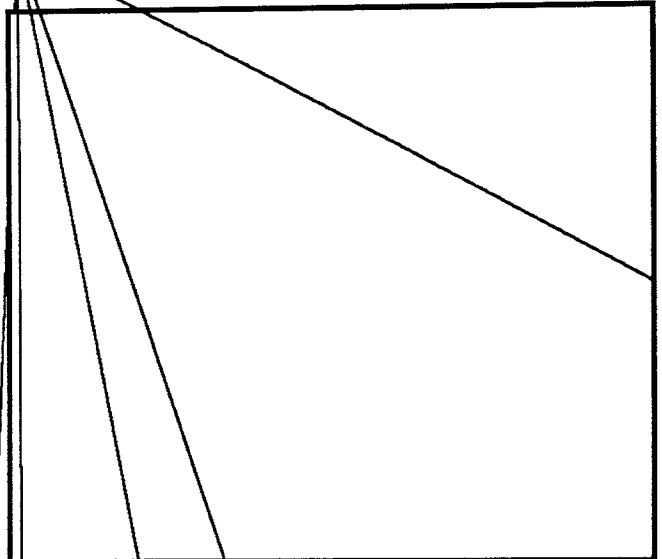
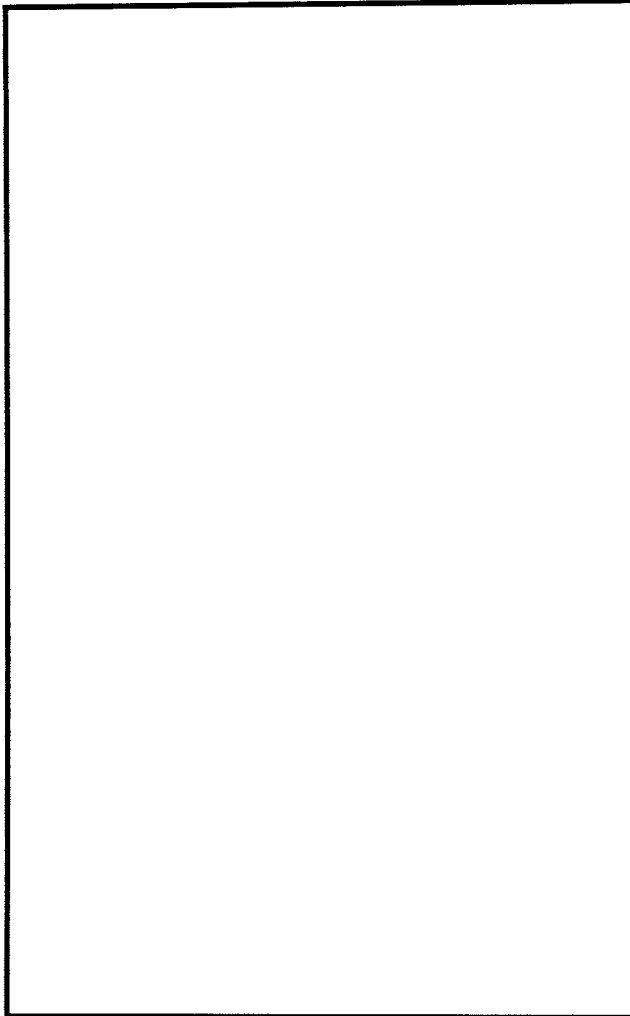
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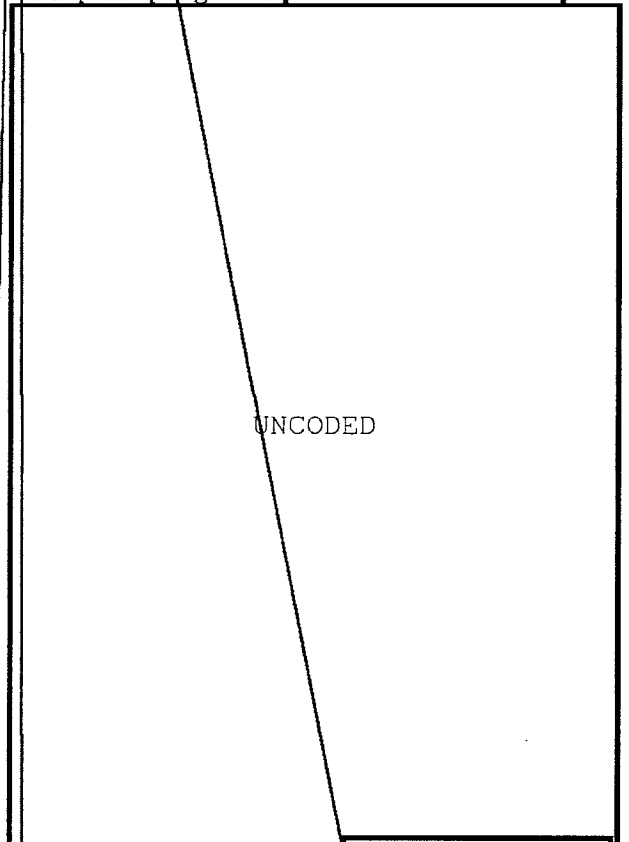
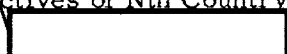
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Question 1. What would be your design for a second test?

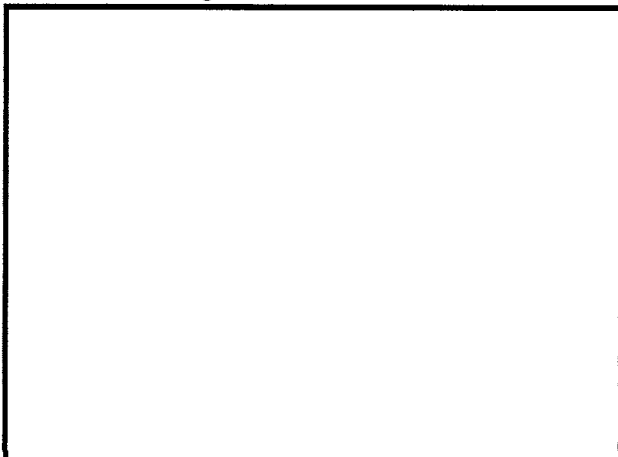
R. S. Our second test would actually depend on the objectives of Nth Country's weapons program.



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After the Test

D. D.: After the results of the test of our design were presented to us, we were asked how the results affected our understanding of fission explosives.



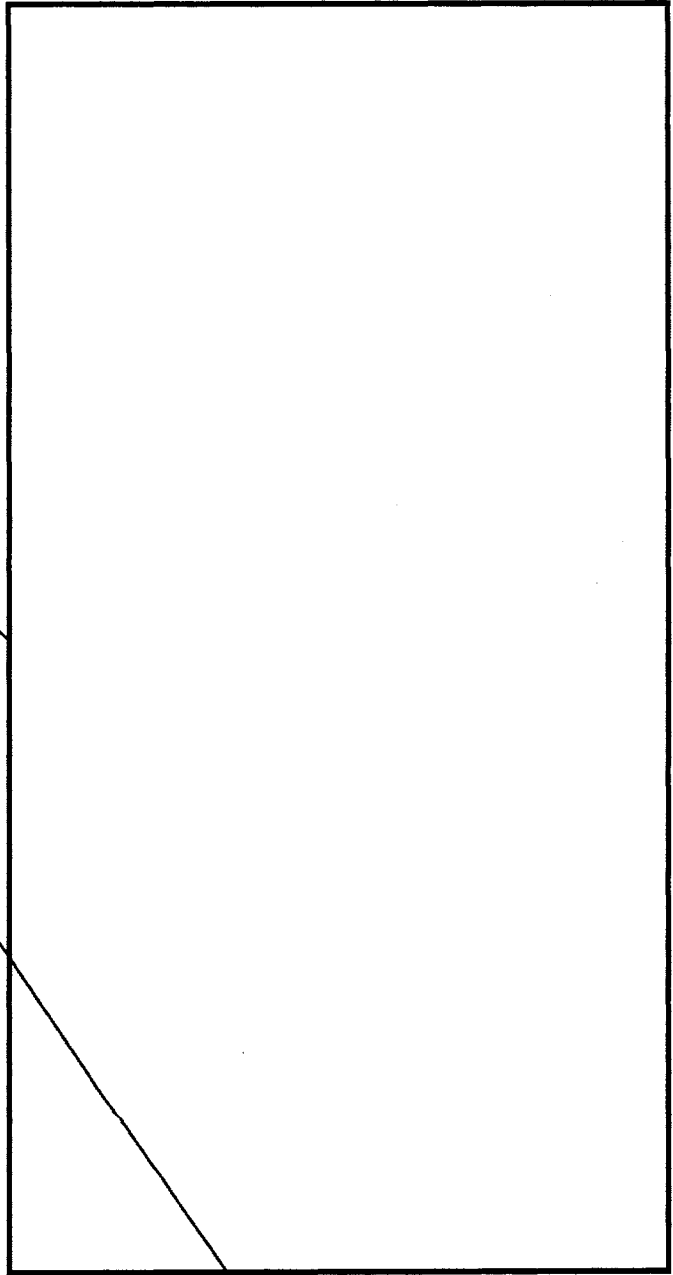
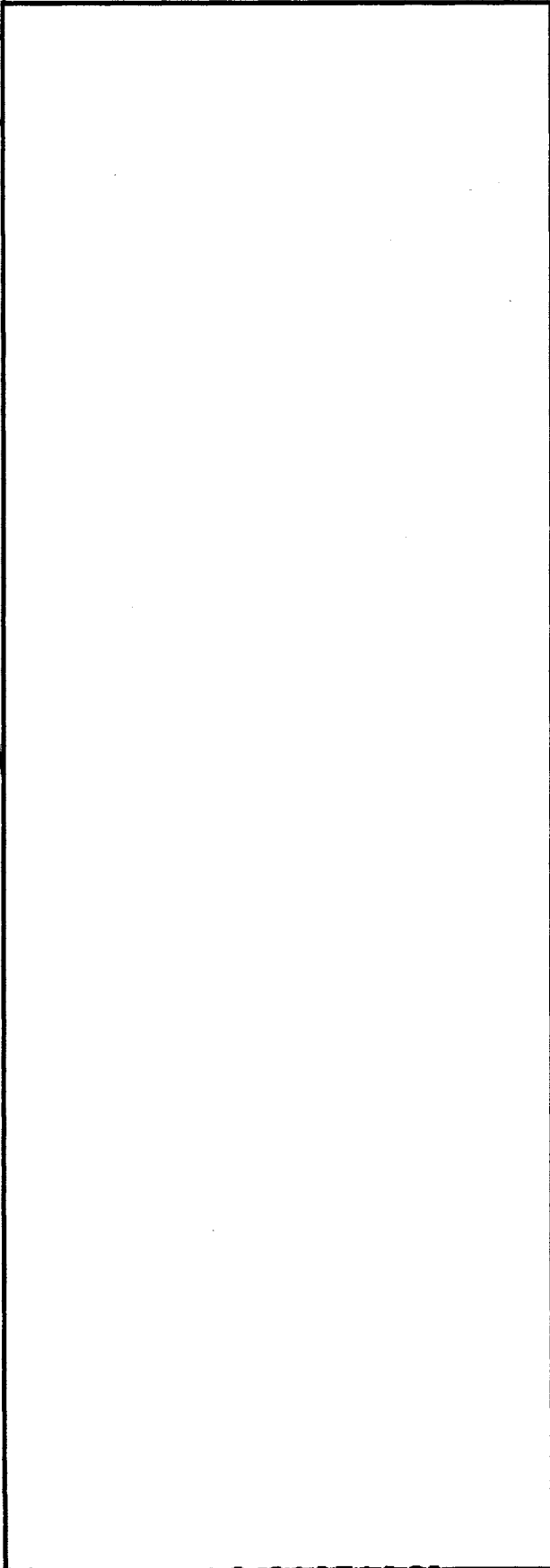
D. D.: Question 2.




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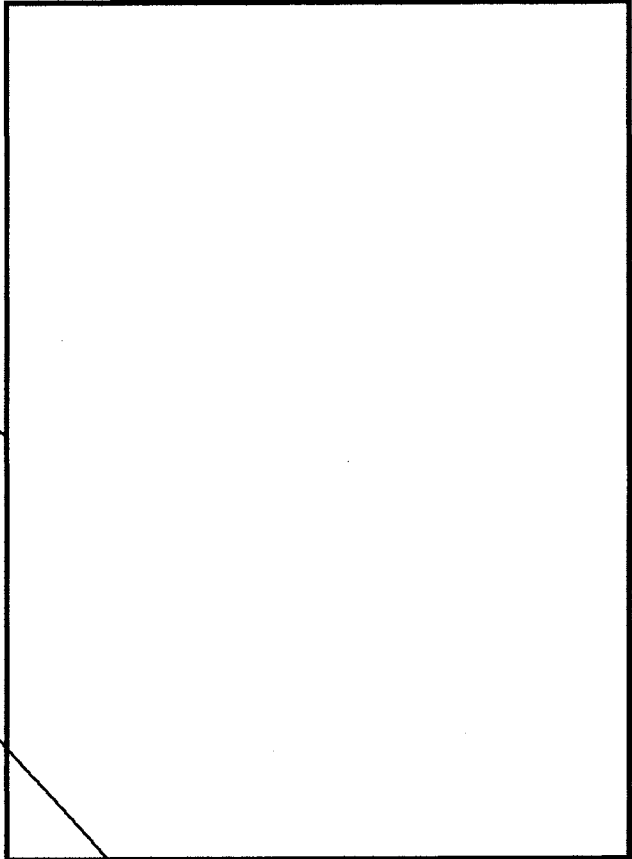
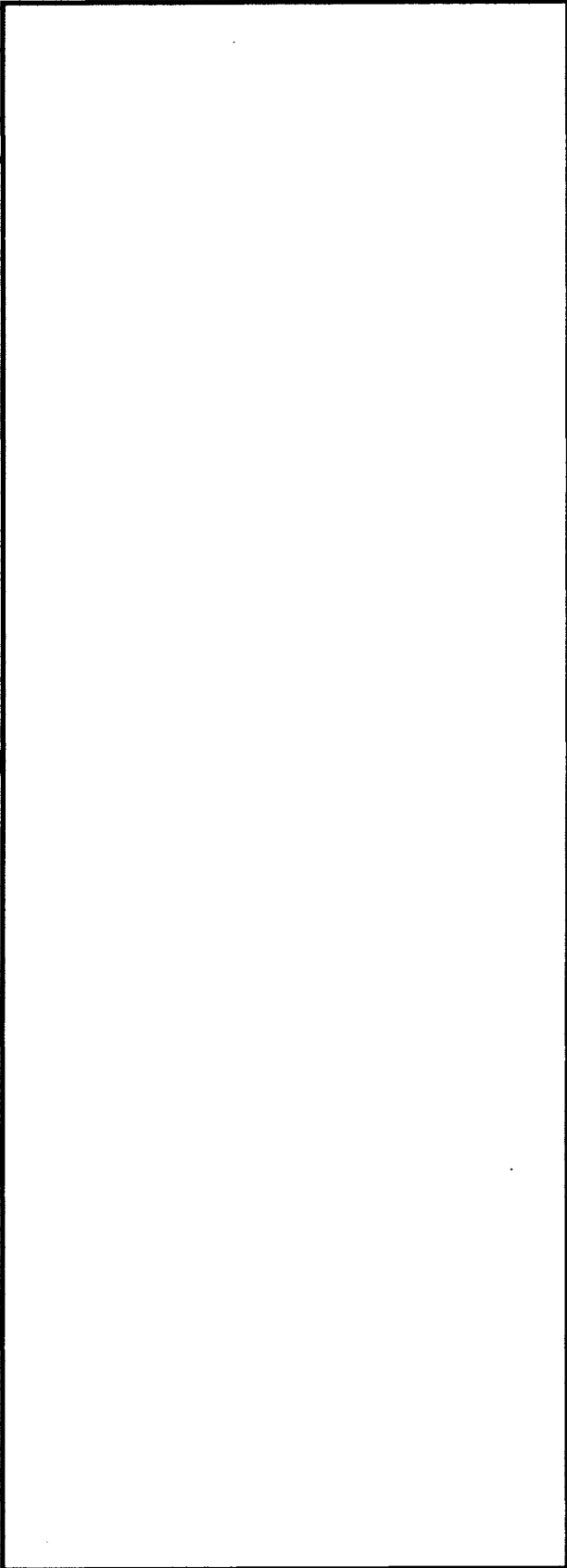
The Designers' View of the Experiment

D. D.: Let us go on to the last section of our presentation. 

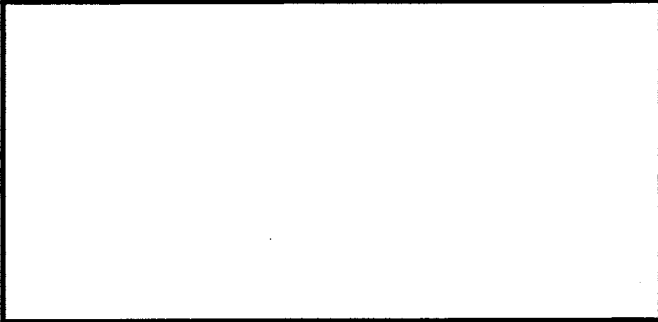


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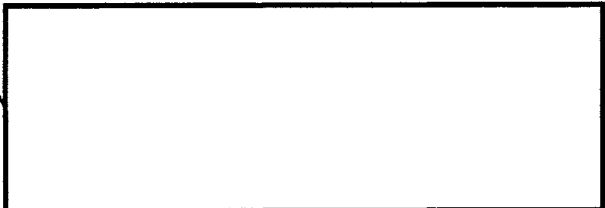
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The informal way in which the Nth Country Experiment was set up and its part-time nature at the beginning led to a lack of continuity (we worked hardest when the Lab committee had asked to see our notebooks).

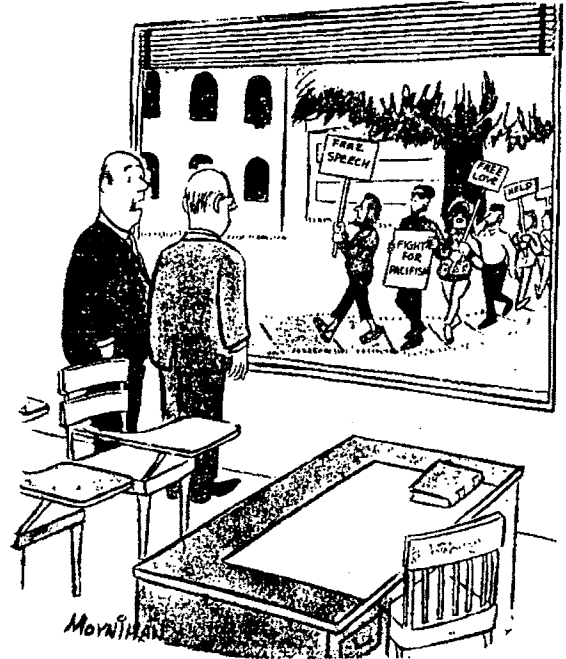


R. S.: It was incredible how we kept underestimating the time!



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Thank you.



"We'll have to view their demands in a different light. Their science class has the bomb."

Slide 6.

Questions about the Nth Country Experiment

This section is a collection of questions which were asked during the Nth Country briefings and the Experimenters' considered answers to these questions. Occasionally, questions directly or indirectly required an answer from the Committee or LRL; these questions are listed and answered in a separate subsection.

The results of the test of the Final Design, which were given to the Nth

Country by the Laboratory in April 1967, are included in the answer to Question 38.

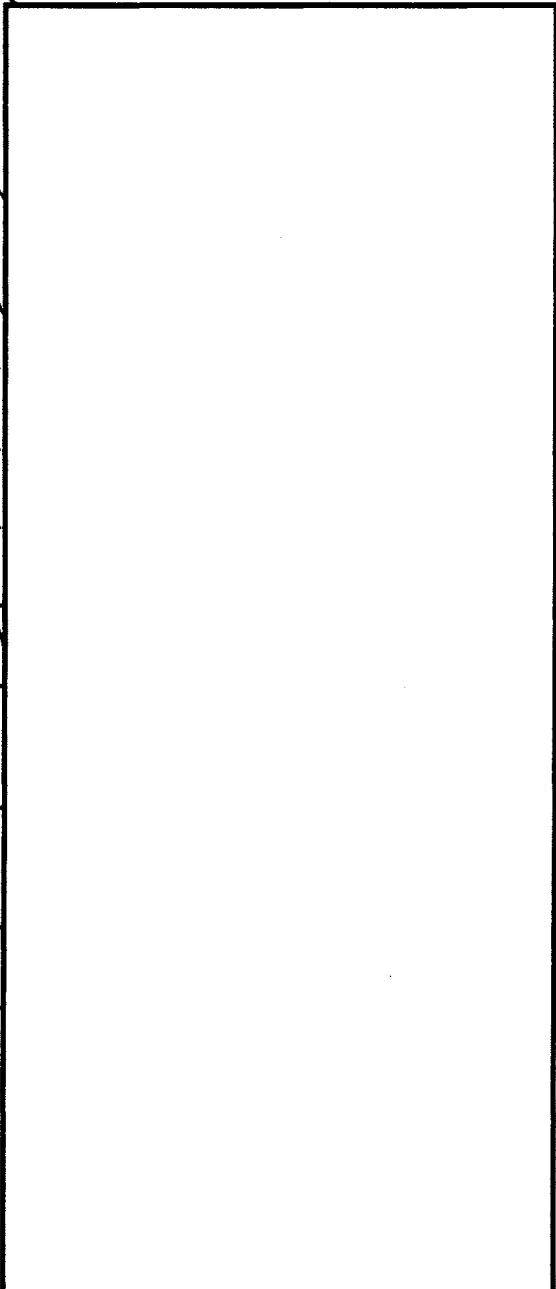
A LIST OF THE QUESTIONS

Details and Physics of the Design

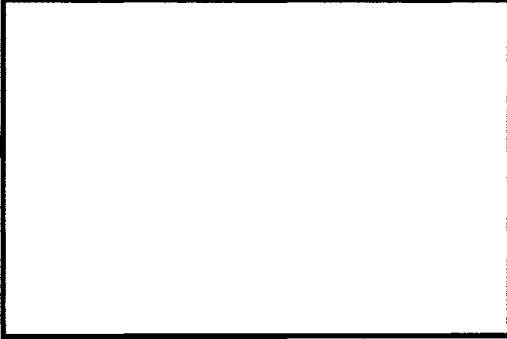
1. Could your design actually be built?

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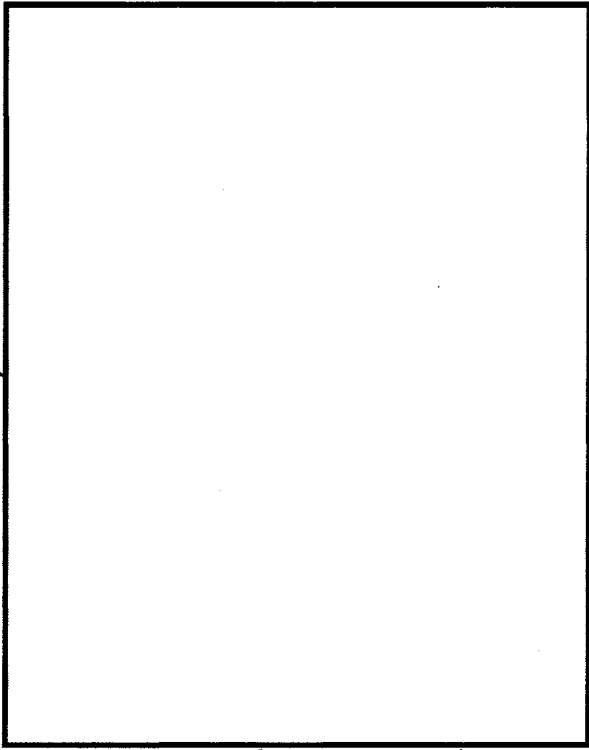
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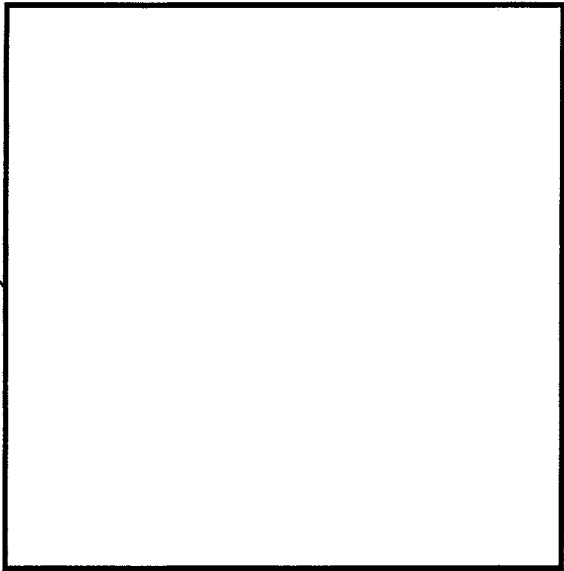
18. Were you given a definition of a militarily significant yield?



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30. In how much detail did you specify the experiments and calculations which you requested?



36. What did you propose to measure during the nuclear test of your device?



38. What did you learn from the test?

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Design Difficulties and Effort Con-
siderations

47. What kind of questions could you ask
of the Laboratory during the Exper-
iment?

48. What kind of questions did you ask?

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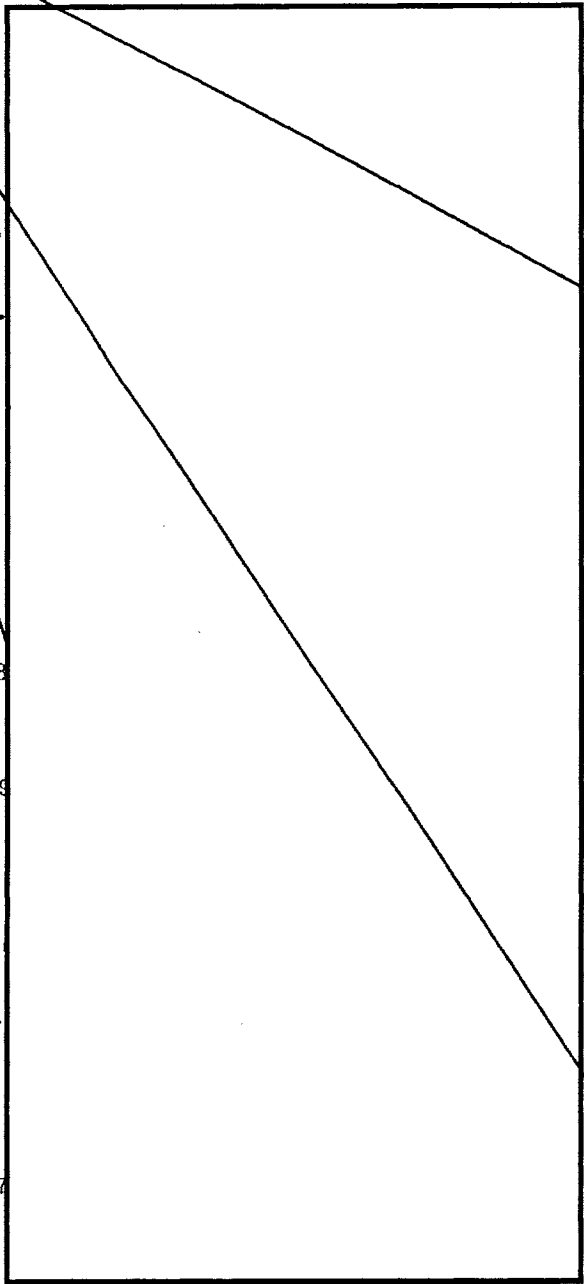
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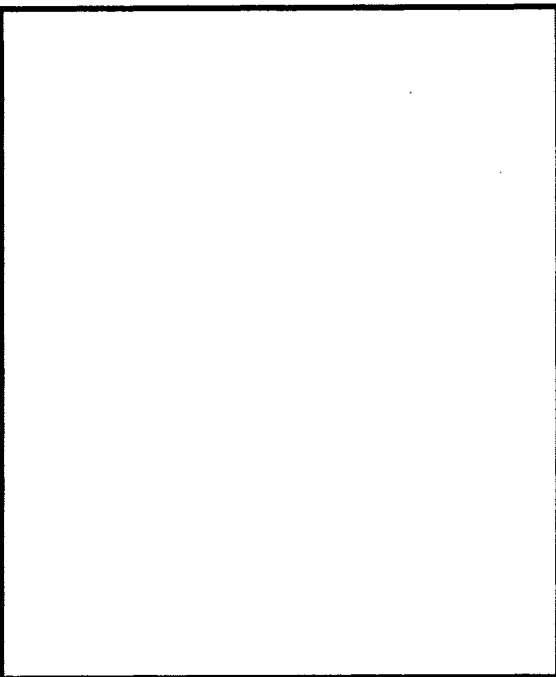
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83. Did you find that any document was particularly misleading?

84.
85.
86.



Information Sources and Intelligence

- 73. What information was made available to you at the beginning of the Experiment?
- 74. How did you look for information?
- 75. Did anyone assist you in searching for literature?
- 76. What sort of a library is necessary?

FOIA (b) (3) - 42 USC 2162 (a) - RD DOE
THE ANSWERS

Details and Physics of the Design—D. A.
Dobson and R. W. Selden

87.

88.

89. With your present understanding of nuclear explosives, what information would you instruct your spies to steal?

LRL's View of the Experiment

90. Were you surprised at the successful outcome of the Experiment?

91. What would you have done if the Experiment had not succeeded?

92. Do you think that any three physicists could have done this Experiment?

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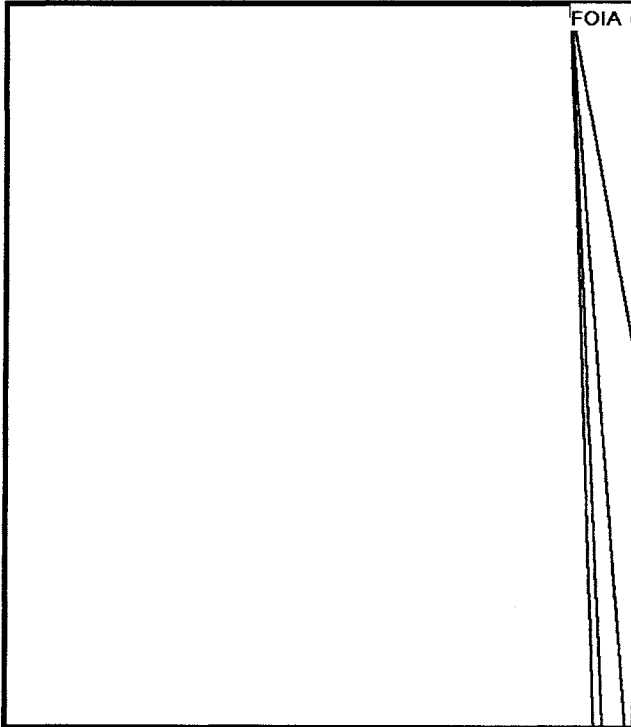
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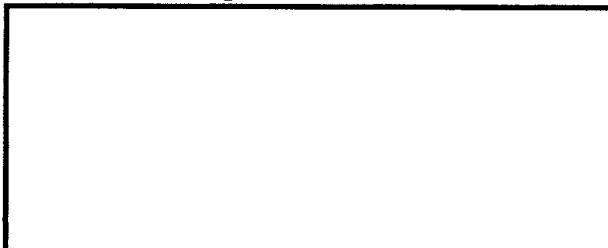


18. Were you given a definition of a militarily significant yield?

The only thing we were told is contained in the original proposal of the Experiment to us in May 1964. The pertinent part of the proposal is:



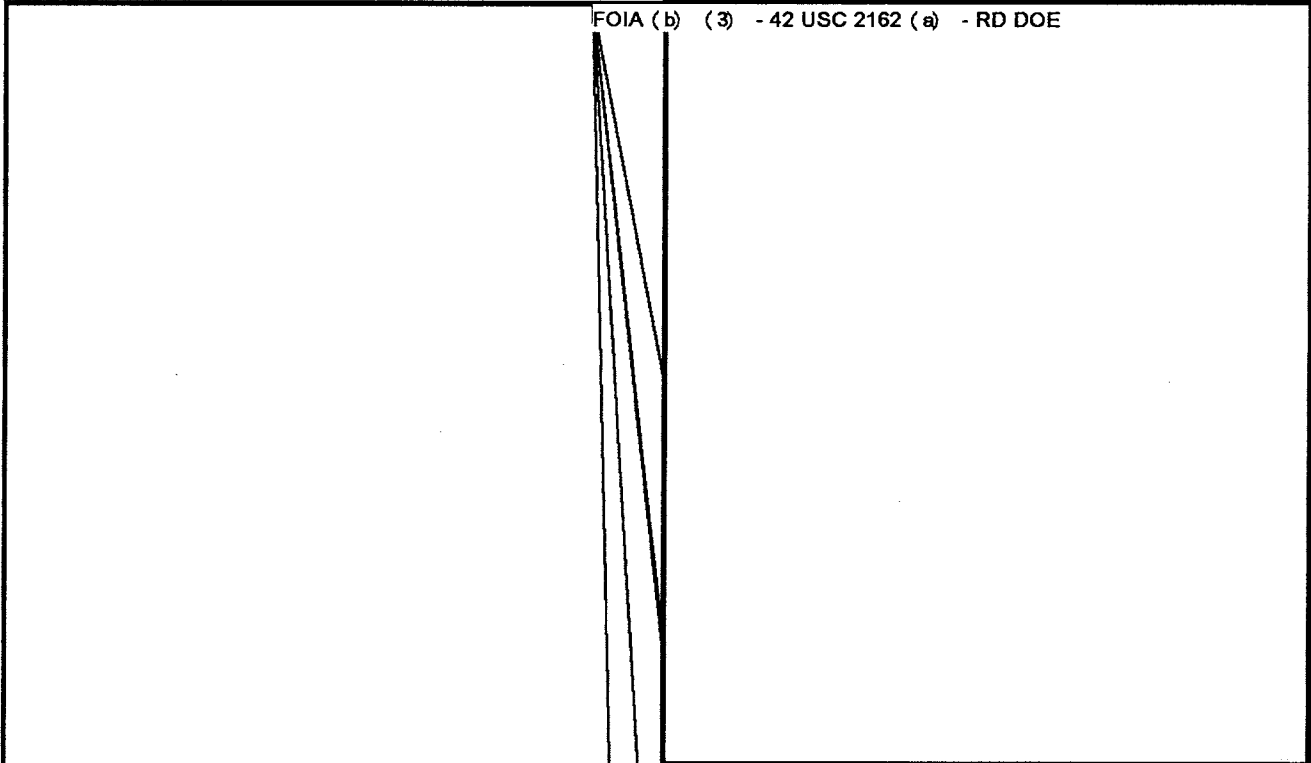
The goal of the participants should be to design an explosive with a militarily significant yield. A working context for the experiment might be that the participants have been asked to design a nuclear explosive which, if built in small numbers, would give a small nation a significant effect on their foreign relations.



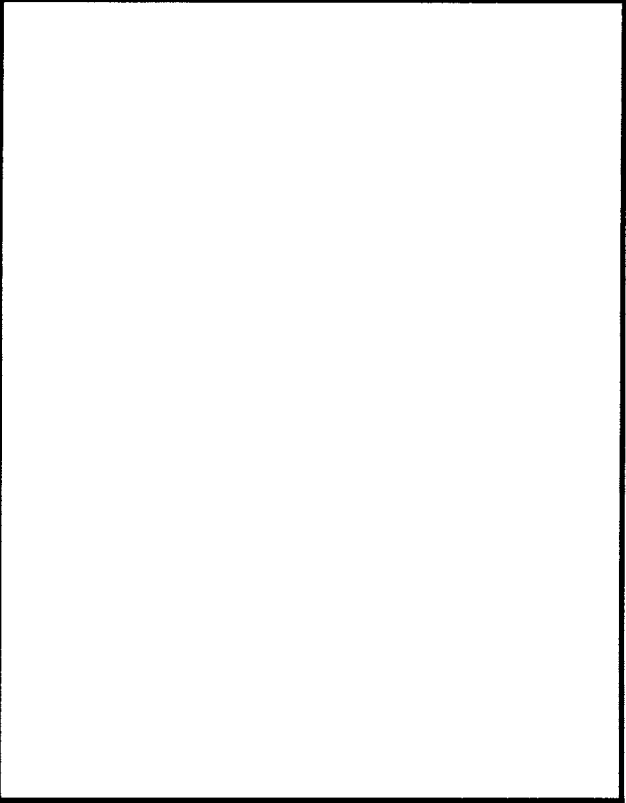
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[redacted] The results of the calculations were given to us, but not the codes themselves.



30. In how much detail did you specify the experiments and calculations which you requested?

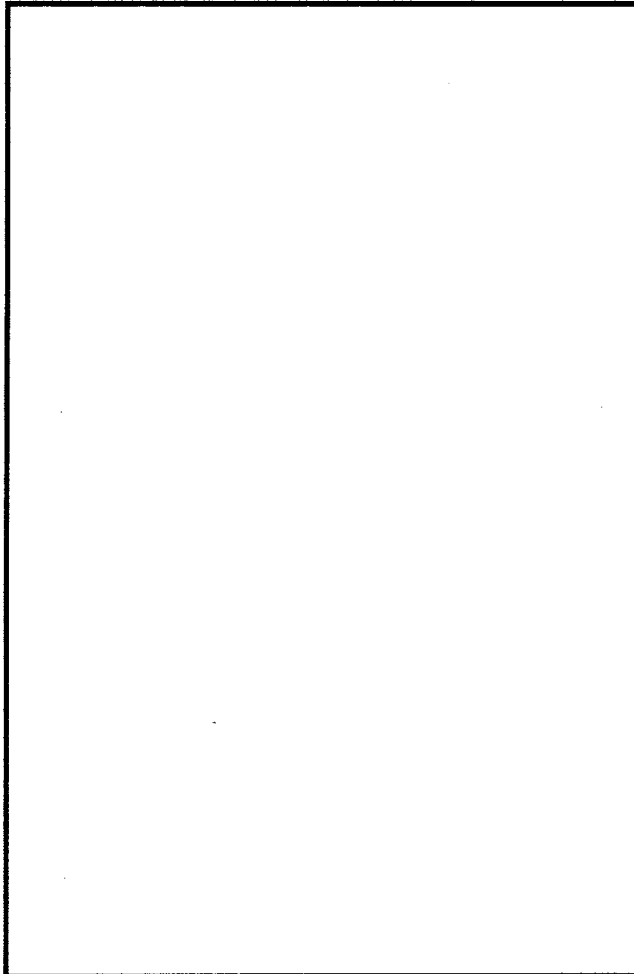


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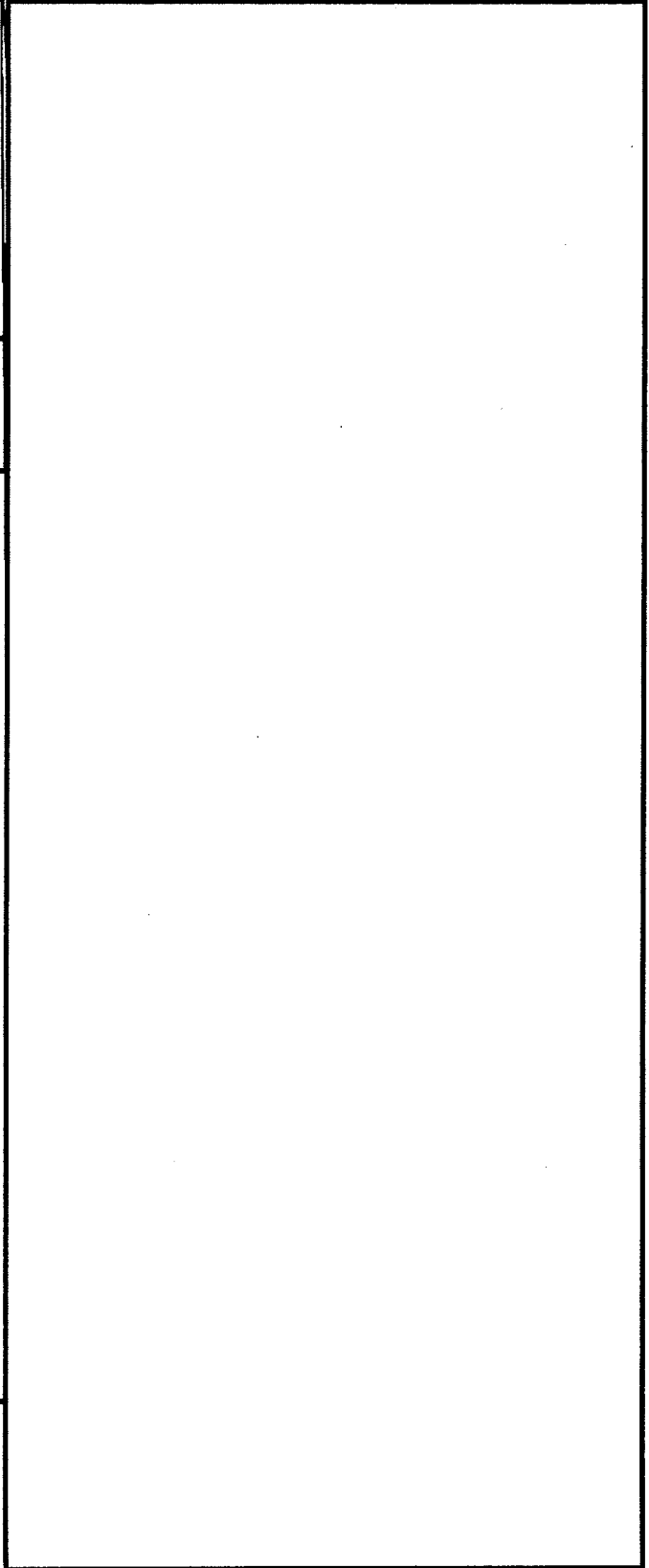
FOIA (b) (3) - 42 USC 2162 (a) - RD DOE
our requests for diagnostic results:



36. What did you propose to measure during the nuclear test of your device?



38. What did you learn from the test?
The Laboratory's "test group" told us to assume that our device had been tested, and they responded as follows to



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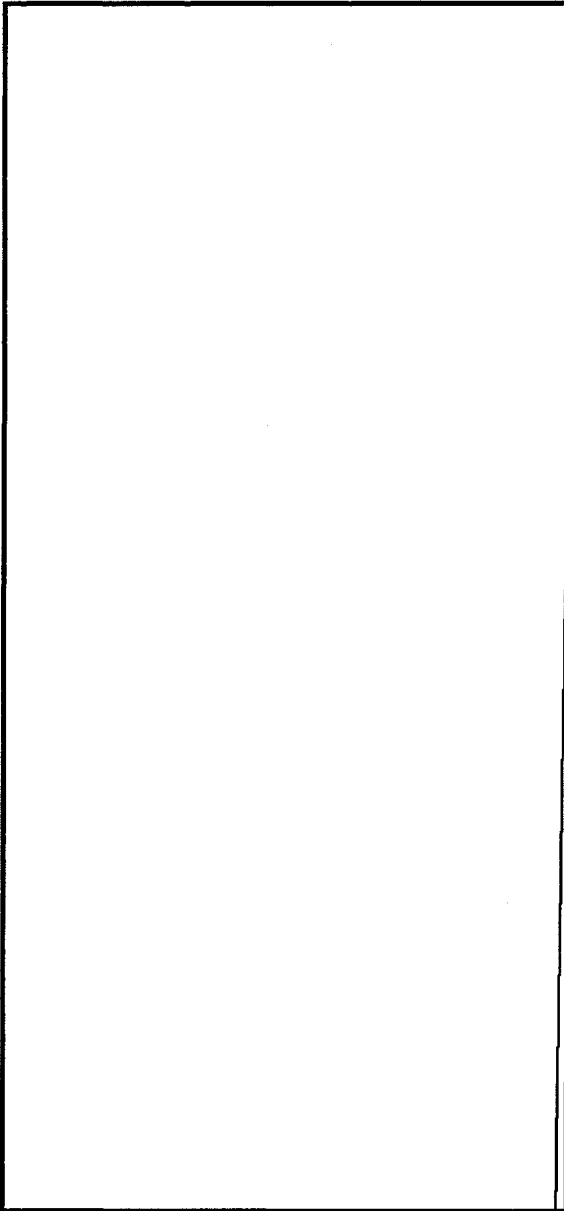
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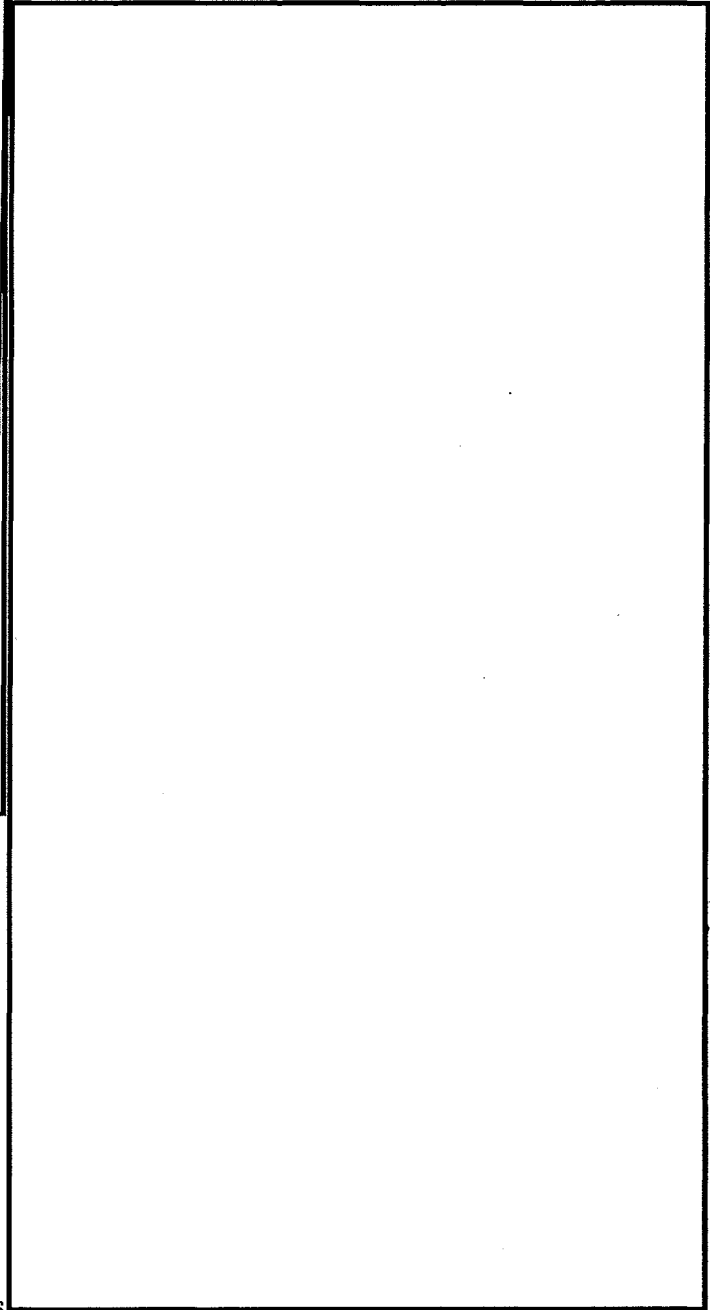
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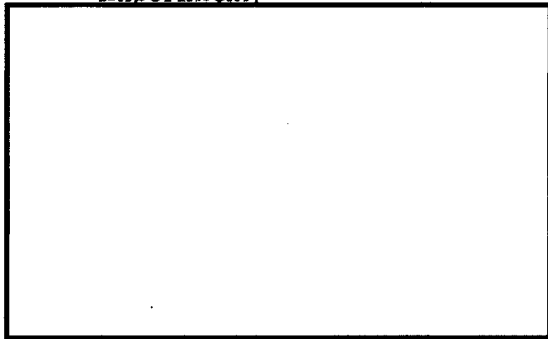


It seemed to us that a major part of the problem was to come up with the right questions.

48. What kind of questions did you ask?



47. What kind of questions could you ask of the Laboratory during the Experiment?



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[Redacted]

[Redacted]

76. What sort of a library is necessary?

Information Sources and Intelligence
—D. A. Dobson and R. W. Selden

73. What information was made available to you at the beginning of the Experiment?

We were told that we could use any unclassified information we could find.

74. How did you look for information?

[Redacted]

75. Did anyone assist you in searching for literature?

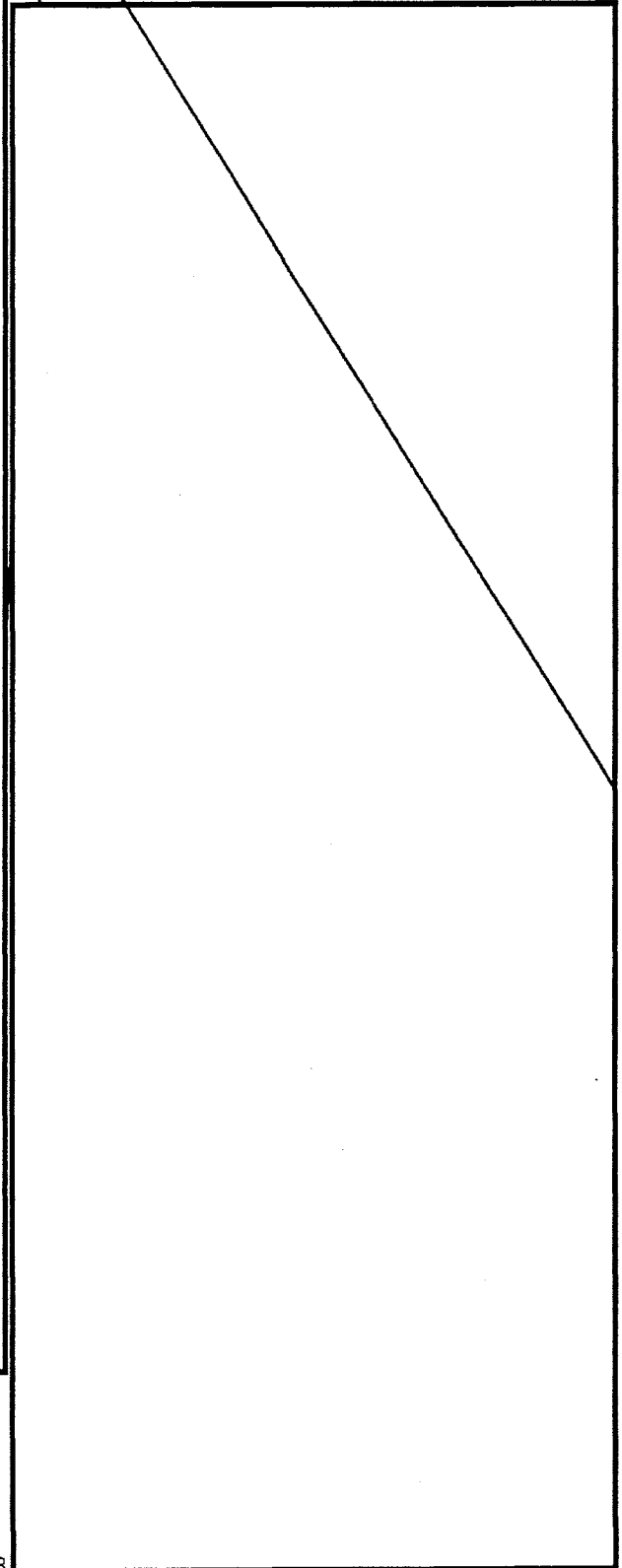
Shortly after the Experiment started we requested a search for information on a list of subjects.

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[Redacted]

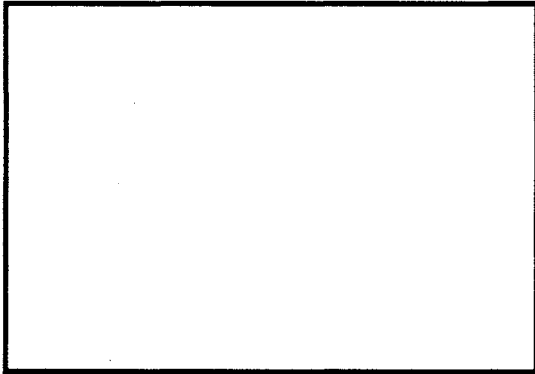
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FOIA (b) (3) - 42 USC 2162 (a) - RD DOE
with these questions about fission ex-
plosives:



89. With your present understanding
of nuclear explosives, what in-
formation would you instruct your
spies to steal?

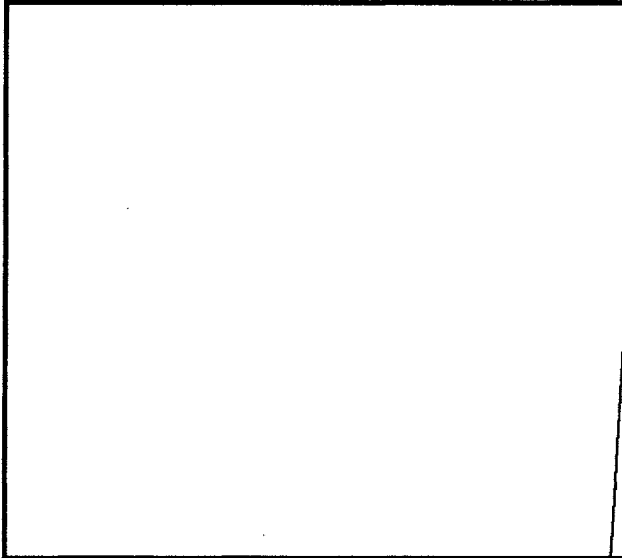
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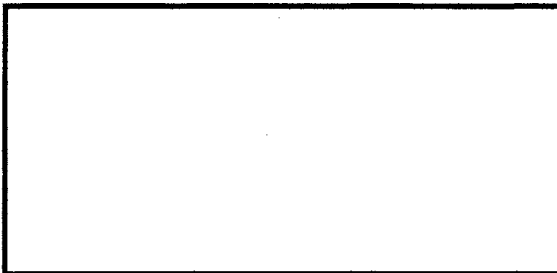
No. We think that LRL makes a rather strict selection among the physicists it hires, and perhaps an even stricter selection among those it accepts as postdoctoral study candidates. Further, we considered only Ph.D. trained physicists for the Experiment—perhaps because we (unconsciously) felt that such a project requires a demonstrated ability for independent research and did not want to take the time for the physicists involved to develop such skills on their own. I would estimate that the three Experimenters are at least in the top quartile of U.S. Ph.D. physicists.

LRL's View of the Experiment—W. J. Frank

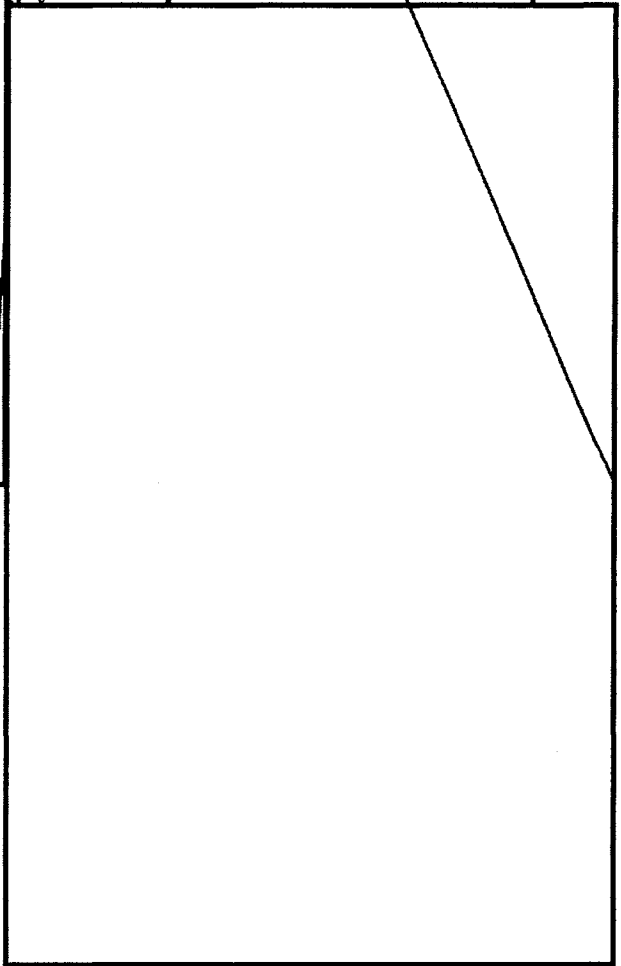
90. Were you surprised at the successful outcome of the Experiment?



91. What would you have done if the Experiment had not succeeded?



92. Do you think that any three physicists could have done this Experiment?



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Epilogue

R. W. Selden

March 1969

The Experiment was formally ended in September of 1968 by a series of planned events which included: two meetings with the LRL Committee and Directors for an open discussion of the Nth Country's understanding of nuclear explosives and a summary of current U. S. technology; a historical survey of the development of nuclear explosives in the U. S. by Larry Germain and Jim Frank; and individual discussions with staff members, visits

to LRL facilities including Site 300 (the explosive test site) and the "museum," and a visit to the Nevada Test Site.

At the conclusion of these activities, I joined LRL's B Division, and Dave Dobson took a teaching position outside the Laboratory. Dave participated in most of the activities described above, and many of the comments made here about the Experiment reflect his thoughts.

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