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This Document Contains 6

INTER-OFFICE MEMORANDUM

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No. of Pages. Copy of 10

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DATE July 14, 1944

TO: Members of Initiator Committee

FROM: K. T. Bainbridge

SAA20006-180000

SUBJECT: Minutes of Meeting of July 6, held in Room B-212.

Present: Members of Committee and R. Oppenheimer, A. Ayers, G. Farwell.

JAN 29 1981

A-83-013  
3-26

I.

The committee should soon arrive at a final design for the initiator and all of the following factors are important.

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW DATE: 3/2/96	1. DETERMINATION (CIRCLE NUMBER):
AUTHORITY: DAD, DADD	2. CLASSIFICATION CHANGED TO:
NAME: R. B. ...	3. CONTAINS NO DOE CLASSIFIED INFO
2ND REVIEW DATE: 3/26/96	4. COORDINATE WITH:
AUTHORITY: R. B. ...	5. CLASSIFICATION CANCELLED
NAME: R. B. ...	7. OTHER (SPECIFY):

II. Mr. Dodson presented his results on neutron background measurement. This is attached as Appendix A.

Improvements in the purification on Monsanto Po can be anticipated. The material shipped has not yet made the 50% by weight of Po requirement. The delivery schedule as of April 12 - 14, 1944 is being held to. This report is included in Appendix B.

III. Absolute Measurements.

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Classification changed to: Segre discussed the procedure followed in making the absolute measurements

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of initiator strength. A discussion of the method and a summary of the measurement is included in a report by George Farwell, attached as Appendix C.

[Redacted]

It is possible that the absorption in the stronger source might change the spectral distribution by an appreciable amount. In the implosion case the strength of source must be known accurately and an accuracy of 10% was suggested.

[Redacted]

IV.

[Redacted]

His report was circulated prior to the meeting to members of the Initiator Committee.

b) Critchfield also reported on Safety Provision for the 20 mm Range, a copy of Breslow's report on Safety Provisions was distributed to members of the committee prior to the meeting and to Dr. Hempleman and Mr. Wood.

Critchfield inquired about the possibility of firing active shots on the 3" scale at Anchor.

McMillan suggested that the ground around the 20 mm should be inspected to get some idea of the strength of Po which had deposited there and its removal by rain.

[Redacted]

A recommendation was put as a motion by Critchfield that all gun assembly large scale prototype targets should include initiators or dummy initiators for test. The final vote was: McMillan against the recommendation, Bainbridge and Critchfield voted for it, Segre and Dodson did not vote, Bacher and Parsons were absent.

The main argument against incorporating initiators in prototype or dummy targets was that the target results would not mean anything if two variables are involved. The main arguments for incorporation of initiators were

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SUBJECT:

- (2) The final initiator test for a complete gun assembly could not start for one or two months until after completion of the seating work proposed by McMillan, and the prior seating work would have to be repeated under the new conditions.
- 3) All large scale work represents a tremendous drain on the shop.

The initiator work should ride along with the same assembly as used to test seating design.

V. Ayers presented a report of the designs and showed sample assemblies of the various types of initiators which have been tested or are under construction for test, including those reported on, which are included in the drawing of July 6, 1944, and the ones which were measured by Farwell. The earlier types are given in the April report. Ayers asked for more assistance from the committee in defining his functions and duties. Ayers asked for help from the committee in defining the number of initiators which should be prepared for the month of July. The committee recommended that more tests be made on a limited number of types of which the following three were selected:

- 1) The tapered type, similar to #6 of the 7/6/44 drawing.
- 2) The tapered type, similar to #3 of the 4/21/44 drawing, and
- 3) The corrugated type, #9 of the 7/6/44 drawing.

The committee recommended that 5 active shots of type 1 above, 5 active shots of type 2, and 2 active shots of type 3 above, should be scheduled for July. 5 of type 3 should be made, but until the corrugated type is shown to work, only two will be wanted with Po.

The committee recommended that only inert ones be shot for any new types. Once the action of the inert ones appear satisfactory then provision will be made for active shots.

A discussion followed of the necessity for more frequent meetings, and it is recommended that meetings be held every two weeks. The members felt it was more satisfactory to have regularly scheduled meetings and have them called off if there were no essential business than to have long meetings at infrequent interval

KTB:br

- cc: A. Ayers
- R. Bacher
- C. Critchfield
- R. Dodson
- E. McMillan
- W. Parsons
- E. Segre
- J. Oppenheimer
- File

K. T. Bainbridge

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APPENDIX A

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UNCLASSIFIED SUMMARY OF NEUTRON Bd. MEASUREMENTS

Foil

Strength  
Curies on Date

Mc/cm<sup>2</sup>

Mg.Po/cm<sup>2</sup>

n/c/sec.

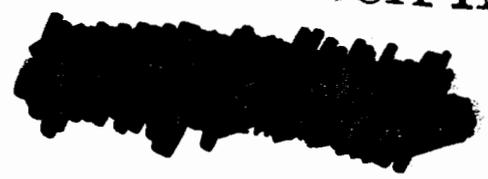
Calc. for  
Pure Po<sup>210</sup>

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Po Delivery Schedule

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As of April 12-14, 1944.

<u>Month</u>	<u>Scheduled Minimum</u>	<u>Amount Sent, Monsanto Assay</u>	<u>Amount Rec'd. Our Assay</u>
March		0.94 c	0.62 c.
April	2.5 curies	2.39 c.	2.05 c.
May	2.5 curies	2.6 c.	2.36 c.
June	2.5 curies	3.1 c.	2.76 c.
July	6 curies		
August	6 curies		
September	10 curies		

10 c./month as soon as W operates.

20 c. held in reserve in B1 for spot delivery on request.

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APPENDIX C

NEUTRON YIELDS OF INITIATOR ASSEMBLIES FIRED TO 7/4/44

by G. Farwell

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Eleven active gun assemblies designed by Ayers have been fired by the E-4 20 mm testing crew with the assistance of E. Nooker, the neutron emission of each assembly has been measured, after hand assembly where possible and after gun assembly in every case.

Determination of absolute neutron yields is based upon comparison of the active assemblies with a Po-Be standard calibrated by Graves. Results are estimated to be accurate to  $\pm 5\%$ . The comparisons are made with a  $BF_3$  detector. An 8% correction is made for absorption by the walls of the target-assemblies.

Differences in target design have no measurable effect on the magnitude of the correction.

Efficiencies are estimated from the measured neutron yields and the activities of the Po foils as measured by Dodson. 100% efficiency is defined as the emission of 2500 neutrons per second per millicurie of Po (cf Roberts, CF 864) and assumed 4 $\pi$ contact of Po and Be.

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW  
USE RE: REV DATE: 3/2/96  
AUTHORITY: 38 CFR 1.56 (a)  
NAME: [Redacted]  
DATE REVIEWED: 3/2/96  
CLASSIFIED BY: [Redacted]  
REASON FOR CLASSIFICATION: 1.56 (a)  
OTHER (SPL):

Target Description	Gun Ass'y Yield Hand ass'y yield	Total neutrons per second (Gun ass'y)	Millicuries Po (at date of firing)	Neutrons per sec. mc Po	Efficie %
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Unique Document #  
THE WHITE HOUSE  
WASHINGTON

August 22, 1958

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Dear Dr. Bradbury:

I am today announcing that the United States will suspend nuclear weapons tests for a period of twelve months and, under certain conditions of progress toward real disarmament, continue that suspension on a year-to-year basis.

It will, of course, require an extended period to negotiate and install a genuine and assured disarmament arrangement. Even though we will not be doing any weapons testing, it will be necessary that we maintain our weapons development progress during the period and with no less urgency than in the past. It is necessary, in the interest of our country's defense, that the staff of your laboratory, and that of the other weapons development laboratories, continue their research and development in this field with their current vigor and devotion.

I am instructing the Atomic Energy Commission to develop plans to see that these essentials are met and that the vitality of our laboratories is maintained.

Sincerely,

*Dwight D. Eisenhower*

Dr. Norris Bradbury  
Director  
Los Alamos Laboratory  
Los Alamos  
New Mexico

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW DATE: 11/15/95	DETERMINATION (CIRCLE NUMBER(S))
AUTHORITY: 50 USC 2052 ADD	1. CLASSIFICATION RETAINED
NAME: <i>NRB/Smith</i>	2. CLASSIFICATION CHANGED TO:
2ND REVIEW DATE: 11-15-95	3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD	4. COORDINATE WITH:
NAME: <i>100/4th</i>	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY):

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*[Handwritten notes and scribbles]*

TAD-2355

May 29, 1958

Brig. General A. I. Starbird  
Division of Military Application  
U. S. Atomic Energy Commission  
Washington 25, D. C.

*[Handwritten note: This copy contains no...]*

Dear General Starbird:

Enclosed herewith please find documents T-1009 (rough draft) and T-1026 by George Bell on the subject of hazards from clean and standard weapons and containing comments upon the article by Leipunsky. Although Bell has assembled this material and done most of the work on it, much of the input has come from other members of the Laboratory staff. In fact, just today Bell has had a discussion on the subject with various members of the Health Division and we are quoting below general comments he has made as a result of such discussions as well as his own thinking.

As you agreed on the telephone today, we assume that you will not reproduce either of the documents, T-1009 or T-1026. However, we believe that the numerical data contained in them are as good as we can supply at this time and we certainly have no objection to you using them as long as they are accompanied by the relevant assumptions and limitations as specified in the documents. As I told you, we will attempt to get out a properly finished document on this subject as soon as possible and will send you a copy even before reproduction. At that time we would appreciate it if you would return T-1009 and T-1026.

On the subject itself, I cannot add much to what Bell says. I would point out that the calculations are made upon the basis of a static world population whereas, in fact, the world population is increasing slightly faster

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DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW-DATE: <u>1-19-96</u>	DETERMINATION (CIRCLE NUMBER(S))
AUTHORITY: <input type="checkbox"/> AOC <input type="checkbox"/> AOC BADD	<input checked="" type="checkbox"/> 1. CLASSIFICATION RETAINED
NAME: <u>R. C. [unclear]</u>	<input type="checkbox"/> 2. CLASSIFICATION CHANGED TO:
2ND REVIEW-DATE: <u>1-31-96</u>	<input type="checkbox"/> 3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD	<input type="checkbox"/> 4. COORDINATE WITH:
NAME: <u>[unclear]</u>	<input type="checkbox"/> 5. CLASSIFICATION CANCELLED
	<input type="checkbox"/> 6. CLASSIFIED INFO BRACKETED
	<input type="checkbox"/> 7. OTHER (SPECIFY):

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Brig. Gen. A. D. Starbird

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May 29, 1958

then exponentially with an e-folding time of around 150 years. Thus it is obvious that the number of individuals affected over a period of several generations by any long-lived isotopes formed now will greatly exceed the number affected by short-lived isotopes, even if the effect of the long-lived isotopes were considerably less on a static population. Of course, I do not know how long the earth can support a population growth at the current rate. (I even wonder whether it is worse for an individual some generations hence to die of a mutation defect or of starvation, but I guess this is not to the point.) In any case, since  $C^{14}$  production per kt is about the same for clean and standard devices, the growth of the world population does not affect conclusions on their relative merits.

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Another point to mention is that if an individual acquires sufficient  $Er^{20}$  to cause his death, that fact might possibly be obvious to an attending physician and a one-to-one correspondence could be seen between nuclear explosions and this particular individual's death. On the other hand if a person dies two hundred years from now as a result of a gene mutation, it will be impossible to determine whether this has come about as a result of some radiation to an ancestor or as a result of one of the many other factors affecting mutations. What meaning, if any, this point has on the general subject I do not know. However, it would seem to me that all a small amount of radiation does is speed up nature a little bit because the mutations will eventually appear spontaneously or as a result of natural radiation anyway.

We quote below George Ball's general comments:

"We have found difficulties in arriving at a clear-cut assessment of the paper of Leipunsky. In general the paper appears to us to be scientifically sound. The principle difficulty in evaluating the paper lies in the fact that most of the radiation damage discussed by Leipunsky is genetic damage. The field of radiation-induced genetic damage is one in which LASL has no first-

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hand technical competence, and it appears to us to also be a field with great uncertainty. Any comparison of long term genetic effects with short term pathologic effects is bound to be, at this time, rather arbitrary and subject to varying interpretation. This is not only because damage produced per unit of radiation is quite uncertain but also because genetic and pathologic damage manifest themselves very differently. To consider mutations as genetic casualties may be sound statistical genetic theory; it may also be sound morality and propaganda. However, it is not clear that it is meaningful to compare long term genetic casualties with other casualties as involving equal human suffering or burden to society.

$C^{14}$  can only look like a major hazard if one considers genetic damage which will be produced over thousands of years. For some purposes, casualty rates, or probability of death per individual are more meaningful than total number of casualties. In a comparison of casualty rates,  $C^{14}$  damage which extends over several hundred generations, would appear relatively less hazardous than pathologic damage by this factor of several hundred.

Further, uncertainty is found in interpreting  $Cs^{137}$  data in terms of long term genetic damage. Leipunsky assumes that reported  $Cs^{137}$  is in equilibrium with soil K and computes a serious hazard. It appears to us that the reported  $Cs^{137}$  comes mostly from direct fallout and thus that Leipunsky's computation of  $Cs^{137}$  hazard is too high. However, the exact extent of the  $Cs^{137}$  hazard is not yet clear.

Bearing the above general remarks in mind, a number of comments are required:

(1) Leipunsky compares pure fission and pure D,T devices. The same comparison will not hold as between current U. S. standard and clean thermonuclear devices.

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Brig. General A. D. Starbird

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May 29, 1958

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"(2) However, it appears probable that Laipunsky has substantially overestimated the damage due to  $Cs^{137}$  and somewhat overestimated the damage due to  $Str^{90}$ . The  $Cs^{137}$  overestimate arises because Laipunsky assumed that  $Cs^{137}$ , which has been found in people is in equilibrium with  $K$  (similar to the way in which  $Str^{90}$  and  $Ca$  are related). He thus concludes that  $Cs^{137}$  levels in people will persist for a long time (about 40 years). It seems more reasonable that most of the  $Cs^{137}$  now in people came directly from fallout and that it will disappear fairly rapidly, as it is eliminated with a biological half life of approximately 140 days.

"(3) Therefore, it cannot be concluded that for even a standard two-stage device the long term genetic casualties produced by  $C^{14}$  and  $H^3$  may not exceed or equal genetic and leukemia casualties produced by long-lived fission products ( $Cs^{137}$  and  $Str^{90}$ ). The conclusion here depends largely on how one defines a genetic casualty and how one treats the  $Cs^{137}$  hazard. Laipunsky could have obtained a factor ten more mutants (genetic casualties) by considering U.S. figures on all deleterious mutations. These considerations are discussed in T-1026.

"(4)  $C^{14}$  can be a major source of world-wide casualties if and only if one counts the long term genetic casualties--which may not be produced or show up until thousands of years after the  $C^{14}$  was produced. If one is willing to consider long term, genetic casualties as a legitimate hazard, it should also be noted that the highly irradiated survivors of local fallout will in themselves constitute a potential world-wide genetic hazard. It appears that for a war with yield  $\lesssim 10^8$  megatons (and with about half the detonations as surface bursts on typical ground) the long term genetic casualties produced by local fallout will exceed those due to  $C^{14}$ . Thus if one chooses to emphasize genetic hazards, it appears likely that a wartime weapon will produce long term genetic damage which is roughly proportional

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Brig. General A. D. Starbird

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May 29, 1958

to the total radiation received by survivors of local fallout, [redacted]

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"(5) Long term genetic hazards do not look like a very serious wartime consideration to us. However, since genetic damage may manifest itself over thousands of years, it has the pronounced characteristic that many casualties may be produced while the hazard to any one individual is very small. Thus, for example, one night (with numbers of T-1026) by detonation of  $2 \times 10^5$  megatons produce sufficient  $C^{14}$  to induce about  $10^8$  inherited human mutations and thus about  $10^8$  'genetic casualties.' However, these would appear over hundreds of generations and might, in fact, be completely undetectable. For some purposes the casualty rate, say in individuals per generation, may be more meaningful than the total number of casualties. To obtain a casualty rate for  $C^{14}$  in individuals per generation one must divide the total calculated  $C^{14}$  casualties by like 200 since the damage will extend over like 200 generations."

Yours sincerely,

Darol Froman

DF:rb

Encs: T-1026, cy 2A  
T-1009, cy 2FD

Distribution:

- 1A - Brig. Gen. A. D. Starbird, w/encs.
- 2A - George Bell, w/o encs.
- 3A - TAD Files, w/o encs.
- 4A, 5A - Central Records, w/o encs.

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