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DEC 21 1954

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Collection <u>DBM Files</u>
Box <u>J-1194 B-2</u>
Folder <u>HRHA-7-1 Pacific Proving Grounds 1954</u>

U. S. Atomic Energy Commission
1901 Constitution Avenue
ATTN: Div of Biology & Medicine
Dr. Bugher
Washington 25, D. C.

Dear Dr. Bugher:

Reference is made to correspondence between you and the Commander ARDC during April and May 1954 concerning the desirability of having Lt Col Lulejian analyze the Pacific fallout as he has done the Nevada. This has been accomplished and five copies of the latest ARDC report together with a memorandum to you from Lt Col Lulejian are inclosed.

Your comments concerning the inclosed report or memorandum would be appreciated.

If we can be of any further service to you in this matter feel free to call upon us at any time.

This letter does not contain RESTRICTED DATA and upon removal of inclosures may be handled as UNCLASSIFIED.

Sincerely,

ROBERT N. ISBELL
Colonel, USAF
Chief, Atomic Operations Division

- 2 Incls
1. ARDC Rpt C4-23676
2. Memo to Dr. Bugher
w/1 Incl - Memo to
Dr. Libby

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**** CLASSIFICATION CANCELLED *
WITH DELETIONS
BY AUTHORITY OF DOE/OC**

J. Diaz 1/25/88
REVIEWED BY DATE

* *LTJ. DNA Varallo To
DOE, OC Dated 10/22/87*

* *w/o Encl. 1
Carlussen 1/24/88*

ATTACHED AT HQ ARDC AS INCLS 1 & 2

C4-25581

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MEMORANDUM FOR DR. EUGHER

This document is classified ~~SECRET~~ Dec 54

SUBJECT: (U) Radioactive Fallout

No. [redacted] copies [redacted]

C. d. d. 8/

1. In the inclosed report I have analyzed the fallout from the first shot of CASTLE Test Operation. I am amazed at the similarity of this event with the fallout at Nevada. As a matter of fact, if the JANGLE - Fallout Model had been simply extrapolated to the CASTLE Bravo yield by a straight line extrapolation (where distance is proportional to the third power of the yield and fallout area is proportional to the two thirds power of the yield) then I'm sure that the CASTLE Bravo shot would not have been fired. This is because all Bikini Atoll islands and the islands of Rongerik, Rongelap, and Bikar are clearly in the fallout area even when such a simple extrapolation is used. This fact is further brought out by the fallout plot prepared by the CASTLE Rad Safe organization after the Bravo event utilizing the ARDC method of elliptical approximation indicated in ARDC Report C3-36417 and its supplement. [redacted]

2. A closer look at the actual Bravo fallout brings out the curious fact that as the yield is increased, and the height of burst is kept constant, the distribution of activity within the atomic cloud changes. For example, in the JANGLE - Surface shot, analysis of the fallout shows that approximately 40% of the activity resided in the mushroom and 40% in the stem. However, analysis of CASTLE Bravo fallout shows that approximately 80% of the fallout comes from the stem. This leaves only 20% of the activity in the mushroom. Since it is assumed that 10% of the activity is non-scavengable by the soil debris, this means that within 24 hours, 75% of the fallout is from the stem and only 5% from the mushroom. This curious shifting of the immediately scavengable activity from the mushroom to the stem was evident in the Nevada Shots. During TUMBLER/SNAPPER Test Operation, the average activity in the stem and mushroom was approximately 5% each. During UPSHOT/KNOTHOLE Test Operation, however, the activity in the stem increased to 10 or 15% but the activity of the mushroom still remained at 5%. The tower heights of both test operations were 300 ft, but the yields were different. [redacted]

[redacted] Hence this trend which was first noticed in NPG is verified in the Pacific Tests. (S [redacted])

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3. Another curious factor that really puzzles me is the assumption made by many people that Bikini Atoll islands were contaminated by the up-wind and cross-wind components of the fallout from the first shot of CASTLE. I cannot find any evidence of this. Bikini Atoll was in the downwind direction. What contaminated the Bikini Islands was the downwind fallout which came from 10,000 ft to 20,000 ft above sea level. Curiously enough, in none of the subsequent barge shots, was ground zero or the lagoon or the immediate test area in the downwind path. I am afraid that this has given rise to the misconception that barge (or water) surface shots are less contaminating than land surface shots. I feel confident that if the first shot of CASTLE were fired on the lagoon waters it would have severely contaminated the Bikini Islands. The downwind contamination would have extended further out and covered more area, but the time of fallout would have been delayed by a factor of 2. Although a shift of wind is blamed for the unexpected contamination of Rongelap and Rongerik, there is no

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MEMO TO DR. BUGHER

such excuse made for the winds over Bikini Atoll. It seems to me that the excessive contamination of Bikini itself could have been avoided had the simple fallout plot been more clearly understood during the first shot of CASTLE. Upon post analysis, after all of the data was gathered and evaluated, I tried to determine from the fallout plots just what was the dose received by the Rongelap natives. I am amazed to find that the integrated 48 hour dose of the Rongelap natives is over 300 roentgens. Some thought should be given to the possibility that many of the natives did receive 300 roentgens or higher within 48 hours and yet they did not show severe symptoms of radiation sickness, and to date there have been no reported casualties. I wonder if this is an error in my indirect measurements of integrated dose, or whether our concepts of the sickness or the median lethal dose must be revised. ([REDACTED])

4. The excessive fallout from CASTLE Bravo shot indicates to me that, if anything, the SUNSHINE estimates of the Strontium 90 uptake by human beings is not exaggerated. Actually SUNSHINE may have underestimated the uptake by a factor of 2. This is true, unless Chicago had excessive fallout. I have written a memo to Dr. Libby on this subject. A copy of this memo is inclosed for your reference. Dr. Dudley and Dr. Western of your Division have indicated to me that the uptake of Sr90 by the Chicago babies reported in January 1954 may have been due to fallout of fission products on plants. This contamination adhered to the plants externally. Subsequently, cows ingested the plants and thus received the Sr90 directly. Cow milk, cheese and meat then passed this on to the mothers. Even if this is true, it does not alter the fact that with a total available debris of 1.5 to 0.75 MT of fission products, the Chicago babies showed the equivalent of 4 MT of fission products by SUNSHINE estimates. [REDACTED]

5. I will continue to study and analyze the fallout primarily to assess its military implications both from the defensive and offensive points of view. However, this problem of immediate fallout also appears to be tied intimately to the world-wide contamination problem. [REDACTED]

6. This document classified S [REDACTED] in accordance with paragraphs 23b and 56, AFR 205-1.

1 Incl
Memo to Dr. Libby

N. H. Lulejian, USAF
N. H. LULEJIAN, Lt Col, USAF
Atomic Operations Division

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RESTRICTED DATA
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1946

MEMORANDUM FOR: R. W. P. LIDBY

This document contains ~~_____~~ pages

No. ~~_____~~ ~~_____~~ CC-A

SUBJECT: (U) World-Wide Contamination

1. During the RAIN-SUNSHINE conferences of June 1953 and January 1954, I discussed with you the possibility that 75 to 85% of the total residual activity of surface burst weapons would be deposited immediately downwind (within 200 to 300 miles downwind) 6 to 18 hours after bomb detonation. The events of 1 March 1954 (CASTLE-BRAVO Shot) have proved the existence of large concentrations of residual activity downwind. For this reason I have taken the trouble of analyzing in detail the percentage downwind fallout from CASTLE-BRAVO Shot in the first 24 hours. See inclosed AEC report, O4-23676 for details. (██████████)

2. I believe that this fact has a distinct bearing on the validity of SUNSHINE assumptions of the Strontium 90 burden imposed by explosions of nuclear weapons. In Table I, I have listed all of the known explosions of atomic weapons to date. Then I have assumed that for tower shots (15 to 50KT from 300 ft towers) 10 to 30% of the residual activity is scavenged out in several hours by the soil, and hence is not available for world wide distribution. Similarly, I have assumed that for 25KT exploded from a 100 ft tower, 50% of activity is scavenged out by the soil. For surface shots, it is assumed that 80% is soil-scavenged out and therefore unavailable for world wide contamination. (Proof of these assumptions are in the inclosed AEC Report). (██████████)

3. In the Chicago baby experiments (reported by you in the January 1954 conference) you showed that new born babies in the Chicago area have about 1/6 SUNSHINE Unit of Sr90 or about 1/6000 of tolerance. On the basis of the original SUNSHINE estimate of an even distribution of 25,000 KT of debris to bring the world population up to tolerance, 4KT would give the Chicago babies the observed deposition. Since these experiments were concluded in 1953, it is assumed that Joe 4 (or TK Joe I) detonated in August 1953 did not add to the Sr90 burden of the Chicago babies. Table I shows that although a total of 9.4KT were detonated by 1952, only a maximum of 2.7KT were available for world wide contamination. It is my contention that only 1.74 or even as low as 1.54 KT were available for U.S. deposition (see last two columns of Table I). Even if this is not true, and only the maximum value of 2.7KT is used, it is still less than the 4KT found by your experiment in the Chicago babies. It should be further pointed out that by the end of 1953, only 50% of the available atmospheric atomic debris had reached the ground. If this is true then we only had 2.7/2KT (or even as low as 1.55/2KT) available for the Chicago babies. And yet their uptake was 4KT by SUNSHINE estimates. The conclusion is inevitable that the SUNSHINE estimates are not conservative as popularly believed in many quarters. On the contrary SUNSHINE underestimated the Sr90 hazard. Many people have assumed that the SUNSHINE overestimates the Sr90 uptake by factors of 10 or even 30. The statement is also made that the Chicago baby uptake of Sr90 was not through the plant-animal-man cycle, but that the fission products were picked up by the animal (cow) directly from fallout that externally covered plant life, and this was then passed on to the mothers of

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Page, (U) World-Wide Contamination

the Chicago babies. It seems to me that regardless of the mode of introduction of Sr90 into the human biological cycle, that fact that the Chicago babies picked up 1/6 SUNSHINE unit from a total available debris which may have been as low as 2.7/25T or even 1.55/25T, is quite significant. It would be interesting to repeat the Chicago baby experiment in 1955. If the babies show an uptake of 1/2 SUNSHINE unit or more in 1955 the original SUNSHINE estimate of 25,000T allowable may have to be lowered to 10,000 or 15,000T. Your attention is particularly invited to Figure 11 of the inclosed report. (S ~~SECRET~~)

4. This document classified ~~SECRET~~ in accordance with paragraphs 23b and 56, AFR 205-1.

1 Incl
Table I

N. M. BALESTIAN
Lt Colonel, USAF
Atomic Operations Division

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TABLE I

No. _____ Series CS-A

TEST LOCATION	DATE	TOTAL YIELD IN AT (Winston)	YIELD AVAIL-ABLE FOR WORLD-WIDE CONTAMINATION	YIELD AVAIL-ABLE FOR CONTAMINATION OF U.S.	YIELD AVAILABLE FOR CHI-CAGO AREA CONTAMINATION
Trinity	Jul 45	24	12	12	10
Miroshina	Aug 45	14	14	7	1
Nagasaki	Aug 45	22	22	11	2
Crossroads	Jul 46	40	15	7	1
Sandstone	May 48	105	50	25	5
Joe 1	Sept 49	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Fanger	Jan 51	40	40	40	30
Greenhouse	May 51	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Buster	Nov 51	72	72	72	50
Joe 2 and 3	Nov 51	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Jungle	Nov 51	2	[REDACTED]	[REDACTED]	[REDACTED]
Tumbler	Apr 52	55	55	55	30
Sapper	May 52	57	[REDACTED]	[REDACTED]	[REDACTED]
IXY	Nov 52	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Mike	"	8000	[REDACTED]	[REDACTED]	[REDACTED]
Alf	"	550	550	300	300
TOTAL THRU 1952		9441	2735	1754	1539

Joe 4	Aug 53	DELETED
CASILE	Mar 54	
Bravo	"	10,000
Romeo	"	7000
Koon	"	100
Union	"	5000
Yankee	"	7000
Hector	"	1350

GRAND TOTALS UP TO JUNE 1954	40,891	9425	6814	6194
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TABLE I

No. [redacted] Series CE-9

TEST LOCATION	DATE	TOTAL YIELD IN KT (Fission)	YIELD AVAIL-ABLE FOR WORLD-WIDE CONTAMINATION	YIELD AVAIL-ABLE FOR CONTAMINATION OF U.S.	YIELD AVAILABLE FOR CHI-CAGO AREA CONTAMIN-ATION
Trinity	Jul 45		12	12	10
Mirshina	Aug 45		14	7	1
Nagasaki	Aug 45		22	11	2
Crossroads	Jul 46		15	7	1
Sandstone	May 48		50	25	5
Joe I	Sept 49		[redacted]	[redacted]	[redacted]
Ranger	Jan 51		40	40	30
Greenhouse	May 51		[redacted]	[redacted]	[redacted]
Buster	Nov 51		72	72	50
Joe 2 and 3	Nov 51		[redacted]	[redacted]	[redacted]
Jungle	Nov 51		[redacted]	[redacted]	[redacted]
Tumbler	Apr 52		55	55	30
Snapper	May 52		[redacted]	[redacted]	[redacted]
IXY	Nov 52		[redacted]	[redacted]	[redacted]
Mike	"		[redacted]	[redacted]	[redacted]
Alto	"		550	300	300
TOTAL THRU 1952		9441	2735	1754	1539

Joe 4
CASLE
 Bravo
 Romeo
 Koon
 Union
 Yankee
 Hector

Aug 53
 Mar 54
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GRAND TOTALS UP TO JUNE 1954

9425 6814 6194

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