

Office Memorandum • UNITED STATES GOVERNMENT

TO : Those Listed Below  
FROM : *Wilbur C. Strasser*  
J. L. Marshall, Director  
Division of Classification

DATE: 1958  
MAR 24 1958

336

SUBJECT: PROPOSED RELEASE OF INFORMATION ON STRONTIUM-90 PRODUCTION FROM WEAPON TESTING

MILITARY APPLICATIONS - 2 STRONTIUM  
# X Security 2-10

SYMBOL: C:RLM

When separated from enclosures, handle this document as UNCLASSIFIED (Insert proper classification)

We would like your comments and/or concurrence on the attached paper recommending the unclassified release of information (Appendix A) compiled by Dr. Wright Langham on the production of strontium-90 in U. S. nuclear weapons operations.

The comments of the Department of Defense will also be obtained before presentation of the paper to the Commission for action.

Prompt return of your comments will be appreciated.

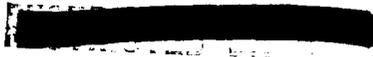
Enclosure:  
Subject paper.

Addressees:

- ▶ C. L. Dunham, Director, Division of Biology & Medicine
- Brig.Gen.A.D.Starbird, Director, Division of Military Application
- Dr. C. H. Reichardt, Director, Division of Intelligence
- Edward Diamond, Acting General Counsel, Office of General Counsel

002762

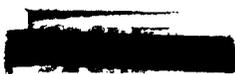
DOCUMENT TRANSMITTED  
HEREWITH CONTAINS



CLASSIFICATION CANCELLED  
BY AUTHORITY OF DOE/OC  
*Jose Diaz* 4/28/81  
REVIEWED BY DATE  
*Wilbur A. Strasser* 4/27/81  
REVIEWED BY DATE

DOE 5650.2, III-12

By: W. Tench 6/15/87



US DOE ARCHIVES	
326 U.S. ATOMIC ENERGY COMMISSION	
RG	<i>DOE HISTORIAN (D/SM)</i>
Collection	<i>1132</i>
Box	<i>3369</i>
Folder	<i>2</i>

Proposed Release of Information on Strontium-90 Production from Weapon Testing  
Report to the General Manager by the  
Director of the Division of Classification

The Problem

This

No. [REDACTED]

1. To consider the declassification of the fact that U. S. nuclear weapon test series and the Hiroshima and Nagasaki bombs resulted in the release of certain quantities of Sr-90, specifically the data presented in table 1 of Appendix A.

Summary and Discussion

2. Presently, attempts to assess the radioactive fallout hazards from Sr-90 of continued testing of nuclear weapons must rely heavily on extrapolations of measurements of contamination levels (Project Sunshine data) resulting from nuclear weapons tested. Absence of specific information regarding actual production of strontium in nuclear weapon tests has been a major weakness in such extrapolations. However, an assumption of a uniform testing rate of 10 megatons of fission yield per year over the past five years has been used which approximates the total fission yield in all U. S. devices detonated thru Redwing. The table in the attached report (Appendix A) presents the total Sr-90 activity produced by each United States nuclear weapon operation through the year 1956 (Operation Redwing). These totals are sub-divided into two groups, namely: (1) the total Sr-90 activity produced by weapons with total energy yield of less than 1 megaton and (2) the total Sr-90 activity produced by weapons with total energy yield of more than 1 megaton. This division is important in as much as only the weapons with yields of 1 megaton or greater make a major contribution to world-wide fallout. The publication of this information will permit a more accurate evaluation of the health hazards from

This document contains restricted data as defined in the Atomic Energy Act of 1954 and is being transmitted in this manner to [REDACTED] as required by the person's position.

the world-wide fallout of Sr-90 produced in U. S. nuclear detonations.

3. In compiling the data in table 1 of the attached report (Appendix A) consideration was given to the amounts of fission occurring in the various components of the weapon and to the variation of Sr-90 fission yield with weapon type. Thus, the total Sr-90 produced for a specific operations, where yields of all the devices detonated may be released, as unclassified, namely, Trinity, Japanese bombings, Crossroads, and Sandstone would show that the Sr-90 production per kiloton of fission yield varied for these tests:

	From AEC/641/1 Fission Yield	From Table 1 Sr-90 produc- tion kilocuries	Average Sr-90/kt curies
Trinity	27 kt	1.7	63
Japanese	41 kt*	3.5	85
Crossroads	49 kt	3.3	67
Sandstone	106 kt	12.9	122

\*From data released (18 and 23 kt)

From this variation in average rate of Sr-90 production, it would be possible to conclude that the devices in these tests were composed of different types of fissionable material. The type of fissionable material used in Trinity, Japanese and Crossroads devices is unclassified. The higher average rate of Sr-90 production per kiloton yield for the Sandstone tests and the known data on Sr-90 production in the fission of U-235 and Pu-239 would indicate that a large part of the yield of the Sandstone devices resulted from fission of U-235. However, it would be impossible on the basis of this information alone to establish the actual proportion of the fissionable material which was U-235. It is concluded, therefore, that this information does not reveal any classified weapon design information.

From the data in table 1 (Appendix A) on Sr-90 production and an assumed average fission yield of Sr-90, it would also be possible to derive an approximate total fission yield figure for any of the listed operations, both in terms of weapons with total yields of less than 1 megaton and those with total yields of over 1 megaton. It would thus be possible to derive a total fission yield for all U. S. operations through the Redwing Operation of approximately 46 megatons. This is more accurate than the 50 megaton figure given in the Joint Committee on Atomic Energy Hearings as the total fission yield of all U. S. weapons tested through 1957. (See Appendix B).

4. Since the yields of only a few devices in PPG operations subsequent to Sandstone, have been published or may be declassified and yield information exchanged with the British has been carefully selected to avoid giving the total energy yield in any given operation, it would not be possible to derive fission - fusion ratio information on the thermonuclear tests in these operations. Therefore, it is recommended that the data on Sr-90 production presented in Appendix A be declassified subject to the following provisions:

- (a) That release of additional yield information on tests in the Operations Ivy, Castel and Redwing (those involving thermonuclear devices) will be carefully reviewed prior to any exchange or declassification of such data
- (b) Data on fissionable material used in individual devices after Crossroads operations is not to be released
- (c) Similar information on Sr-90 production for subsequent test

operations involving thermonuclear tests will be evaluated to determine if data on fission - fusion ratio is revealed, prior to its declassification.

Staff Judgments

5. The Divisions of Biology and Medicine, Military Application, Intelligence and Office of General Counsel concur in the recommendations of this paper.

Recommendations

6. The General Manager recommends that the Atomic Energy Commission:
- (a) Determine that the data on strontium-90 production from U. S. nuclear weapon operations through Operation Redwing, presented in Appendix A, may be published without constituting an undue or unreasonable risk to the common defense and security.
  - (b) Note that the DOD comments and concurrence in this action are attached as Appendix C.
  - (c) Note that no public announcement is required since the compiler of the information, Dr. Wright Langham, plans to use these data in a paper to be published.
  - (d) Note that the JCAE and the GAC will be notified of this declassification action by letter such as that attached as Appendix D after the DOD concurrence is received.

## "Appendix A"

Table 1. Strontium-90 Production from United States Nuclear Weapons Test Operations

Date <sup>a</sup>	Operation and Site	Strontium-90 Production (kilocuries)		
		Less than 1 MT <sup>b</sup>	Greater than 1 MT <sup>b</sup>	Total
7/16/45	Trinity (New Mexico)	1.7	--	1.7
8/8/45	Japanese Bombings	3.5	--	3.5
7/1/46	Crossroads (Bikini)	3.3	--	3.3
5/1/48	Sandstone (EPG) <sup>c</sup>	12.9	--	12.9
2/1/51	Ranger (NTS) <sup>c</sup>	4.2	--	4.2
5/1/51	Greenhouse (EPG)	52.0	--	52.0
11/1/51	Buster-Jangle (NTS)	8.5	--	8.5
5/1/52	Tumbler-Snapper (NTS)	12.0	--	12.0
5/1/53	Upshot-Knothole (NTS)	30.1	--	30.1
11/1/52	Ivy (EPG)	92.3	3629.5	3721.9
4/1/54	Castle (EPG) *			
4/1/55	Teapot (NTS)	19.0	--	19.0
7/1/56	Redwing (EPG)	85.8	862.0	947.8
	Total	325.3	4491.5	4816.8
	Total (per cent)	6.8	93.2	--

a. Where an operation consisted of more than one detonation, the date given is approximately the midpoint of the series.

b. Based on total fission plus fusion yield.

c. EPG and NTR refer respectively to the Eniwetok Proving Grounds in the Marshall Islands and the continental Nevada Test Site.

\* Combined for declassification purposes.

## "Appendix B"

Excerpt from Joint Committee on Atomic Energy Hearings on the  
"Nature of Radioactive Fallout and Its Effects on Man", June 5 - 7,  
1957, page 770:

"Senator ANDERSON. I tried to say at the present level of putting fission products into the atmosphere. I am trying to get some fixed term if I can use it. If that is not a correct one I am sure Dr. Langham can give me a better one.

Dr. NEUMAN. I am not clear what present level of testing has been assumed. I take it to be based on measurements up to the fall of 1956.

Dr. LANGHAM. It has averaged roughly 10 megatons for 5 years. This does not include that the Russians and British have done in the last few weeks".

To be added after receipt of DOD comments and/or concurrence in the proposed declassification action.

MLC comments are to be requested by letter such as attached.

Draft letter to Military Liaison Committee:

1. The Commission has determined that data in the attached table on total strontium-90 produced in U. S. nuclear weapons operations will not reveal weapon design information.
2. However, it would be possible to derive, using an average fission yield for Sr-90, an approximate total fission yield for each test operation in terms of detonations with total energy yields of less than 1 megaton and those with total energy yields of greater than 1 megaton. The total fission yield for all operations thus derived from the data in the attached table is approximately 46 megatons. This is more accurate than the 50 megaton fission yield figure presented in the Joint Committee on Atomic Energy Hearings of June 5-7, 1957 on "The Nature of Radioactive Fallout and Its Effects on Man".
3. The Commission believes that the release of the information on strontium-90 production in U. S. nuclear detonations as presented in the attached table will permit a more accurate evaluation by the scientific public of the radioactive hazards from world-wide fallout on strontium-90.
4. Since the data in the attached table will reveal more accurate information on the total fission yield of each U. S. nuclear weapons operation than has previously been published, we would appreciate the Department of Defense comments and/or concurrence on the possible publication of this information.

Attachment:  
As stated above.

"Appendix ~~SECRET~~

Table 1. Strontium-90 Production from United States Nuclear Weapons Test Operations

Date <sup>a</sup>	Operation and Site	Strontium-90 Production (kilocuries)		
		Less than 1 MT <sup>b</sup>	Greater than 1 MT <sup>b</sup>	Total
7/16/45	Trinity (New Mexico)	1.7	--	1.7
8/8/45	Japanese Bombings	3.5	--	3.5
7/1/46	Crossroads (Bikini)	3.3	--	3.3
5/1/48	Sandstone (EPG)	12.9	--	12.9
2/1/51	Ranger (NTS)	4.2	--	4.2
5/1/51	Greenhouse (EPG)	52.0	--	52.0
11/1/51	Buster-Jangle (NTS)	8.5	--	8.5
5/1/52	Tumbler-Snapper (NTS)	12.0	--	12.0
5/1/53	Upshot-Knothole (NTS)	30.1	--	30.1
11/1/52	Ivy (EPG)	92.3	3629.5	3721.9
4/1/54	Castle (EPG) *			
4/1/55	Teapot (NTS)	19.0	--	19.0
7/1/56	Redwing (EPG)	85.8	862.0	947.8
	Total	325.3	4491.5	4816.8
	Total (per cent)	6.8	93.2	--

a. Where an operation consisted of more than one detonation, the date given is approximately the midpoint of the series.

b. Based on total fission plus fusion yield.

c. EPG and NTR refer respectively to the Eniwetok Proving Grounds in the Marshall Islands and the continental Nevada Test Site.

\* Combined for declassification purposes.

"Appendix D"

Draft letter to Joint Committee on Atomic Energy and GAC:

The Commission has declassified the attached compilation of data on total strontium-90 produced in the U. S. nuclear weapons operations through Redwing. The Commission does not plan a public announcement of the fact this data has been declassified. A paper entitled "Nature of Radioactive Fallout and Its Effects on Man" containing these data will be submitted by Dr. Wright Langham for publication in a scientific journal.

The Commission believes the publication of this information will enable the scientific public to make a more accurate evaluation of the radioactive hazards from world-wide fallout of strontium-90 due testing of nuclear weapons,