

DECLASSIFIED
Authority NND 959001
By SPR NARA Date 2-10-95

TOP SECRET

OD-5/11-54111-1
LTD 548, Atomic
Energy-Announcements

REPRODUCED AT THE NATIONAL ARCHIVES
THE PRESIDENT'S SCIENCE ADVISORY COMMITTEE
EXECUTIVE OFFICE BUILDING
WASHINGTON 25, D. C.

DEPARTMENT OF STATE

1959 MAY 21 PM 57

May 21, 1959

Discussed at S/P
mtg 6-15-59.
Friday, 6/15
Specie JHE
Glawrence - LRS
D Beckler SAC
H Waters SAC

OFFICE OF DIRECTOR
S/P

MEMORANDUM FOR HENRY OWEN

Office of the Assistant Secretary for
Policy Planning
Department of State

Subject: Residual Radioactivity and National Policy

I am returning your note and the attached mimeographed material on residual radioactivity and national policy.

I have discussed this problem with members of the staff of this office. There seems to be general agreement that the mimeographed document does not reflect a balanced or authoritative understanding of the radiation danger problem. I would suggest that several of us meet with interested members of the Policy Planning Staff of the State Department to discuss the matter and to put it into better perspective. Your attention is called to the studies that were made about a year ago in connection with the NSC consideration of the fallout shelter program, particularly the AEC study of the fallout problem in the event of global war. I understand that the Joint Committee on Atomic Energy may soon hold hearings on this subject.

Please let me know if you would like to get together.

David Z. Beckler
Executive Officer

Attachments:
K-TS-5352
K-TS-5352-a

TOP SECRET

K-TS-5918-1

DECLASSIFIED

Authority NND 959001

By SPR NARA Date 2-10-95

REPRODUCED AT THE NATIONAL ARCHIVES

Top Secret

Dave:

I'm sending this to you not because I think it's red hot, but because Gerry Smith, Howard Furnas, + I wonder if it would not be useful for your office to arrange for a study such as recommended in the final paragraph. We felt, however, that we knew so little about this that we had best check with you informally to see whether you think that such a study would be feasible + useful before taking any further steps, e.g., sending over a memo. Would you please let me have your reaction to the desirability of such a study?

Thanks,
Henry Owen

Mr. David Bechtler

Top Secret X-75-5352

DECLASSIFIED

Authority NND 959001

By SPR NARA Date 2-10-95

This document consists of 2 pages
9 of 15 Copies, Series A

REPRODUCED AT THE NATIONAL ARCHIVES

March 10, 1959

DEPARTMENT OF STATE

RESIDUAL RADIOACTIVITY AND NATIONAL POLICY

100 MAR 25 1959

In all that has been said on the subject of general nuclear war in recent months, from the windy debates on Capital Hill and in the press to Albert Wohlstetter's reasoned treatise on "The Delicate Balance of Terror," little, if any, attention has been paid to the radiation effects which would result from a resort to massive nuclear attacks by either side in pursuance of its national policy. Moreover, this omission is not confined to military philosophers. Because of the capricious behavior of local fallout and the slowness of residual radioactivity in producing casualties, these "bonus effects," as they are euphemistically referred to, have been almost entirely ignored as a factor in military planning. But a brief look at the scale of the nuclear exchange which might occur in a general war in conjunction with the available information on the maximum permissible concentration of residual radiation suggests some sobering conclusions. ?

To state the proposition in briefest terms, it may be possible that in the near future the total number of nuclear weapons which would be required to eliminate the nuclear retaliatory capability of either the United States or the Soviet Union might produce enough residual radioactivity to jeopardize the lives of most of the world's population. Many of the premises which form the basis for such a conclusion are controversial or have been inadequately investigated. Yet the implications for national policy which it poses are so momentous as to warrant the attention of all whose duty it is to insure our national survival. ?

Writing in the November 1958 issue of the Marine Corps Gazette, Dr. Edgar A. Parsons, whose field is military science and strategy, has made some cogent observations on residual radioactivity as it relates to military planning. The following paragraph summarizes some of Dr. Parson's main points.

The maximum permissible concentration (MPC) of radio strontium (Sr90), a product of nuclear explosions, for the standard man is one microcurie.* Nuclear explosions in the megaton range produce

* Many radioactive isotopes are produced as the result of nuclear explosions. Of these only radiostrontium (Sr90) and Caesium 137 (Cs137) are important in connection with residual radioactivity. Their long half-life (28 years for Sr90 and 30 years for Cs137) permits them to remain in the stratosphere for many years, gradually returning to earth as long term fallout. Caesium 137 has a biological half-life of about 140 days and is chiefly a genetic hazard. Radiostrontium, the main villain, has a biological half-life of 7½ years and produces bone lesions and sarcomas as well as leukaemias.

TOP SECRET

K-75-5352-a

DECLASSIFIED

Authority NND 959001

By PJR NARA Date 2-10-95

~~TOP SECRET~~
REPRODUCED AT THE NATIONAL ARCHIVES

stratospheric fallout of radio strontium on a world wide scale which continues descending to the earth's surface for periods of 10 years or more. As an example of the effects of this fallout, the AEC has calculated that the CASTLE series in 1954 created enough Sr90 in the stratosphere to cause the concentration from this series alone to reach .0125MPC or 1 1/4 percent of the permissible maximum by 1970. After 1970 the rate of descent of the radioactive material from CASTLE will be substantially lower than its rate of decay, and the concentration will begin to decrease. These calculations are based on a total of 24 megatons of fission products in the stratosphere. By extension, it might be argued that if 24 megatons of fission products produce an amount of radiation equivalent to 1 1/4 percent of the MPC, then 1900 megatons of comparable detonations will cause the concentration to reach 100%. The problem of calculating the megaton equivalent of the world MPC has been the subject of considerable controversy since the thermonuclear breakthrough. In 1953 the world MPC was placed at 755,000 nominal KT bombs or 15,000 MT. Early in 1957, in a speech at Northwestern University, Dr. Libby of the AEC described his method of calculating a revised MPC of 11,000 megatons. Dr. Ralph E. Lapp took exception to Dr. Libby's findings and, on the basis of some of Dr. Libby's own statements (including those about the CASTLE series cited above), estimated that the MPC is 2600 MT. Further, noting that the MPC concept is restricted to a healthy adult working under controlled and supervised conditions, Dr. Lapp reduced his calculation by a factor of ten to make it applicable to prolonged exposure by large populations in accordance with the recommendations of the International Committee on Radiation. Thus Dr. Lapps' resultant figure is an MPC of 260MT, or about one-fortieth of Dr. Libby's MPC.

The important point in all this is that, regardless of the wide range of opinion as to its exact value, there is a finite upper limit on the concentration of residual radiation which the world can tolerate. It remains then to estimate where we would stand in relation to any of the MPC's which have been mentioned, if we were to become involved in a nuclear war within the next few years. A very rough estimate of the total yield of the present Soviet stockpile of nuclear weapons based on current estimates would be about 1000 MT. The current figure would probably be tripled by 1962 and would continue to rise rapidly thereafter. It is important to note that the range of error in our estimates of the Soviet stockpile is from one-half to twice the stated figures.

There is no information available on the size of the US stockpile. However, Dr. Parsons made an approximation based on the SAC strength figures given to the Senate Committee on Air Power last year. SAC was described as having 1400 B-47 medium bombers and 300 B-36 heavy bombers which were in the process of being replaced with some 500 to 850 B-52's. Dr. Parsons assumed that this force would be able

*P. Minuteman Seminar
figure was
200,000 MT,
with which
Lapp/Nitze
agreed.
Seminar
forgot its
was on basis
2000 MT
US/Soviet
survived.
HJ*

DECLASSIFIED

Authority NNP 959001

By LR NARA Date 2-10-95

~~TOP SECRET~~
REPRODUCED AT THE NATIONAL ARCHIVES

3

to fly a total of 1500 missions delivering an average of 10 MT per mission for a total yield of 15,000 MT, an amount in excess of Dr. Libby's MPC. This calculation did not include any fissionable materials which might be delivered by the Tactical Air Command, the Army, the Navy, UK forces or by missiles.

Another approach to the question of what quantity of radioactive material might be released into the atmosphere during an all out nuclear war is through the study of US target systems. Here again there is wide divergence of opinion as to the numbers of targets which would have to be destroyed in order to neutralize or eliminate our retaliatory striking power.

According to an Air Force study made last summer in connection with a Soviet requirements estimate, there will be some 373 primary targets located in North America by mid-1962. Neutralization of these targets would require 2,521 ICBM's, assuming that each carries a 1.5 MT warhead, plus follow-up attacks with 578 bombs of 5 MT each. The total yield required therefore would be on the order of 6500 MT. This figure is undoubtedly excessive, since it makes no allowance for overlap and includes attacks with both missiles and bombers on targets which would be of marginal importance in an initial attack. Making adjustments for these factors might allow us to halve the number of weapons required. In Europe and the UK the Air Force calculations produced a requirement for 592 missiles and 194 bombs, while in the rest of the world the total came to 335 missiles and 72 bombs, or a total of about 2700 MT, in addition to North American requirements. Again this figure is probably high.

It has been reported that an investigation by the Stanford Research Institute, made to determine US anti-ballistic missile requirements, led to the conclusion that in 1962 the Soviets would need up to 2900 ICBM's over target to neutralize the US retaliatory capability. The Stanford study assumed characteristics for the Soviet ICBM which were comparable to those estimated in NIE 11-5-58.

Making allowance for unavoidable errors and the bias which may have crept into these estimates of Soviet requirements, it is still reasonable to conclude that radioactive material from several thousand megatons of nuclear explosions would be released into the atmosphere by an attack on retaliatory targets in North America alone. These figures do not take into account explosions resulting from wild shots or attacks against targets at sea. The total potential residual radiation which would result from a worldwide attack on Western retaliatory targets should certainly give pause to even such a presumably callous group as the Soviet planners. The long term dangers to the Soviet Union would be great even though not a single Western nuclear weapon were to explode.

TOP SECRET

DECLASSIFIED

Authority NND 959001

By SPR NARA Date 2-10-95

REPRODUCED AT THE NATIONAL ARCHIVES

4

Assuming that these conclusions are correct, there are a number of important implications for US policy which come readily to mind.

. . . Any method of increasing the number of weapons which the Soviets would need to destroy our retaliatory capability would increase the danger to the USSR itself. Two means of raising Soviet requirements are by dispersal and by hardening installations. Air bases must be dispersed since they are difficult to harden. But missile launching sites, control centers and weapons storage facilities can be hardened with spectacular results in terms of increased requirements for weapons to knock them out. The Canadian position paper for the recently completed US-Canadian estimate of the Soviet threat to North America contains the following calculations based on US data concerning the effects of nuclear weapons. Assuming an ICBM with a warhead of one megaton and a CEP of 5 nautical miles, three such weapons would be required over target to give 90% assurance that a soft ICBM site would be knocked out. If the site were hardened to 100 PSI overpressure, 257 ICBM's would be required to render the site unusable. If the CEP of the missile were reduced to 2 nautical miles, the figures would be one and 41 respectively. The significance of these calculations is too obvious to belabor.

. . . Assuming that a large scale hardening program were carried out and that Soviet requirements could thereby be raised to a level which would cause the resulting radiation to exceed the MPC, important changes in planning by both sides would be indicated:

a. The Soviet planners would be faced with the expensive and complex task of mounting a simultaneous attack with thousands of weapons without prejudicing surprise. Adding to these considerations the knowledge that the resulting radioactivity would exceed the MPC might force them to adopt a strike plan which would contemplate concentrating their offensive weapons against cities and control centers rather than against retaliatory targets. Such a plan would not give any assurance against the USSR's receiving unacceptable damage in return, unless a nearly airtight defense could be devised. In the absence of such a defense, the temptation to the Soviets to strike first would be sharply reduced.

b. Since the danger of war by miscalculation would be ever present, shelter against the radiation hazard would have to be constructed for the entire population of the US. Cities would require much greater protection as they might be the primary targets.

. . . On the principle of what's sauce for the goose is sauce for the gander, our own war plans should be scrutinized with an eye to the residual radioactivity which would result from their execution.

As has been amply demonstrated, there is a wide area of disagreement among the experts on the subject of radioactivity. It is possible

TOP SECRET

DECLASSIFIED

Authority NND 959001

By SPR NARA Date 2-10-95

~~TOP SECRET~~
REPRODUCED AT THE NATIONAL ARCHIVES

5

that both Soviet and US war plans could be executed without causing the extinction or crippling of most of the human race through long term fallout. Nevertheless, if the limit of radioactivity which mankind could tolerate is anywhere near even the higher estimates which have been mentioned, the effects on our national planning would be enormous. A thorough study by an impartial and qualified body in order to arrive at the best possible determination of the megaton equivalent of the MPC should be undertaken immediately as a first step in what may prove to be a truly agonizing reappraisal of the concept of massive retaliation.

| ?

| .