

[REDACTED]

UNCLASSIFIED

RECEIVED

DEC 6 1967

711

RS 5232/242  
September 9, 1966

To: W. F. Roherty - 5633

*M. L. Merritt*

From: M. L. Merritt - 5232

Re: HOB Effects on Fallout

CLASSIFIED BY	12/23/97
DATE	12/4/97
BY	W. C. Layne
REASON	W. C. Layne
APPROVED BY	W. C. Layne
DATE	12/4/97

The most recent and authoritative study of fallout for burst heights below a fireball is Brough and Rainey's DASA 1572 (RS 3415/4412). It is distinctly better than Cowan's much earlier study in TM-153-54-51 since the understanding of how fallout particles form has been much advanced in the intervening eleven years.

Brough and Rainey, in the first place, make the argument that the fireball radius relevant to fallout should scale as  $W^{1/3}$  rather than  $W^4$ , and it is my understanding that this change is to be made in the next issue of Capabilities of Atomic Weapons. The argument is, very shortly, that the formation of fallout particles is dictated by the temperature within the fireball; and the radius at which proper temperatures occur, scales as  $W^{1/3}$ . The  $W^4$  is a purely photographic phenomenon.

Brough and Rainey limit their conclusions to the yield range from 0.1 to 100 kt because it is only here that data exist---the lowest megaton air bursts were at scaled heights of  $500 W^{1/3}$ . I feel that the argument about fireball radius does not depend on this range of data and can perfectly reasonably be expected still to be valid in the low megatons.

Brough and Rainey examine the height of burst dependence in the range where they have data, using an empirical form based on the most modern ideas of how the fallout process takes place. To apply it to a megaton is an admitted extrapolation, though a reasonable one, to be compensated for by conservatism in the conclusions derived.

Since 1.5 mt is the yield of interest, and 100 R/hr or 500 R total dose is a relevant fallout level, we note first that a surface burst would cover an area of about 3000 mi<sup>2</sup> or a downwind distance of 250 miles under nominal meteorology.

[REDACTED]

SANDIA SYSTEMS - INFORMATION CENTER	
DOWNGRADING OF CLASSIFICATION	
CLASSIFICATION CHANGED TO	U
PERSON CHANGING	W. C. Layne
DATE	1-12-98
REASON	W. C. Layne (1-12-98)
RECORD ID	98SN1039
DATE	12-4-97

UNCLASSIFIED

[REDACTED]

[REDACTED]  
**UNCLASSIFIED**

W. F. Roherty - 5633

-2-

RS 5232/242  
September 9, 1966

Using Brough and Rainey's formula (33), the corresponding area for a half-fireball radius height of burst would be  $.2 \text{ mi}^2$ . Assuming a safety factor of 100 in area, the predicted area covered by an airburst 1.5 mt would be  $20 \text{ mi}^2$ , or a downwind distance of 14 miles.

Again I repeat, we have extrapolated tenfold beyond what Brough and Rainey wish, but I believe we have been sufficiently conservative (hundredfold) with the use of this extrapolation.

MM:5232:mr

Distribution:

1/4A - W. F. Roherty, 5633  
2/4A - B. F. Murphey, 5230  
3/4A - J. W. Keizur, 5520  
4/4A - M. L. Merritt, 5232

**UNCLASSIFIED**

[REDACTED]