SAVE

[redacted]

SERVICE FORCES
STATES ENGINEER OFFICE
MANHATTAN DISTRICT
OAK RIDGE, TENNESSEE

IN REPLY REFER TO

By Authority of the U. S. Atomic Energy Commission
Per [illegible] 25 July 1945 11/4/47
[illegible] No. XXX-5-3a

26156

[redacted]

Classification Cancelled or Changed
To [illegible]
By Authority of C. L. Marshall
[illegible]

33115

Subject: The Use of the Gadget as a Tactical Weapon Based on Observations Made During Test II.

MEMORANDUM to Major General L. R. Groves

Name [illegible] Title / / Date

1. A great deal of the energy of Test II was wasted in vaporizing the steel tower and hundreds of tons of sand, glazing the sand, etc., as a result of detonating it at the low elevation of 100 ft. Even so, the observed destructive range was great, i.e. probably a radius of over one mile.

2. The large part of the opacity of the cloud and its column was made up of dust which was sucked up in the rising hot material by the hundreds of tons from long distances, probably having the radius of the "cleaned-off" area (3,000 ft.)

3. If the detonation altitude is raised to approximately 2,000 ft. for more effective use of the blast, the ball of fire, or cloud, probably will start to rise without the high billows of smoke and dust noted in Test II. The approximately 40 tons of nitric oxide formed will be spread out so thin in the diameter of one mile which is reached at the end of a rise of one mile that the oxide will not be visible to any great extent. The active materials probably will be so finely divided that they may rise without being visible.

4. Large amounts of dust and smoke will rise from the debris and fires started by the explosion, which will extend over a large area probably one to two miles in radius, and drift with the wind.

5. Since any airplane flying near a recent detonation will have difficulty in locating the cloud of active material in the air unless they carry detection instruments, all planes should avoid flying over or down wind of such an area for at least three hours after detonation.

6. The light intensity at detonation is sufficient to warrant the pilot's wearing welder's goggles, or covering his eyes in some way, at zero time in order that he may avoid having a blind spot for the next 10 to 15 minutes after zero time. Pilots in accompanying planes within a 30-mile radius of zero should be briefed likewise.

7. Detonation at approximately 2,000 ft. will spread the active materials in all directions. That part directed toward the ground will be spread over a larger area than the area of activity at the base of the column in Test II. Some of this will be swept upward with the dust from the destroyed area and some

[redacted]

NON-CCRP

CLASSIFICATION CANCELLED
BY AUTHORITY OF Topic 1421 CGWG
BY Jose Diaz DATE 4/6/81
BY Wilbur A. Strauss DATE 4-3-81

US DOE ARCHIVES
326 US ATOMIC ENERGY COMMISSION
RG
Collection PBM Files
Box 3361
Folder 19 MR&A Alamagordo 1945-1950

Department of Energy
Historian's Office
ARCHIVES

[redacted]

will be subject to the thermal currents produced by the fires. Some, particularly the finest particles in the lower half of the spherical ball of fire will be drawn upward by the negative blast wave and follow in the up-draft of the rising cloud without ever reaching the ground. Since less dust will be available in the cloud and its column of up-draft, it seems reasonable to expect less chance for agglomeration and adsorption of active material on dust and other particles large enough to fall out of the cloud rapidly. Thus, it is not unlikely that a high detonation level may result in a less active deposit in the devastated area per unit of area and likewise, less along the path of the cloud than was the case in Test II. It is probable that a greater proportion of the active material, particularly if the majority of it is in very fine particles, may stay up in the air and not settle out quickly or even for long periods of time. If they come in contact with moisture and act as a focus for drop formation or rain passes through the cloud, the active material may be brought down to the ground.

8. The presence of a strong inversion at 20,000 ft. or several inversions at and below 20,000 ft. with humidities below 60% are cited by Dr. Horschfelder, sufficient to stop the rise of the cloud at the strongest inversion levels. The high humidity (over 80%) and the lack of an inversion up to 40,000 ft. are cited to be the reasons favoring the height attained by Test II. It is this officer's opinion that this subject needs more elaboration and study before any definite predictions as to elevation can be made. This is particularly so if it is desired to find the proper conditions which might hold the cloud down to levels from which it can be precipitated with rain, or to avoid its precipitation by rain.

Preliminary

9. /analysis of active materials found on the ground after Test II indicates that about 25% are water soluble. Thus, a rain would dissolve some of the active material on the ground, and mechanical washing would tend to carry it into the soil along with the water. Actual experience with sandy soil has shown a reduction of 2/3 following a thunder shower.

10. The wind tends to drift "active" dust into hollows and crevices.

11. The intensity of the gamma radiation in a vehicle (a sedan or carry-all is about 3/4 that measured on the ground.

12. Simple dust filter masks covering only the nose and mouth appear to furnish adequate protection for several hours against inhaling active dust raised by wind and passing vehicles.

13. The decay rate is apparently somewhat more rapid than anticipated (is less than K/T) so that delays for safety from exposure to high intensity will be less than those formerly considered.

14. Oiled or dirt roads suffered little damage from the blast until they neared the crater area in Test II.

[redacted]

[redacted]

16. Certain conditions may be suitable for the use of the gadget as an assault weapon:

a. A strong, steady wind essentially perpendicular to the line and in the direction of the assault. The wind should be in the same, or nearly the same, direction from the ground up to 40,000 ft. or higher. The higher the velocity, the better to dilute any activity which might fall out near the devastated area and carry it into the back country, particularly if that part of the back country were of no tactical value.

b. A rain to wash the active material into the natural drainage, unless this would handicap maneuvers or put out fires which might have other advantages.

c. Immediate advance of armoured vehicles through the right and left margins of the devastated area. These vehicles could be in readiness about 10 miles away. The drivers should be protected by welder's goggles against the flash, and all personnel should be equipped with the simple masks. The front vehicles would be accompanied by monitors who would try to find the best path through the one or two miles of marginal safety through the edge of the devastated area. This would probably be through the burning zone also. This zone might have intensities as low as 10 to 50 r/hr. by the time it was being used. The terrain, wind, vegetation, etc. would influence the local intensities. The presence of roads, or lack of roads, would be a large factor in the time spent and thus the dose received in passing through the critical area.

18. The gadget would produce a large tidal wave in a restricted harbor. This would be very effective on a low coral island harbor. The intense waves so set up might prevent, or wash off, the deposit of the active materials on the land portions so that occupancy might be possible shortly thereafter.

17. Recently dug, deep, slit trenches would offer a great deal of protection to the occupant.

18. The following is an over-simplified table of probabilities for normal active troops:

	Acute exposure within 1 - 24 hrs.	Prolonged exposure 1 week	2 weeks
Limit of Safety			
Some blood changes	30 r	50 r	60 r
25% weak in 2 days			
Will recover	50 r	75 r	100 r
50% weak	75 r	150 r	150 r
75% weak 25% permanent damage	100 r	150 r	200 r
50% permanent damage 100 % weak	200 r	250 r	300 r

[redacted]

[redacted]
Colonel, M. C.
Chief, Medical Section

will be subject to the thermal currents produced by the fires. Some, particularly the finest particles in the lower half of the spherical ball of fire will be drawn upward by the negative blast wave and follow in the up-draft of the rising cloud without ever reaching the ground. Since less dust will be available in the cloud and its column of up-draft, it seems reasonable to expect less chance for agglomeration and absorption of active material on dust and other particles large enough to fall out of the cloud rapidly. Thus, it is not unlikely that a high detonation level may result in a less active deposit in the devastated area per unit of area and likewise, less along the path of the cloud than was the case in Test II. It is probable that a greater proportion of the active material, particularly if the majority of it is in very fine particles, may stay up in the air and not settle out quickly or even for long periods of time. If they come in contact with moisture and not as a focus for drop formation or rain passes through the cloud, the active material may be brought down to the ground.

8. The presence of a strong inversion at 20,000 ft. or several inversions at and below 20,000 ft. with humidities below 60 % are that [sic] by Dr. Hirschfelder, sufficient to stop the rise of the cloud at the strongest inversion level. The high humidity (over 80%) and the lack of an inversion up to 40,000 ft, are that to be the reasons favoring the height attained by Test II. It is this office's opinion that this subject needs more elaboration and study before any definite predictions as to elevation can be made. This is particularly so if it is desired to find the proper conditions which might hold the cloud down to levels from which it can be precipitated with rain, or to avoid its precipitation by rain.

9. Preliminary analysis of active materials found on the ground after Test II indicates that about 25% are water soluble. Thus, a rain would dissolve some of the active material on the ground, and mechanical washing would tend to carry it into the soil along with the water. Actual experience with sandy soil has shown a reduction of 2/3 following a thunder shower.

10. The wind tends to drift "active" dust into hollows and crevices.

11. The intensity of the gamma radiation in a vehicle (a sedan or carry-all) is about ¾ that measured on the ground.

12. Simple dust filter masks covering only the nose and mouth appear to furnish adequate protection for several hours against inhaling active dust raised by wind and passing vehicles.

13. The doesy rate is apparently somewhat more rapid than anticipated (is less than K/T) so that delays for safety from exposure to high intensity will be less than those formerly considered.

14. Oiled or dirt roads suffered little damage from the blast until they neared the crater area in Test II.

[Page 3]

15. Certain conditions may be suitable for the use of gadget as an assault weapon:
a. A strong, steady wind essentially perpendicular to the line and in the direction of the assault. The wind should be in the same, or the higher the velocity, the better to dilute any activity which might fall out near the devastated area, and carry it into the back country, particularly if that part of the back country were of no tactical value.
b. A rain to wash the active material into the natural drainage, unless this would handicap maneuvers or put out fires which might have other advantages.
c. Immediate advance of armored vehicles through the right and left margins of the devastated area. These vehicles could be in readiness about 10 miles away. The drivers should be protected by welder's goggles against the flash, and all personnel should be equipped with the simple masks. The front vehicles would be accompanied by monitors who would try to find the best path through the one or two miles of marginal safety through the edge of the devasted area. This would probably be through the burning zone also. This zone might have intensities as low as 10 to 50 r/hr. by the time it was being used. The terrain, wind, vegetation, etc. would influence the local intensities. The presence of roads, or lack of roads, would be a large factor in the time spent and thus the dose received in passing through the critical area.
16. The gadget would produce a large tidal wave in a restricted harbor. This would be very effective on a low coral island harbor. The intense wave action might prevent, or wash off, the deposit of two active materials on the land portions so that occupancy might be possible shortly thereafter.
17. Recently dug, deep, slit trenches would offer a great deal of protection to the occupant.

18. The following is an over-simplified table of probabilities for normal active troops:

Limit of Safety	Acute exposure within 1-24 hrs.	Prolonged exposure, 1 week	Prolonged Exposure, 2 week
Some blood changes	30 r	60 r	60 r
25% weak in 2 days till recover	50 r	75 r	100 r
50% weak	75 r	100 r	150 r
75% weak 25% permanent damage	100 r	150 r	200 r
50% permanent damage 100% weak	200 r	250 r	300 r

Stafford L. Warren, Colonel, Chief of Medical Section