

Image Cover Sheet

CLASSIFICATION

SYSTEM NUMBER

140848

UNCLASSIFIED



TITLE

VAPOUR DANGER FROM GROSS MUSTARD GAS CONTAMINATION

System Number:

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Notes:

DSIS Use only:

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EXPERIMENTAL STATION

SUFFIELD, ALBERTA

Classification / Designation
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By Authority of
Sur l'Autorisation de C. Laforce

FIELD EXPERIMENT NO. 141

Date 25 Feb 48 Signature D. Kuseler
Appointment
Fonction

(re-draft of F.E. 114)

VAPOUR DANGER FROM GROSS MUSTARD GAS CONTAMINATION

1. INTRODUCTION AND OBJECTS OF TRIAL

It has been suggested that a retreating enemy might attempt to delay use of abandoned air fields by heavy contamination with mustard just before evacuation.

The object of this trial is to obtain data on the vapour danger likely to be encountered on re-occupation of an airfield so contaminated.

Two separate areas will be contaminated simultaneously in this trial, one being the main area representing part of an airfield and the other a small control area on which a single drum will be burst to enable P. & M.S. to assess ground contamination and vapour concentration from a single burst.

2. METEOROLOGICAL CONDITIONS

- Wind velocity 5 - 20 mi/hr.
- Wind direction any.
- Ground temperature (a) 80°F or above.
(b) 60°F - 80°F.



3. SITE

Area A-2. A level site with minimum vegetation is required. Both main and auxiliary trials must be done on similar terrain and the site for the small-scale trial must be upwind of the site for the main trial.

MAIN TRIAL

4. MATERIALS

- 50 light gauge 50 gallon drums charged crude mustard gas. (25 drums will be used on each occasion).
- 210 sticks of dynamite for each occasion.

5. ARRANGEMENT OF DRUMS

25 drums will be arranged as in the attached diagram (Appendix 1). 8 sticks of dynamite will be placed beneath each drum and wired for electrical firing of all drums. (A preliminary test will be done to check that the dispersal of the mustard is satisfactory with this amount of dynamite and that the mustard is not ignited).

6. CHEMICAL SAMPLING

Zero for the experiment is the time at which the drums are burst.

As quickly as possible after zero, injector-operated bubblers will be placed on hinged jump cards at the points shown in the diagram. Height of bubbler inlets to be about 30 inches above ground (stands required). Samples will be taken at all sampling points according to the following schedule:-

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Field Experiment No. I4I (cont.)

1st. Sample.	Zero + 15 minutes to Z + 30 minutes.
2nd. Sample.	Z + 30 minutes to Z + 60 minutes.
3rd. Sample.	Z + 1½ hours to Z + 2 hours.
4th. Sample.	Z + 3½ hours to Z + 4 hours.
5th. Sample.	Z + 6 hours to Z + 6½ hours.
6th. Sample.	Z + 23 hours to Z + 24 hours.
7th. Sample.	Z + 47 hours to Z + 48 hours.

Further samples may be required if significant vapour concentrations persist longer than 48 hours.

Additional sampling will be done (during each of the above sampling periods) to provide "on the spot" estimates of vapour concentration at the centre of the contaminated area, for control of time of exposure of human observers. For this purpose 3 samples will be taken simultaneously near the centre of the contaminated area and the average of the results of the estimates given to Phys. Sections's representative.

7. PERSISTENCE TESTS

Persistence tests will be done at 5 selected points on the contaminated area, at intervals until negative reactions are obtained.

8. EXPOSURE OF MEN

Groups of men (minimum 6 per group) will be allotted suitable tasks to be carried out near the centre of the contaminated area. There will be up to 7 periods of exposure (fresh men for each exposure) starting at approximately the times at which the chemical samples are taken. The times of exposure of the men will be adjusted (on the basis of the "on the spot" estimates of vapour concentration) to give dosages (CT) not exceeding 600 mg. min/m³.

The men will wear respirators, battle dress, gum boots and A/G gloves. Phys. Section's representative will decide whether impregnated panties are to be worn.

9. METEOR OBS.

Relevant meteor obs. will be recorded during the whole period of the trial.

10. DECONTAMINATION

M.E.O. will provide gasoline and swabbing material for decontamination of field equipment, in addition to the usual arrangements to decontamination of personnel.

11. ADMINISTRATION

In charge of trial - M.E.O.

Responsible for final report - C.E.O.

C.E.O. Decision on time of trial. Departmental organization and warnings. Transport arrangements. Final report.

M.E.O. In charge of trial. Emplacing, wiring and bursting drums. Assistance to P.&M.S. in preparing layout for small-scale trial. Provision of protective clothing, impregnated clothing, etc., to meet Chem. Sec. requirements. Field decontamination centre.

Chem.S. Provision and operation of all vapour sampling equipment and report on estimates of vapour concentrations. Persistence tests.

O.M.&E. Provision of 25 drums charged mustard.

Phys.S. Control of exposure of human observers. Report. Decision as to dress of observers.

P.&M.S. Meteor records. Calculations from data obtained on trial. Conduct of small-scale trial.

SMALL-SCALE TRIAL

1. This will be done simultaneously with the main trial, on terrain identical in character. The site for this trial must not be downwind of the area used in the main trial.

2. MATERIAL

One 50 gallon drum charged mustard gas (as used in main trial). Contents to be dyed 1% Rhod. B. extra. Sample to be sent to P. & M.S. one day before trial.

8 sticks of dynamite.

3. LAYOUT - See diagram in Appendix 2.

4. PROCEDURE

The layout of filter paper assemblies, sand plates and stakes to mark vapour sampling positions will be put down and checked before the trial. M.E.O. will arrange that the sand plates are set in flush with ground level. P.&M.S. will fill plates with sand and assist in emplacing plates.

The papers and sand plates will be removed from the area under direction of P.&M.S. representative in the field. Sand will be transferred to glass jars in the field by P.&M.S. and plates brought in for washing.

Vapour samples will be taken (Chem.S.) at the indicated points according to the same schedule of times as for the Main Trial.

Meteor observations will be taken at a site chosen to serve for both main and small-scale trials.

Field Experiment No. I4I (continued)

5. RESPONSIBILITIES

C.E.O.

Organization and transport arrangements.

M.E.O.

Provision of filter-paper assemblies, extra soup plates to be numbered on bottom (250) for sand plates and stakes (I2).
Emplacement of sand plates with help from P & M. S. Exploding drum. Decontamination arrangements.

CHEM. S.

Provision and operation of sampling units. Analysis of samples. Report.

O. M. & E.

Provision of charged drum. Sample of charging to P & M. S. before trial. Report.

P & M. S.

Calibration papers. Met. observations in field. Assistance to M.E.O. in preparing layout. Provision of sand. Supervision of removal of papers and sand plates. Assessment of ground contamination. Analysis of results. Final Report.

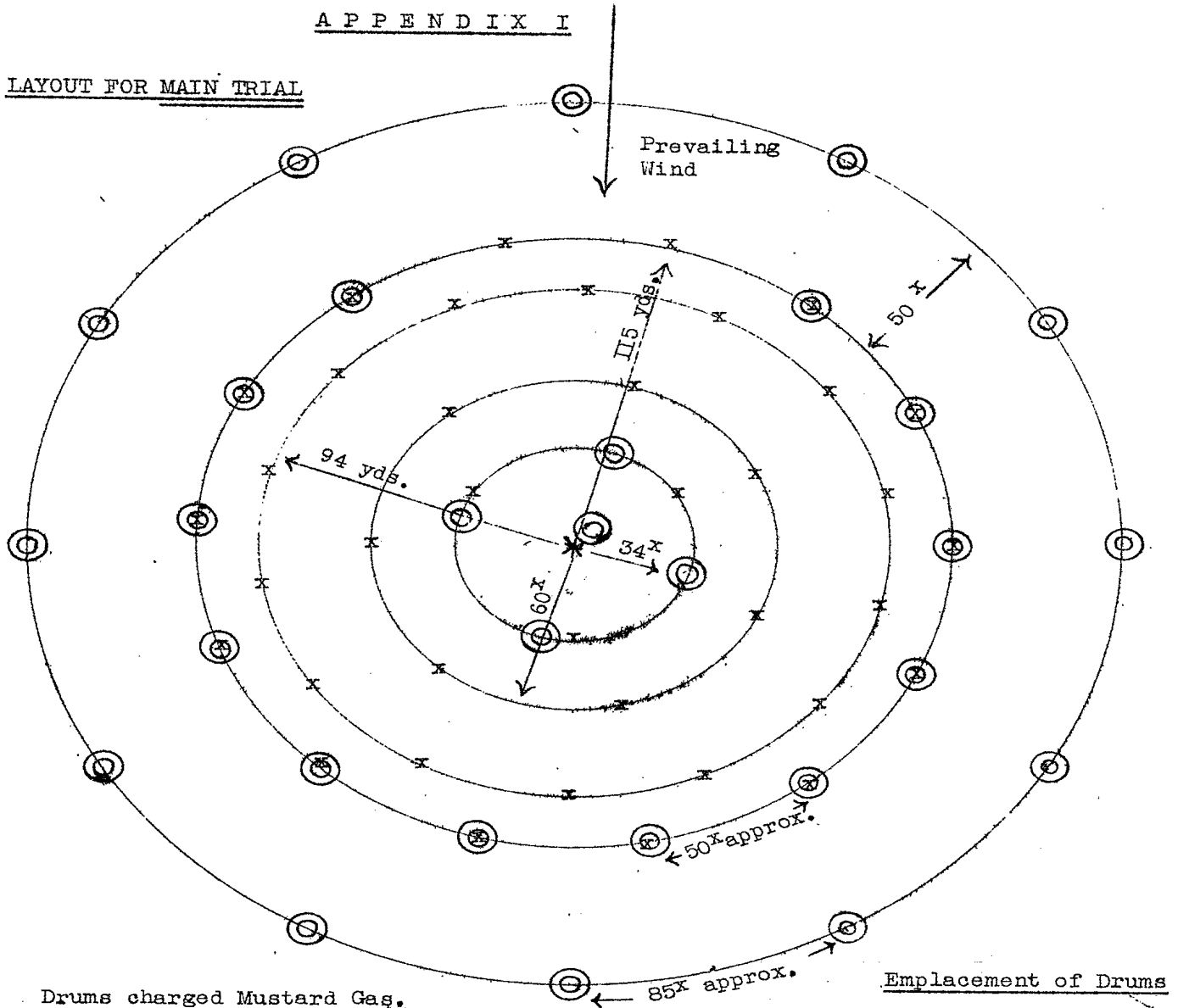
W.R. Lane

(W.R. Lane)
for C.E.O.
Experimental Station

WRL/RA

APPENDIX I

LAYOUT FOR MAIN TRIAL



X Drums charged Mustard Gas.

⊙ Injector operated bubblers
Sampling at approx. 30 ins.

Emplacement of Drums

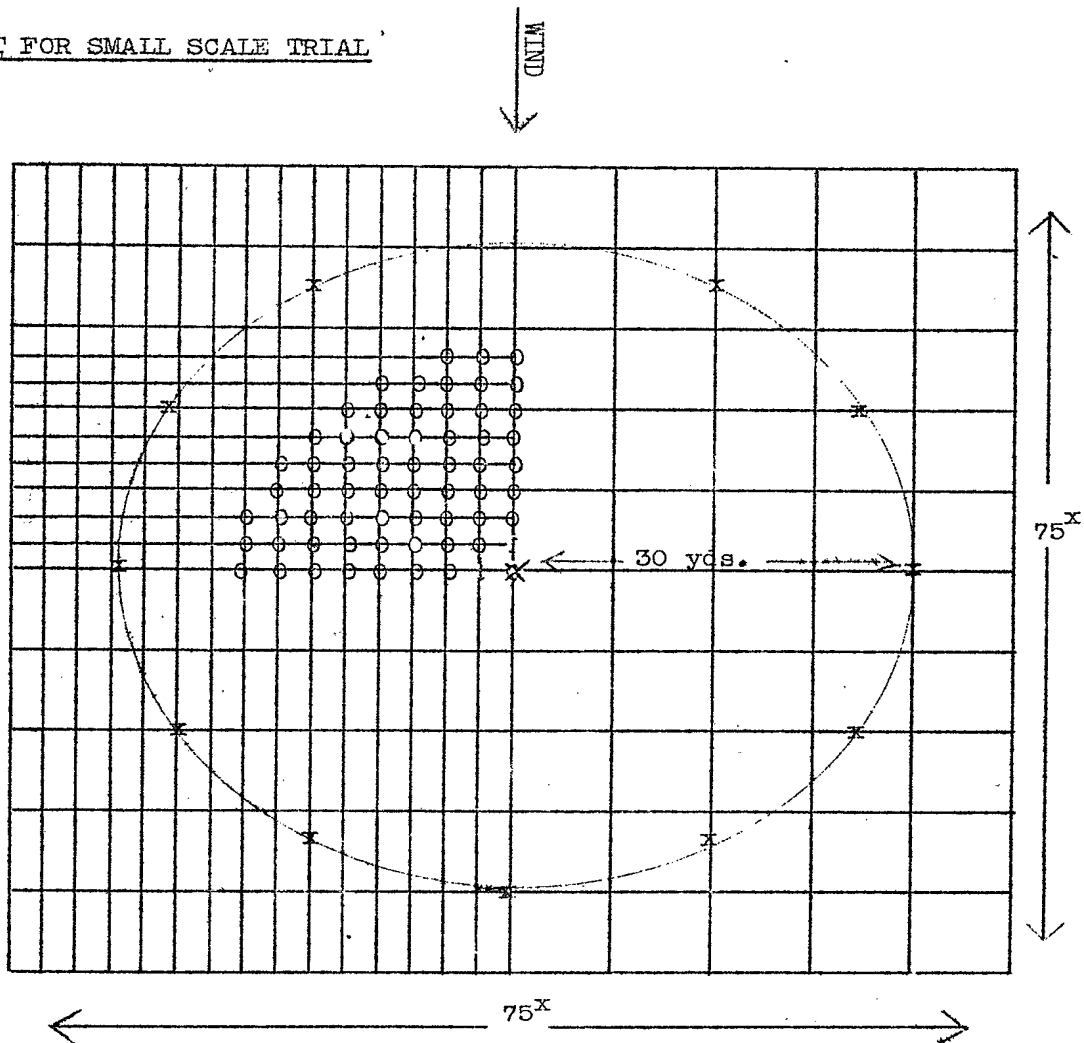
Centre : I drum

- Circle (I) : 3 drums (radius 34^x)
- Circle (2) : 7 drums (radius 60^x)
- Circle (3) : 14 drums (radius 94^x)

Sampling Lines Circle I : radius (115) yds.
Circle II: radius (165) yds.

APPENDIX 2

LAYOUT FOR SMALL SCALE TRIAL



Filter paper assemblies on $2\frac{1}{2}$ yard grid 31 rows of 31 papers each. Total 961 papers.

Sand plates emplaced (O) over central portion - Total 216 plates - to be numbered on bottom and filled with sand. (P & M. S. will provide sand.)

Sampling positions (X) : to be marked with stakes II positions at 15 yard intervals on 30 yard circle. - I position at centre of layout.

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26 Oct. 1943.

EXPERIMENTAL STATION

SUFFIELD, ALBERTA

FIELD EXPERIMENT NO. 141

(Addendum)

For trial No. 2. of F.E. 141, the following changes will be observed.



1. The small layout for assessment of one drum will not be used. One drum with dyed charging will be included the main layout and this will be visually assessed.
2. The ground temperature to be 40-60°F.
3. Unless 60% dynamite becomes available, 12 sticks of 40% dynamite will be used for each drum.
4. Fifteen minute sampling times will be used for the first day. Thereafter they will be increased to thirty minute samples or longer, as decided necessary by Chem. S.
5. "On the spot" sampling to determine times of exposure will be discontinued. Calculated times of exposure will be used instead.
6. Sampling heights on the outer and middle circles will be 8-in. and five foot, six inches. On the inner circle, 8-in. samples only will be taken.
7. Groups of men (minimum of six per group) will be exposed on the layout. The dosage (C.T.) to be aimed at will be 700 (assuming the air temperature to be about 50°F.).

The men will be dressed as follows:

- a) Battle dress, Canadian, non-impregnated.
- b) Shirts, non-impregnated.
- c) Undershirts, short-armed, non-impregnated.
- d) Drawers, impregnated.
- e) Socks and boots, non-impregnated.
- f) Drill order.
- g) Respirators, light type, at the gas position.

Respirators, light type, will be worn to allow exposure of the front chest which would be protected by the general service respirator haversack.

Groups of men will be exposed at the following times:

- Z + 2 hours
- Z + 6 hours
- Z + 8 hours
- Z + 24 hours
- Z + 30 hours
- Z + 48 hours

The men will be positioned on a downwind arc of the inner circle. (Appendix 1. Program F.E. 141, Trial 1.)

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Field Experiment No. 141. (cont'd.)

Addendum

There will be three chemical sampling points for each group of six men ("Physiological Sampling Points"). Three stakes (2 yards apart) will be driven into the ground to support the inlet tube of each sampling point at the height of 36 inches. For the later exposures (24 and 48 hours), there will be 4 sampling points instead of three.

The time and duration of each sample at the physiological sampling point (which will be supplementary to the chemical sampling carried out at other positions on the layout) will depend on the duration of exposure necessary for the predicted dosage.

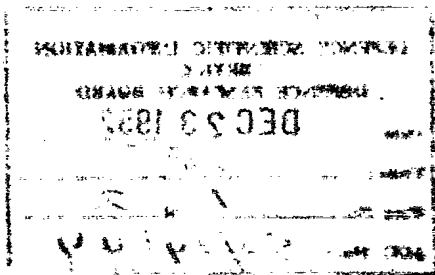
During exposure, the men in the groups occupying the area within the first 24 hours will be engaged in digging slit trenches. At no time will they move more than a few feet away from their appointed sampling points.

In the case of the men occupying the area at 24 and 48 hours, when the exposure periods will last for a number of hours, an area, rectangular, 5 x 3 yards, will be roped off. A sampling point will be established on each side of this rectangle. The men will remain within the limits of this area, and during exposure will be engaged in various types of manual work such as sawing logs and chopping wood.

In passing to and from the sight of exposure, the men will have to pass over contaminated area approximately 115 yards long. To minimize the unmeasured dosage of mustard vapor to which they will be exposed on passing to and from the site of exposure, they will be transported in a closed-in truck. When upwind of the contaminated area the truck will be ventilated by opening the canvas flaps.

To determine the concentration of vapour likely to be encountered in this truck, as soon after zero as possible, it will be driven to the site of the exposure where it will remain stationary for 10 minutes. The rear flap will be opened for one minute. The truck will then return to the control point. A continuous vapour sample will be taken during this period.

8. M.E.O. will provide logs, fence posts, etc., for sawing and chopping exercises mentioned above. Saw horses, saws, axes, also to be supplied.
9. Chem. S. will supply impregnated clothing for the driver and injector operator in the truck which is to transport observers back and forth.



K. Birchall

(K. Birchall) Sq/Ld.
C.E.O.,
Experimental Station.

Field Experiment No. 141
Vapour Danger from Gross Mustard Contamination

17/43

The results from the first trial of this experiment are not complete but indications are that the trial was very successful. Observers were exposed to CF of 400 and upward at various times from immediately after the trial up to 48 hours afterwards - several casualties of a Class II variety have resulted although none were of the nature reported from Australian experiments. Chemical sampling was carried on up to 5 days after the trial. Air temperature at the time of the trial was 74°F, relative humidity 32%, and the gradient 1.9°C lapse. Further trials will be carried out, and the results of trial 1 will be reported in detail shortly. Eighty per cent of the area used (namely 32,000 sq. yds) in this trial was contaminated in excess of 200 gm/m³.

J. Huggill
 (J. Huggill) Major,
 G.E.O.
 for Chief Superintendent,
 Experimental Station.

Distribution

C.S.	1
D.C.W. & S.	2
C.G.D. (R)	2
U.S.L.C.	2
Lt. Col. Sawyer CMBR	1
R. Kingan BOSO	1
G.E.O.	1
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