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CIVIL DEFENCE
INSTRUCTORS' NOTES

APR 1967

General Notes



PUBLISHED FOR THE HOME OFFICE
AND SCOTTISH HOME DEPARTMENT BY
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INTRODUCTION

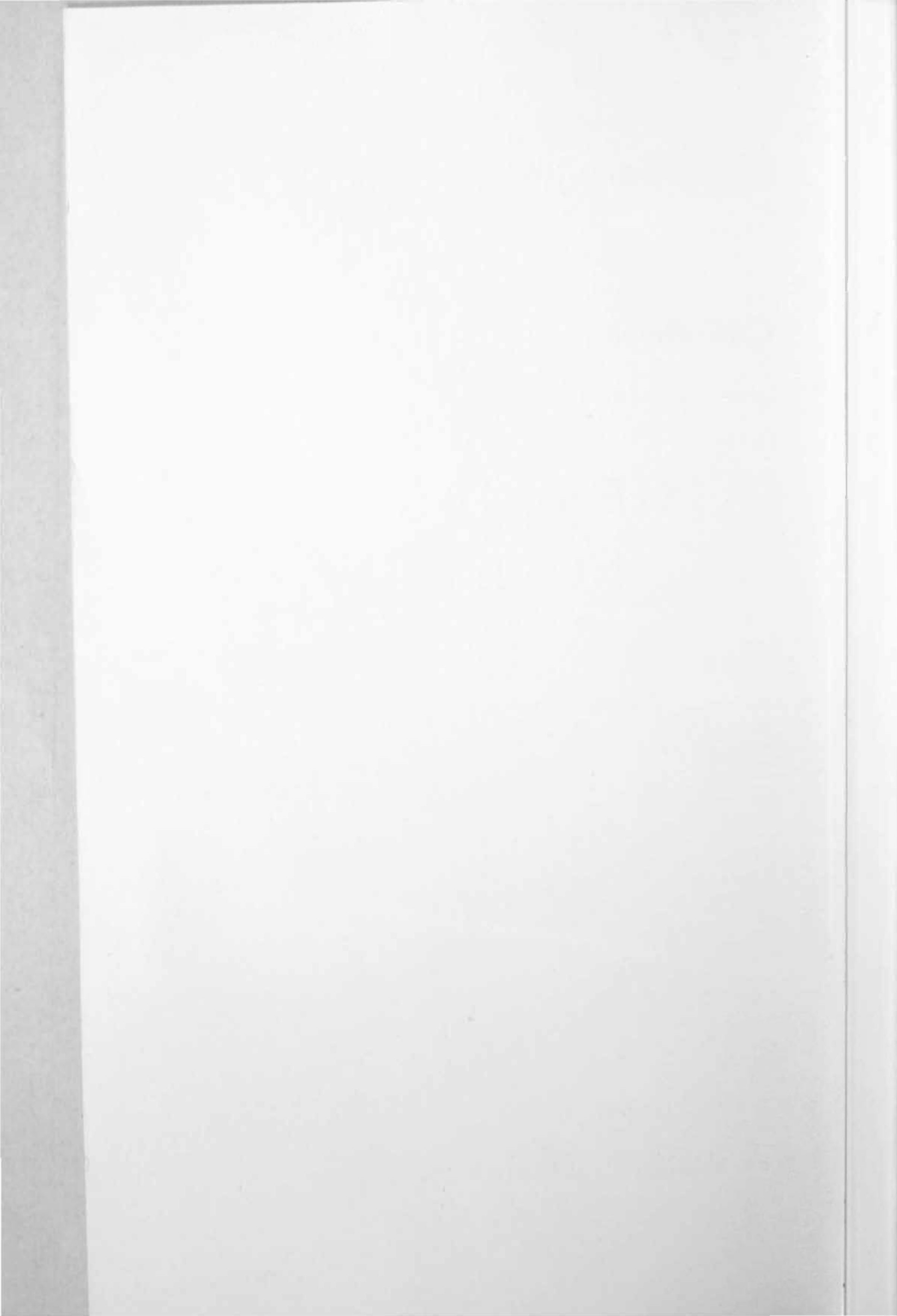
These notes deal with the general subjects that are included in the syllabuses of training for members of the Civil Defence Corps and the Industrial Civil Defence Service.

HOME OFFICE
SCOTTISH HOME DEPARTMENT

Civil Defence Instructors' Notes

GENERAL
NOTES

LONDON
HER MAJESTY'S STATIONERY OFFICE
1960



General Notes

(1960)

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Introduction to Civil Defence

Subjects covered

Purpose and organisation of civil defence ; Civil Defence Corps ; Industrial Civil Defence Service ; other services concerned with casualties ; Police and Fire Services ; Armed Services.

Notes for Instructor

- (a) The object of the lecture is to explain the need for the Civil Defence Services and to outline their organisation.
- (b) The member under training is a small but important part of a large organisation—the Civil Defence Services—which has been set up to save life in the event of enemy attack. He must be made aware, at the outset of his training, of all the parts of the organisation and of the importance of his own particular part and the contribution it makes to the safety of the country. This note provides the basic facts about the organisation.
- (c) Normally this lecture is the first training a volunteer receives after enrolment. He will be inclined to judge the standard of the training arrangements by his experience on this occasion, and if the session is dull or badly presented, he will probably lose interest and discontinue training. It is therefore important that the lecture should be carefully prepared and presented in an interesting way.
- (d) Diagrams should be used where possible. The instructor should make particular reference to the local organisation of the area. He should make clear to the class that his aim is to give a general picture rather than an account accurate to the last detail.

The Object of Civil Defence

- 1 Civil Defence is the defence of the country by any means short of military action, against the effects of hostile attack. That is a very broad definition which embraces many things that are not of immediate concern to the Civil Defence Services, e.g. the arrangements for the maintenance of electricity and gas supplies in the event of air raid damage. This session is confined to that part of civil defence to which the member is making his or her contribution—the Civil Defence Services.

The Need for Civil Defence

- 2 It is just as necessary that preparations for civil defence should be made in peacetime as it is that the Armed Forces should be prepared. These preparations do not imply that war is imminent. Indeed, they are a deterrent to war. The sight of a country taking calm and sensible precautions against the effects of aggression is likely to make a potential aggressor hold back.

The Organisation of Civil Defence

- 3 The development of civil defence services is the responsibility of the central government. It involves much detailed planning and local organisation, and to discharge this responsibility, the central government is being assisted by local authorities and industry. Assistance is also being given by the Women's Voluntary Services and the Voluntary Aid Societies (in England and Wales the St. John Ambulance Association and Brigade, and the British Red Cross Society ; in Scotland the Scottish Branch, British Red Cross Society and the St. Andrew's Ambulance Association).

The Role of the Civil Defence Services

- 4 The role of the Civil Defence Services is to save lives at risk from enemy attack, and to minimise the damage, particularly fire damage, to the physical resources (houses, factories, etc.) of importance to the continuing life of the community. The Civil Defence Services carry out their role in the following main ways :
- (a) education of the public, before attack, in life saving precautions ;
 - (b) rescue of people trapped in damaged buildings ;
 - (c) first aid and medical care ;
 - (d) fire fighting ;
 - (e) feeding and care of people who have lost their homes ;
 - (f) public warnings of fall-out and control of the public in areas affected by fall-out.

There are services in operation in peacetime equipped to deal with some of these tasks in the event of a peace-time accident or disaster. The Civil Defence Services are formed by building up these peacetime services
peacetime service, by creating a new service.

The Civil Defence Corps : General

- 5 The Civil Defence Corps in Great Britain is a Crown Service which was established in 1949. Its purpose is to provide a trained and organised body of men and women to undertake prescribed civil defence duties in support of local and certain other authorities on whom specific civil defence functions have been conferred by the Civil Defence Act of 1948 and regulations made under the Act. The Corps, which is in peacetime manned wholly by unpaid part-time volunteers, is organised territorially in local divisions. In England and Wales responsibility for the recruitment, organisation and training of these local divisions rests on the Councils of counties, county boroughs, metropolitan boroughs and certain specified county districts and in Scotland on the councils of counties and large burghs.

Civil Defence Corps : Organisation of Divisions

- 6 In England and Wales, each local division of the Corps is, except in London, composed of the following five sections :
- (i) *Headquarters Section* : The main functions of this Section are (a) to staff the control centres, (b) to provide the necessary service of communications (including wireless operating, field cable laying and a service of despatch riders), (c) to undertake the reconnaissance required by the local control organisation, both operational reconnaissance and reconnaissance on technical aspects of modern warfare, and (d) to provide scientific advice to Controllers.
 - (ii) *Warden Section* : The wardens are the link between the Civil Defence Services and the public at large. They are responsible for local reconnaissance and reporting, for the organisation of street parties, and for the deployment of life-saving civil defence services within the wardens' post area. They have special responsibilities in connection with warnings of " fall-out " and public control in " fall-out " areas.
 - (iii) *Rescue Section* : The basic unit of the Rescue Section is the rescue party, consisting of a leader, a deputy leader, and six other men. Each member of the party will carry rescue equipment in a manpack; the equipment carried by the party as a whole will be adequate for ordinary rescue tasks. One party in six, however, will carry specialised equipment. Parties will travel in vehicles as near as possible to where they are going to work, and will then proceed on foot with their equipment to the tasks assigned to them.

(iv) *Ambulance and Casualty Collecting Section* : This Section is built up on the normal peacetime ambulance service already provided by county and county borough councils. It has two main functions :

(a) *Ambulance duties* :

- (i) the continuance of the normal work done by the peacetime service, and
- (ii) the conveyance to hospitals and forward medical aid units of casualties caused by enemy action.

(b) *Casualty Collecting duties* :

- (i) to render such first aid as may be necessary, and
- (ii) to place seriously injured casualties on stretchers and to organise the carrying of stretcher cases, including those who have been released by rescue parties, to the ambulance loading points.

(v) *Welfare Section* : The Welfare Section is concerned with such functions as evacuation, billeting, care of the homeless, welfare in shelters, emergency feeding and public information centres.

7 Normally the Officer-in-Charge of the organisation and training of each Section, known as the Head of Section, is the appropriate officer of the local authority, and in the case of the Warden Section the usual arrangement is for the Chief Constable to be appointed to organise the Section. Heads of Sections are assisted by officers appointed from among the members. In the case of the Warden Section, the senior of these Corps officers is known as the Chief Warden, who is also known as deputy Head of the Section.

8 In London, local divisions in the City of London and the Metropolitan Boroughs consist of Headquarters, Warden and Welfare Sections. The London County Council administers centrally Rescue, Ambulance and Casualty Collecting, and Welfare Sections. As Welfare functions are divided between the London County Council on one hand and the City of London and the Metropolitan Boroughs on the other, the Welfare Section is included in the civil defence organisation of each.

9 In Scotland, each local division is composed of four sections, namely, Headquarters, Warden, Rescue and Welfare. The ambulance function is carried out by the Scottish Ambulance Service (see paragraph 14) and the casualty collecting function by the Warden Section. The latter has an additional element (not found in England and Wales), namely, the casualty warden, who is the specialist in first aid in the Section.

The Civil Defence Corps : First Aid

10 The Civil Defence Corps includes no element of medical practitioners. These form part of the Casualty Services proper (see paragraph 14), but "lay" first aid—the treatment that can be given by the layman to ensure so far as possible that the casualty's condition does not worsen before he reaches medical attention—is an important life-saving function of the Corps.

11 All Sections of the Corps have the duty of giving first aid incidental to their main functions, e.g. the Rescue Section of giving first aid to trapped casualties during rescue operations, the Welfare Section of giving first aid and home nursing to the homeless under their care. But casualty collecting personnel in England and Wales and casualty wardens in Scotland are trained to a higher standard in first aid and are responsible for its application in other circumstances, e.g. to untrapped casualties in the damaged areas.

The Industrial Civil Defence Service

- 12 The larger employers of labour in the country (i.e. those employing 200 persons or more), including the public utility undertakings and Government Departments, have been invited to form industrial civil defence units in their premises, comprising Headquarters, Warden, Rescue and First Aid Sections, having much the same responsibilities as the corresponding sections of the Civil Defence Corps.
- 13 Industrial Civil Defence units formed in this way constitute the Industrial Civil Defence Service, which, while independent of the Civil Defence Corps, is trained on the same lines, and is intended to operate in the closest collaboration with the Corps and the other public civil defence services. The first duty of an industrial civil defence unit will be towards the industrial or commercial concern in which it is formed, but where a number of units in adjoining premises have been formed into an "Industrial Group" they may be used to assist one another, and just as industry may call on the Corps for assistance, so industrial civil defence units may be called upon to help the Corps outside the works, but only in accordance with pre-arranged plans agreed between managements and the local Corps authorities and subject

Other Services concerned with Casualties

- 14 Further arrangements for casualties are based on an expansion of appropriate parts of the peacetime National Health Service, viz :
- (a) *The Hospital Service* : The existing Hospital Service would be reorganised and expanded in the event of war, in order to receive and treat casualties from air attack.
 - (b) *Forward Medical Aid Units*: The Hospital Service is responsible for manning and equipping forward medical aid units. Each unit will consist of four sections. In operations, each section will be mobile and consist of one medical officer, one trained nurse and nine nursing auxiliaries. The unit will be based in wartime on an "acute" hospital, but in peacetime on a general hospital. Their function will be to go forward and set up the unit in or as near to the damaged area as possible, and :
 - (i) to screen casualties arriving at the unit ;
 - (ii) to treat injured casualties and to give emergency treatment to the seriously injured before transport to hospital, and to hold cases which cannot be moved immediately ;
 - (iii) as far as possible, to provide simple means of de
 - (c) *Scottish Ambulance Service* : This is a central organisation carrying out the same peacetime functions as the local authority ambulance services in England and Wales, and would similarly be expanded to deal with air raid casualties.
- 15 *The National Hospital Service Reserve* is a body organised by the Hospital Service. It is quite distinct from the Civil Defence Corps, but, like the Corps, it consists of volunteers and has been formed for civil defence purposes. In England and Wales, its primary purpose is to provide nursing auxiliaries for the wartime expansion of the Hospital Service and for the staffing of forward medical aid units. In Scotland it has two Sections, one to provide nursing auxiliaries for the Hospital Service, the other to provide staff for the expansion of the Scottish Ambulance Service.

The Police Service

- 16 In war, the police would continue to be responsible for maintaining law and order. They would also be responsible for giving assistance in connection with the evacuation of people under the Government's evacuation plans. After an attack, they would be responsible for crowd and traffic control, and for many other tasks arising out of the civil defence operations.

- 17 Plans are being made to obtain additional policemen and policewomen to assist in carrying out these tasks.

The Fire Service

- 18 The fire threat from modern methods of air attack greatly increases the responsibilities of the Fire Service. The Service would be expanded to meet the threat. To provide for this expansion arrangements have been made for two additional sources of trained man-power :
- (a) *The Auxiliary Fire Service* : This is a body of volunteers like the Civil Defence Corps, raised by the fire brigades and trained in their spare time as auxiliary firemen to expand the service in an emergency.
 - (b) *National Servicemen* : Certain National Servicemen are being trained to serve as firemen in an emergency.
- 19 Nationalisation of the Fire Service in the last war greatly increased its mobility and flexibility. If war should come again it would once more be brought under central control.

The Armed Forces

- 20 In war, the Armed Forces available in this country would give the maximum possible assistance to the civil authorities. To this end, arrangements have been made for most units of the Territorial Army to be given advanced rescue training, and for all other members of the Armed Forces to receive training in elementary civil defence duties as part of their normal military training.

Science and Civil Defence Operations

- 21 New weapons have increased the importance of the scientist to civil defence operations. At all higher levels of control there will be Scientific Intelligence Officers in post to advise the Controller of the degree of risk attaching to any form of deployment which the Controller may be contemplating.

The Threat

NUCLEAR WEAPONS-IMMEDIATE DANGER

Notes for Instructor

- 1 Reference : Manual of Civil Defence : Volume I, Pamphlet No. 1, *Nuclear Weapons*. (Second Edition, 1959.) The Civil Defence Film "The H-Bomb" (running time approx. 25 minutes) may usefully be shown at the commencement of this series of lectures on "The Threat", and again as a recapitulation at the end.
- 2 Diagrams to illustrate the features of nuclear explosions and to show the radii of damage from heat, immediate gamma radiation, and blast for a variety of weapon powers will be of assistance, particularly if the radii are related to local places known to the class.
- 3 Use should also be made of a blackboard to illustrate points and summarise facts as the lecture proceeds.

Object of Lecture

- 4 To introduce, as part of "The Threat", information concerning the latest as well as earlier nuclear weapons ; to give the general characteristics of nuclear explosions, with the types of burst possible ; and to consider the immediate danger arising from such explosions.
- 5 Later lectures will deal with the delayed danger from radioactivity, with the specific threat of fire, and with protective measures.

Introduction. (Reference : Chapter I, paragraphs 1.1-1.12)

- 6 Hydrogen bombs of very much greater power than the atomic bombs used in Japan in 1945 (which gave an energy release equivalent to the explosion of 20,000 tons of T.N.T. and are known as 20 kiloton (20 KT) bombs) have been developed and constitute an even graver threat in any future war.
- 7 An energy release equivalent to the explosion of many millions of tons of T. can be reached, but for the practical purpose of achieving sufficient destruction and damage with economy of effort, it is not likely that hydrogen bombs will need to exceed a power of 500×20 KT, i.e., 10,000,000 tons or 10 megatons (10 MT). The possibility of the use of smaller bombs for tactical reasons, and of larger powers for special purposes must not, however, be excluded.
- 8 Despite their vastly increased energy release, now measured in millions of tons instead of thousands, from the civil defence aspect hydrogen bombs present problems which are largely ones of difference in magnitude rather than in nature from those of the 20 KT bombs hitherto dealt with in training. Since the nature of the immediate effects of the one is similar to those of the other—although the ranges of these effects are increased—the 20 KT bomb is useful as a yardstick with which to study the implications of hydrogen bombs.

Features of Nuclear Explosions (Chapter I, paragraphs 1.3-1.22)

- 9 *General characteristics* : The fireball ; light and heat ; immediate nuclear radiation ; blast ; residual radioactivity.
- 10 *Types of burst* : High air burst ; near ground or ground burst ; underground burst ; surface or very shallow water-burst ; under-water burst.
- 11 Against normal land targets hydrogen bombs are more likely to be burst on or near the ground than high in the air because of the enhanced residual radioactivity hazard that is produced by ground bursts without unduly serious loss of the other effects.

The Immediate Danger

- 12 Immediate damage and danger to life is limited to three of the effects, viz : heat radiation, initial nuclear radiation, and blast :

(i) HEAT RADIATION (Chapter V)

- 13 Intense light and heat are radiated instantaneously from the fireball caused in the explosion. The heat radiated travels at the speed of light (186,000 miles per second). From a 20 KT bomb the heat emission lasts for about $1\frac{1}{2}$ seconds, although most of it is over in about half a second—and it is termed a "heat flash". With a 10 MT bomb, however, the times are very much longer, and the heat radiation may last for 20 seconds or more, although most of it will be over in the first 10 seconds—a time which cannot be described as a "flash".

Effects of heat radiation on people (Chapter V, Tables 6 and 7)

- 14 Direct exposure in the open within $2\frac{1}{2}$ miles of ground zero (G.Z.) of an air burst 20 KT bomb will result in burns on the exposed skin. The nearer to G.Z. the greater the danger to life, and those directly exposed within $\frac{1}{2}$ mile of G.Z. would undoubtedly be killed as a result of serious burns. Severe third degree burns (charring) will result up to about $1\frac{1}{8}$ miles, second degree burns (blistering) up to about $1\frac{1}{3}$ miles, and first degree burns (reddening) up to about $2\frac{1}{2}$ miles. With bigger bombs there is an increase in range, depending on the power of the bomb and whether it is air burst or ground burst, e.g., for a 10 MT ground burst bomb it is about fourteen times that of an air burst 20 KT bomb.

Primary Fires (Chapter V, Tables 8 and 9)

- 15 Combustible materials are capable of being ignited, even by a 20 KT ground burst bomb up to a range of $1\frac{1}{2}$ miles, both in the open and inside buildings if the heat enters through windows, etc. This range is likely to be increased by about twelve times for a 10 MT ground burst bomb.

Secondary Fires

- 16 Although arising indirectly from damage caused by blast, e.g. collapse of buildings on to open grates and stoves, fracturing of gas services and short-circuiting of electric wiring, such fires may add to the general fire problem—although the risk is less than that of primary fires.

(ii) INITIAL NUCLEAR RADIATION (Chapter IV)

- 17 Gamma radiation is emitted instantaneously from the fireball, and whilst the emission is at its strongest for about the same time as the heat radiation (and it travels at the same speed), the danger cannot be said to be over until the lapse of about a minute from the explosion. Gamma rays have great powers of penetration through materials and through the human body. They do not affect inert materials, but do have a harmful effect on the human body, producing radiation sickness. They can cause death if a sufficient quantity enters the body. The amount of gamma radiation received in a given time is referred to as the dose of radiation, and the unit for the measurement of this dose is the roentgen (r. for short). With a 20 KT bomb, for persons caught in the open there is a 50 per cent. chance of survival at $\frac{1}{2}$ mile from the explosion. With a 10 MT bomb the distance at which there is a dose giving a 50 per cent. chance of survival in the open is about $2\frac{1}{2}$ miles, but since building materials considerably reduce (by shielding) the dose reaching those inside a house or shelter, the distance at which such a dose can be absorbed inside buildings is much less. This distance is well within the range of total blast destruction, so that the initial gamma radiation tends to become a less serious factor in comparison with the blast hazard (see paragraph 20) as the power of the bomb is increased.

Note : Neutrons, emitted at the same time as the initial gamma radiation, could, in theory, cause an immediate danger by passing through the human body, but they cannot, in fact, constitute an additional hazard, since at the limit of their damaging range the immediate gamma ray dose in the open is many times a lethal dose, and moreover the chance of survival from blast and heat effects at that range is negligible.

(iii) BLAST (Chapter VII)

- 18** *Nature of nuclear blast* : An intense pressure wave, caused by the rapid expansion of the fireball, travels outwards in all directions at approximately the speed of sound (1,100 feet per second), whatever the power of the bomb. A shock front of highly compressed air is built up, and it is this rapidly moving sustained wall of air which does damage to buildings and installations at considerable distances from G.Z. In nature it resembles a hurricane-like wind which has two phases—a pressure phase and a suction phase—between which it changes direction.
- 19** The duration of the pressure phase, during which most of the structural damage is caused, is from 0.7 second to about 1 second with a 20 KT bomb (compared with about 1/100th second for conventional H.E.). An increase in the power of the bomb brings about an increase both in duration and range, e.g., a 10 MT bomb will produce a blast pressure wave lasting for about 5 seconds or more.

Ranges of damage to typical British houses and of road blockage

- 20** The various degrees of structural damage in built-up areas would in turn cause corresponding hindrance and obstruction to civil defence forces in vehicles and on foot. The table below shows the ranges of various categories of damage and street blockage for ground-burst weapons of different powers. It is expected that slight damage to typical British houses would occur when the static overpressure (pounds per square inch, abbreviated to p.s.i.) in the shock front was about 0.75 p.s.i., at 1.5 p.s.i. the houses would need repairs to remain habitable and they would be irreparably damaged at about 6 p.s.i.

Average ranges (radii) of blast damage to typical British houses and blockage of streets
Ground-burst nuclear weapons : ranges in miles

<i>Weapon power</i>	20 KT	100 KT	$\frac{1}{2}$ MT	1 MT	2 MT	5 MT	10 MT
<i>Damage ring "A"</i> Houses totally destroyed, streets impassable	0- $\frac{3}{8}$	0- $\frac{1}{2}$	0-1 $\frac{1}{4}$	0-1 $\frac{1}{2}$	0-2	0-2 $\frac{1}{2}$	0-3 $\frac{1}{2}$
<i>Damage ring "B"</i> Houses irreparably damaged, streets blocked until cleared with mechanical aids	$\frac{3}{8}$ - $\frac{1}{2}$	$\frac{1}{2}$ -1	1 $\frac{1}{4}$ -1 $\frac{1}{2}$	1 $\frac{1}{2}$ -2 $\frac{1}{2}$	2-3	2 $\frac{1}{2}$ -3 $\frac{1}{2}$	3 $\frac{1}{2}$ -5
<i>Damage ring "C"</i> Houses severely to moderately damaged : progress in streets made difficult by debris	$\frac{1}{2}$ -1 $\frac{1}{4}$	1-2 $\frac{1}{4}$	1 $\frac{1}{4}$ -4 $\frac{1}{4}$	2 $\frac{1}{4}$ -6	3-7 $\frac{1}{2}$	3 $\frac{1}{2}$ -10	5-13
<i>Damage ring "D"</i> Houses lightly damaged, streets open, but some glass and tiles	1 $\frac{1}{4}$ -2 $\frac{1}{2}$	2 $\frac{1}{4}$ -4 $\frac{1}{4}$	4 $\frac{1}{4}$ -7 $\frac{1}{4}$	6-9	7 $\frac{1}{2}$ -12	10-15 $\frac{1}{2}$	13-20

G 2 : 4

- 21** The range of blast damage is substantially greater for an air burst than for a ground burst weapon. The exact amount of the increase varies with the category of damage and with the height of burst, but it might be by as much as 30 per cent.

The Problem of Debris

- 22** With such widespread destruction of buildings, debris will be one of the outstanding problems. Vehicular traffic, for bringing in civil defence services and reinforcements, and evacuating casualties, may be seriously restricted or prevented entirely over a very wide area.

Concluding Summary

- 23** The object has been to give information, essential to later training, concerning the threat of nuclear weapons, concentrating on the immediate dangers due to heat, nuclear radiation, and blast arising from different powers of explosions. The delayed danger from residual radioactivity will be dealt with in a later lecture.
- 24** From the civil defence aspect hydrogen bombs are simply more powerful nuclear weapons than the 20 KT bombs hitherto used in war. The nature of their immediate effects remains unaltered, although the ranges of those effects are increased.
- 25** It is quite wrong to suppose, in spite of the destructive power of the latest hydrogen weapons, that everything living within the area affected by a nuclear explosion is destroyed, and that nothing can be done to mitigate its effects. With adequate advance preparation and proper organization and determination (e.g., evacuation, warning and well trained civil defence services) casualties can be greatly reduced.

The Threat

NUCLEAR WEAPONS—DELAYED DANGER

Residual Nuclear Radiation Risks ; Fall-out ; Induced Radioactivity ; Radioactive Decay ; Radiation Sickness and Radioactive Poisoning

Notes for Instructor

- 1 Reference : Manual of Civil Defence : Volume I, Pamphlet No. 1, " *Nuclear Weapons* ", (Second Edition, 1959).
- 2 Diagrams to illustrate fall-out, induced radioactivity, and radioactive decay, will provide useful visual aids.
- 3 Use should also be made of a blackboard to illustrate points and summarise facts as the lecture proceeds.

Object of Lecture

- 4 To give, as part of " *The Threat* ", information concerning residual radiation risks from nuclear explosions ; to explain radioactive decay, radiation sickness and radioactive poisoning.
- 5 A later lecture will deal with protective measures against the delayed danger.

Residual Nuclear Radiation Risks (Reference : Chapter I, paragraphs 1.15-1.21 ; Chapter VIII)

- 6 Quite apart from the immediate danger to persons at the time of the explosion from gamma radiation, which lasts for a matter of not more than a minute, there can also be delayed, but continuing, danger from residual radiation after a nuclear explosion. The presence of such delayed danger depends primarily on whether or not the fireball touches the ground when the explosion takes place, and this is influenced more by the height of burst than by the power of the bomb.
- 7 Generally speaking, air burst explosions in which the fireball does not reach the ground cause no delayed danger ; but from a ground or near-ground burst—which is particularly likely with a hydrogen bomb—this danger is very real, and it chiefly arises from what is known as " *fall-out* ".
- 8 *Fall-out* : This is the result of highly radioactive explosion products, which at first are gaseous, condensing on to and with pulverised and vapourised material which has been sucked up by the ascending fireball where it has touched the ground. As the fireball rapidly ascends, cools and disperses, the heaviest material spills out first from the rising stem and cloud which remains—much of it falling back into or fairly close to the crater at ground zero, where it causes intense residual radiation. Lighter material is carried higher—some indeed into the upper atmosphere at very great heights—and falls out correspondingly later and further down-wind from ground zero according to the size of the particles.
- 9 The extent and shape of the fall-out pattern, the radioactive intensity of which decreases with distance and time of arrival from ground zero, will depend on the speed and direction of the prevailing winds throughout the height to which the cloud ascends.
- 10 Tests have shown that the fall-out from a ground burst hydrogen bomb can be very extensive, and can present a serious hazard to those in the open in distant areas quite unaffected by blast and fire. For example, in the American hydrogen bomb test in the Pacific in March 1954, Japanese fishermen on the deck of a boat some 70 miles down-wind were seriously affected, and the U.S. Atomic Energy Commission has reported that this ground burst bomb (estimated to be of 14 megatons power) contaminated a cigar-shaped area extending approximately 220 miles down-wind and varying in width up to 40 miles.

- 11 With a shallow water or underwater burst, such as took place in the British " Operation Hurricane " at Montebello and in other American tests, the danger of contamination of adjacent land is also serious, since the majority of the radioactive products present in normal fall-out are trapped in the water flung upwards and outwards by the explosion.
- 12 The greater the distance of fall-out from ground zero, however, the less will be the intensity of the residual radiation it gives off—due to natural radioactive decay with the passage of time whilst the contamination is airborne.
- 13 *Induced radioactivity* : (Chapter IV, paragraph 4.3.) With a ground or near-ground burst there is also likely to be some neutron-induced activity because of the very close contact between the neutrons produced in the explosion and materials on the ground. This induced radioactivity, which is limited to close around ground zero, tends to decay very rapidly, and except directly after the explosion is unimportant compared with the hazard from fall-out.

Radioactive decay (Chapter III, paragraphs 3.1-3.3 ; Chapter VIII, paragraphs 8.6-8.7)

- 14 The danger from residual radiation lies chiefly in the gamma rays emitted by fall-out. Although of much weaker intensity than the initial gamma radiation at the time of the explosion, such gamma rays continue to be given off until decay of the radioactive explosion products in the fall-out is complete. People who have to remain or work in such a contaminated area are therefore subjected to an accumulating dose of gamma radiation whilst they stay there.
- 15 Radioactivity cannot be destroyed, neither can its decay be hastened. The average decay rate of all the various fall-out products of a nuclear explosion is such that as the time is doubled, the activity is somewhat more than halved. Thus if, for example, at a given spot the dose-rate at one hour after burst were to be 100 r./hr., the dose-rate at 2 hours would be less than 50 r./hr., and at 2 days would have dropped to about 1 r./hr. It is, however, possible for very much higher initial radioactivity to be present from fall-out than 100 r./hr.
- 16 Alpha and beta particles are also emitted by fall-out, but their effect is small in comparison with that of the residual gamma rays since they have a low penetrating ability. As will be explained in a later lecture on protective measures, it is desirable to keep dust (which may harbour radioactive explosion products) from contact with the skin of the body, or from being taken into the body, but provided exposure to residual gamma rays can be controlled within permissible limits, the hazard from alpha and beta particles alone is not likely to be serious.

Radiation sickness (Chapter II, paragraphs 2.13-2.15, and paragraphs 2.5-2.8)

- 17 When a person has been exposed to a considerable dosage of gamma rays (whether at one moment as with the initial radiation, or over a period as with residual radiation) a condition known as radiation sickness is set up. This is primarily due to damage to the gastro-intestinal tract, and the inability of the body to make good the damage. On an average 150 r. is the dose at which the onset of symptoms, which commence with fatigue and nausea, may be expected. Above this figure sickness occurs in varying degrees, according to the severity of the dose, and 350 r. to 500 r. is taken as the range of doses giving 50 per cent. of deaths amongst those so exposed. Death is rarely rapid, but serious casualties usually show signs of deep shock with sickness and vomiting within a few hours of exposure.

Radioactive poisoning (Chapter X)

- 18 When radioactive contamination, usually harboured in dust, is taken into the body, either in breathing, eating and drinking, or through wounds and abrasions, radioactive poisoning may occur, giving rise to symptoms similar to those of radiation sickness. Where, however, it is possible to control exposure to gamma rays from residual activity within permissible limits, the hazard from radioactive poisoning alone is not likely to be serious.

Concluding summary

- 19 The object has been to outline the delayed dangers due to residual nuclear radiation. The chief hazard arises from contamination caused by the fall-out of radioactive explosion products (usually harboured in dust or water), which may occur both close to and at a great distance from a nuclear explosion. The degree of contamination is more dependent on whether the fireball touches the ground (i.e. on the height of burst) than on the power of the nuclear weapon used. Conditions which give rise to radiation sickness and radioactive poisoning have been discussed.
- 20 Protective measures, including the detection and measurement of radioactivity, and personal cleansing, will be dealt with in later lectures.

The Threat

FIRE

Notes for Instructor

- 1 Reference (for paragraphs 7-12) : Manual of Civil Defence : Volume I, Pamphlet No. 1, *Nuclear Weapons* (Second Edition, 1959), Chapter V.
- 2 Diagrams to illustrate the danger of the heat radiation from nuclear explosions, and the mode of action of other incendiary agents, will provide useful visual aids.
- 3 Use should also be made of a blackboard to illustrate points and summarise facts as the lecture proceeds.

Object of lecture

- 4 To consider the fire raising danger from nuclear weapons and incendiary agents.
- 5 A subsequent lecture will deal with practical fire prevention measures.

Introduction

- 6 As already mentioned in the lecture under the heading of "The Immediate Danger" the heat flash radiated from atomic explosions and the longer lasting heat radiation from hydrogen bomb explosions is capable of starting primary fires in combustible materials over a wide area, both in the open and inside buildings if the heat enters through windows, etc. Conventional incendiary bombs of various types must also be considered.

Nuclear weapons

- 7 *Primary Fires* : Even from a 20 KT ground burst bomb, where the heat flash radiated at the time of the explosion lasts about $1\frac{1}{2}$ seconds, the range at which combustible material can be ignited is up to a radius of about $1\frac{1}{2}$ miles from ground zero. With more powerful bombs the range of fire effects increases, e.g., with a ground burst 10 MT bomb the radius of combustion would increase to 17 miles.
- 8 *Secondary Fires* : To the primary fire raising danger of the heat radiation from nuclear explosions is added the risk of fires resulting indirectly from damage caused by blast, e.g., the collapse of buildings on to domestic appliances, the breaking of gas mains, and the short-circuiting of electrical wiring.
- 9 *The Fire Situation* : The development of fire resulting from heat radiation is likely to be affected by subsequent blast damage in the area where the latter will produce almost complete destruction of buildings, i.e., within a radius of about $\frac{1}{2}$ a mile of ground zero for a 20 KT ground burst bomb, and within $3\frac{1}{2}$ miles of ground zero for a 10 MT ground burst bomb. There will be a considerable "blanketing" or smothering effect due to this degree of collapse in buildings, and it is unlikely that incipient fires within these distances could continue on any vigorous scale.
- 10 There may, however, be a main fire belt created around this region of complete blast destruction, in areas where buildings are damaged, though still standing sufficiently to allow free burning. This fire belt could extend out to 1 mile from ground zero for a 20 KT bomb, and to 12 miles for a ground burst 10 MT bomb.
- 11 *Possibilities of a Fire Storm* : A fire storm is the term used to describe the spread of fire under conditions where the number of individual fires, the density of buildings in the target, and the combustibility factor is so great as to cause the merging of fires into one gigantic conflagration which draws in an ever increasing supply of air and burns with a "blow-torch" effect.

G 4 : 2

- 12 It is considered unlikely, from the evidence available and in view of the nature of most British targets, that a fire storm could be started in this country by a nuclear explosion, although the possibility cannot be ruled out altogether. The large and almost completely flattened central area of destruction (from blast) around ground zero would tend to retard the development of such a fire storm, but there would in any case be many serious fires and fire areas.

Incendiary agents

- 13 *Incendiary Bomb Fillings* : A variety of fillings is possible in incendiary bombs, depending on the size of the bomb and the type of target against which it is to be used. These include thermite and magnesium (in small bombs of about 2 lbs. weight, usually dropped in cluster containers in very large numbers to saturate a target), oil and phosphorus (in larger bombs) and "napalm" (a composition of jellified petrol, used in fairly large bombs).
- 14 With the smaller type of incendiary bombs the object is to saturate the target (which must be of a reasonably combustible nature having a fairly high density of buildings) in a short period of time with a large number of bombs. Very little aiming is attempted, but various container devices are used to ensure that a close distribution of bombs is achieved when the container opens at a pre-determined height to scatter its contents.
- 15 With all incendiary bomb attacks it is a tactical advantage to drop at the same time about an equivalent weight of high explosive bombs. This has the effect of dislocating water supplies for fire-fighting, breaking open buildings and assisting the fires to burn, as well as intimidating fire-fighters during the period whilst incendiary bomb fires are in the process of developing. Whilst during the 1939-1945 war a proportion of incendiary bombs were frequently fitted with explosive attachments for the latter purpose, the purpose is achieved equally well at less cost by normal H.E. bombs dropped during the raid—with the other advantages mentioned.
- 16 By themselves, most incendiary bombs have poor powers of penetration into conventional domestic or industrial buildings, and the risk of fire is greatest in the roof spaces or upper floors.

Concluding summary

- 17 The object has been to consider the fire raising dangers of nuclear weapons, and of other more conventional incendiary agents, including small thermite/magnesium bombs, oil/phosphorus bombs, and napalm bombs.
- 18 The heat effect from nuclear explosions is a very potent fire raiser, although it is unlikely that continuing fires will develop within the area closest to ground zero, where almost complete destruction by blast is caused. It is important to realise that not only can combustible material in the open be ignited, but also the contents of buildings if the heat enters windows, etc. Whilst the development of a fire storm is unlikely in most British cities from a nuclear explosion, there may well be a belt of fire extending outwards from the area of complete blast destruction to as far as 1 mile for a ground burst 20 KT bomb and 12 miles for a 10 MT ground burst bomb.
- 19 With incendiary bombs the chief fire risk is to the upper storeys of buildings, but it is likely that H.E. bombs will be dropped at the same time in an attempt to open up buildings and increase the spread of fire.
- 20 Practical fire prevention measures will be dealt with in a later lecture.

The Threat

HIGH EXPLOSIVE MISSILES AND UNEXPLODED MISSILES

Object of Lecture

- 1 To explain the types and effects of high explosive missiles, and indications of unexploded missiles.

High Explosive Bombs and Fuses

- 2 A high explosive bomb consists of a charge of high explosive contained in a case fitted with an exploder, fuse and detonator. The fuses used to date fall roughly into two classes—those operated electrically and those which are primarily mechanical.
- 3 Fuses working on either the electrical or mechanical principle can be grouped in four main types :
 - (a) Airburst and proximity fuses which operate at a predetermined distance from the target.
 - (b) Impact and short delay fuses which operate upon impact with the target or after only slight penetration (short delay indicating, at the most, a delay of a few seconds).
 - (c) Long delay fuses which operate at some predetermined time after coming to rest.
 - (d) Anti-disturbance and booby trap fuses which are set when the bomb comes to rest and operate when various disturbing influences are felt.

Types of High Explosive Missiles

- 4 All missiles are designed for a specified purpose. Broadly speaking they may be classified into 8 types as follows :

- | | | |
|---|---|-------|
| (a) General Purpose (G.P.) | } | Bombs |
| (b) Medium Capacity (M.C.) | | |
| (c) Medium Capacity—Deep Penetration (M.C., D.P.) | | |
| (d) High Capacity (H.C.) | | |
| (e) Fragmentation (F.) | | |
| (f) Armour Piercing (A.P.) | | |
| (g) Guided missiles | | |
| (h) Rockets | | |

General Purpose Bombs

- 5 Are designed to a streamlined contour and are thick-walled, having a charge/weight ratio of about 33 per cent. They have nose and/or tail fusing positions, and are intended to cause damage by blast, fragmentation, and earth shock. Their size is likely to range from 250 lbs. to 1,000 lbs. in weight, but there is a tendency to increase their charge/weight ratio, when they become classified as Medium Capacity Bombs.

Medium Capacity Bombs

- 6 Are intended for general operational use, and against normal industrial targets. They have a charge/weight ratio of about 50 per cent. and have nose and/or tail fusing. They are likely to range in size from 250 lbs. to 4,000 lbs.

Medium Capacity Deep Penetration Bombs

- 7 Have a specially streamlined shape, a solid nose, and are fused in the tail only. Intended for use against fortifications and other special targets, e.g. reinforced concrete submarine pens. They are likely to be very large bombs, of up to 22,000 lbs. in weight.

High Capacity Bombs

- 8 Are intended for use against targets where maximum damage by blast is required. They are thin cased, with a charge/weight ratio of about 75 per cent. and are fused in the nose only. The sizes likely to be used may vary from 2,000 to 12,000 lbs.

Fragmentation Bombs

- 9 Are designed for use as anti-personnel weapons to cause damage and casualties by splintering of the case. They are thick walled with nose fusing only, and may be dropped singly or more commonly in clusters. These bombs may weigh up to 20 lbs. each.

Armour Piercing Bombs

- 10 Are designed to penetrate armour plating or reinforced concrete before exploding inside the target. They are heavy cased and solid nosed, with tail fusing only, and have a charge/weight ratio of about 10 per cent.

Guided Missiles

- 11 Practically any type of bomb can be transformed into a guided missile. Radar, television, and automatic "homing" devices are also likely to be used in the future. A typical example of a guided missile is the radio controlled, jet assisted, glider bomb.

Rockets

- 12 The German A 4 Rocket, commonly known as the V 2, is an example of this class of missile. Unlike the flying bomb, which required a prepared stationary launching ramp, the V 2 could be fired from any piece of reasonably hard ground, which was accessible to heavy transport.

Small Anti-Personnel Bomb

- 13 Small anti-personnel bombs may be dropped in very large numbers. They usually remain on or near the surface and if unexploded may still be dangerous, particularly on roofs, in trees or in bushes where they may be difficult to see. An example of this weapon in the last war was the butterfly bomb.

Indication of Unexploded Bombs

- 14 (a) *In Buildings* : Considerable structural damage often caused. May be confused with exploded bomb damage. Path of bomb clearly visible through upper stories. Debris and damage greatest on ground floor. No sign of splinters or blast damage. Mirrors, cups, etc., may still be intact. Damage may be caused by secondary splinters.
- (b) *In Open Ground* : Small bombs usually make a clean hole of entry. Fin marks and paint may be visible. Larger bombs may cause a "splash crater" with firm sides. Hole of entry may be blocked by loose soil.

Effects of High Explosive Bombs

- 15 *Impact* : Any bomb which strikes a target, even though it fails to explode, will cause damage by its mass and momentum. The heavier the bomb and the more robust its construction the greater will be the damage done.
- 16 *Blast* : Can seriously damage buildings over a wide area. Walls, windows, doors and roofs may be blown down. Trees are often stripped of their leaves and branches, but tree trunks, chimneys and other well anchored objects of small surface area, around which blast can easily flow, are frequently left undamaged quite close to the explosion.
- 17 *Fragmentation* : Fragments from bombs besides inflicting casualties can cause structural damage.
- 18 *Earth Shock* : When a bomb explodes below the surface of the ground it sets up a series of shock waves through the earth. Typical effects of earth shock are :
- (a) Underground pipes and cables broken.
 - (b) Cracks in the ground surface.
 - (c) Small rigid objects moved bodily.
 - (d) Walls and roofs broken and show characteristic earth shock cracks.
 - (e) In contrast to the effects of blast, chimneys and similar external features are the first to suffer.

Concluding Summary

- 19 The object has been to explain types and effects of high explosive missiles and signs indicating unexploded missiles.

The Threat

BIOLOGICAL AGENTS

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 7, *Biological Warfare*.
- 2 The instructor will find a set of home-made charts (e.g. definition, features, limitations, types, methods of dispersion, summary) useful visual aids. Alternatively, sub-headings to supplement the chart of headings can be written on the blackboard as the lecture proceeds.

Object of Lecture

- 3 To define biological warfare (B.W.) and to consider its characteristics and potentialities.

Untried Weapon

- 4 Pamphlet No. 7, page 2 : B.W. is as yet an untried weapon and its efficacy highly speculative ; it should, therefore, be remembered that sensational claims for its effectiveness must be to a very large extent guesswork.

Definition

- 5 Pamphlet No. 7, Section 1 : B.W. is the employment of living organisms or their products to cause death, disability or damage to the people, to the domestic and stock animals or to the crops of an enemy country.

Characteristics

- 6 See Pamphlet No. 7, Sections 2 and 3.
- 7 The number of organisms that can produce or carry disease is large, but those which could be used in B.W. are probably very few. Those which might be used against this country are all germs and possess three features in common :
 - (a) Invisible to naked eye.
 - (b) Under favourable conditions can multiply rapidly.
 - (c) Incubation period, during which there are no signs or symptoms, and the germs are multiplying and gaining a hold on the body.
- 8 Most disease-causing organisms fail to meet the requirements of a suitable agent for use in B.W. Principal requirements are :
 - (a) Virulence : small doses effective.
 - (b) Power to produce disability : high risk of death or incapacitation ; considerable damage to crops.
 - (c) Stability : the organisms must be able to withstand destruction and at the same time retain virulence.
 - (d) Means of transmission : airborne clouds which are infective when breathed are more likely to be used than those requiring injection into body.
 - (e) Availability : capable of production in bulk, which may be difficult.
 - (f) Resistance of population : agent should be such that attacked population possesses little or no immunity against it.
- 9 If organism is to have chance of being effective it must be alive when it arrives at suitable place for development. Living organisms are susceptible to destruction by :
 - (a) Heat, i.e. boiling.
 - (b) Light, i.e. direct sunlight.

- (c) Long storage.
- (d) Explosive force, i.e. the explosion by which the organisms might be liberated from a bomb.

Types of Biological Agents

- 10 Pamphlet No. 7, Section 4 : in broad terms B.W. agents, like chemical warfare (C.W.) agents, may be classified as persistent and non-persistent :
- (a) Persistent agents : these are comparatively few and are more resistant. They are spore-bearing germs and, like a seed, can lie dormant for long periods.
 - (b) Non-persistent agents : these are not spore-bearing and consequently tend to die rapidly under adverse conditions.

Modes of Infection

- 11 Pamphlet No. 7, Section 5 : the principal ways by which organisms may be taken into the body are :
- (a) Inhalation.
 - (b) Ingestion.
 - (c) Contact through wounds.

Methods of Dispersion

- 12 See Pamphlet No. 7, Section 6.
- 13 B.W. agents may be disseminated on a large scale by using bombs, or on a small scale against specific objectives by saboteurs. The use of B.W. agents sprayed from the air seems impracticable since the aircraft would be forced to fly at such a height that much of the infective cloud would be dispersed by air currents before reaching the ground.
- 14 An attack with B.W. agents on an urban population as a whole would probably be made by dropping airburst bombs over the selected area. A possible exception is the infection of urban water supplies by saboteurs, but modern processes of filtration and chlorination through which the water passes before it enters the mains reduce the risk of infection from normal sources to negligible proportions.

Potentialities

- 15 See Pamphlet No. 7, Section 7.
- 16 To assess potentialities of B.W. it is useful to compare B.W. with C.W. which, of all weapons, it most resembles.
- 17 B.W. may be regarded as similar to C.W. in that :
- (a) Disruption of industrial potential is caused by temporary or permanent loss of workers, through illness, or lessening of output by lowering of morale.
 - (b) A cloud of organisms suspended in the air behaves like a cloud of non-persistent gas.
 - (c) Respirator is first line of defence for both.
 - (d) Both contaminate food and water.
 - (e) If persistent B.W. agents are used contamination may remain for considerable time.
- 18 B.W. agents differ from C.W. agents and are more difficult to deal with because :
- (a) They cannot be detected by senses or presence or absence revealed by chemical detectors.
 - (b) Identification is slow and difficult and may take several days.
 - (c) Difficult to define infected areas.
 - (d) Decontamination for persistent agents is slow, laborious and uncertain.
 - (e) Incubation period tends to increase risk of spread of infection.

19 Difficult to assess potentialities of B.W. because :

(a) No information exists of its use against man in modern war.

(b) To be effective, a B.W. agent must have survived the many hazards to which it is exposed before it arrives on man, and its effectiveness even then depends on the resistance offered to it by the bodily defence of the individual.

Concluding Summary

20 The object has been to define biological warfare and to consider its characteristics and potentialities. Airburst bombs most likely method of dispersion. Problems of detection, together with precautions to be taken, dealt with in subsequent lecture. As with C.W., the best insurance against B.W. is preparedness. The relative ineffectiveness of B.W. agents against a healthy population, prepared and protected, might easily mean that B.W. would not be employed.

The Threat

CHEMICAL AGENTS

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, *Chemical Warfare*.
- 2 The instructor will find a set of home-made charts (e.g. definition, non-persistent, persistent, nerve gas, mustard gas) useful visual aids ; alternatively, sub-headings to supplement the chart of headings can be written on the blackboard as the lecture proceeds.
- 3 Frames 42, 44, 45 and 46 of Film Strip C.D. 10, "Chemical Warfare", are suitable additional visual aids.

Object of Lecture

- 4 To define war gas, to consider the characteristics and effects of the two gases which have the greatest potential for causing casualties, i.e. NERVE GAS and MUSTARD GAS.

Importance of Gas Training

- 5 Though the Germans did not use gas during 1939/45 war large stocks of new and old gases were found. Some of these were ready for use in bombs and shells. It is not known for certain why Germany did not use gas, but it is fair to assume that the knowledge that the population of this country all possessed efficient respirators and had been trained in their use, together with the possibility of retaliation, were among the main reasons. The success of a gas attack is largely dependent on surprise.

Definition

- 6 Gas is a chemical weapon relying on its poisonous effects and, like other weapons of war, its object is to kill or incapacitate. As its name implies it may be used as invisible vapour. It may be employed as minute solid particles or liquid droplets which are airborne and invisible ; or it may be used as liquid which evaporates to form invisible vapour—both liquid and vapour being dangerous.
- 7 War gases may be divided into two main categories—non-persistent and persistent. War gases may be distributed by the use of air burst bombs to produce a droplet cloud with consequent high vapour concentration or ground burst bombs to preserve the persistent qualities of a gas.

Non-persistent Gas

- 8 Non-persistent gases are those which will remain effective for only a short time, so that the locality in which they have been released quickly ceases to be dangerous. They are liberated in the form of airborne droplets of liquid, particles of a solid, or as a true gas. They are therefore rapidly influenced by the prevailing weather conditions and are quickly dispersed.

Persistent Gas

- 9 Persistent gases are liquids which evaporate slowly, giving off poisonous vapour and therefore "persist" or remain dangerous for some considerable time, unless something is done to destroy or neutralise the liquid.

Characteristics and Effects

- 10 The effects produced by any war gas depend on the dosage—that is the amount of gas a person receives. The higher the concentration the greater will be the injury produced in a given time. Correspondingly, a longer time of exposure will be necessary to produce the same effects when the concentration is lower, but, as regards nerve gas, see paragraph 13.

B. High Explosive Missiles

- 9 There are many types of high explosive missiles capable of being used against this country. They include bombs carried in aircraft, ranging from small anti-personnel devices of a few pounds in weight to large "block busters" weighing as much as 22,000 lbs. (10 tons).
- 10 Other less conventional types which are growing in favour with the attacker include guided missiles capable of being launched from the ground, from ships and even submarines at sea, and from aircraft. Forms of radar, or television, or automatic "homing" devices are likely to be used in the future to guide such missiles to their targets, and little or no warning of their arrival can be expected.
- 11 Apart from guided missiles, ballistic rockets which depend on being aimed at the target can be used, and could carry war-heads of upwards of a ton. The German A-4 Rocket, commonly known as the V.2, of the 1939-45 war, is an example of the ballistic rocket with a fairly short range of several hundred miles, but rocket development is proceeding, and Intermediate Range Ballistic Missiles (IRBMs) and even Inter-Continental Ballistic Missiles (ICBMs) may be used.
- 12 One disadvantage of the ballistic rocket is its doubtful accuracy. It is likely therefore to be used only against a large target, but, like the guided missile, it may permit of little or no warning being given.
- 13 The chief damage caused by most H.E. missiles is due to blast, which can seriously damage buildings over a relatively wide area—although small in comparison with a nuclear weapon. Damage can however occur from the force of impact alone, or through fragmentation, or from earth shock caused by a missile exploding after deep penetration into the ground.
- 14 Some H.E. missiles may also have a prolonged harassing effect due to failing to explode on impact or being deliberately fitted with a delayed-action fuse. Such missiles are known as unexploded missiles (UXMs) and it is often difficult to locate them unless their path through a building or hole of entry in the ground can be detected.

C. Biological Warfare (Reference: Civil Defence Manual of Basic Training, Volume II Pamphlet No. 7.)

Definition

- 15 Pamphlet No. 7, Section 1: Biological Warfare (BW) is the employment of living organisms or their products to cause death, disability or damage to people, domestic and stock animals or to the crops of an enemy country.

Untried Weapon

- 16 Pamphlet No. 7, page 2: BW is as yet an untried weapon and its efficacy highly speculative; it should, therefore, be remembered that sensational claims for its effectiveness must be to a very large extent guesswork.
- 17 *Characteristics:* Pamphlet No. 7, Sections 2 and 3: The number of organisms that can produce or carry disease is large, but most of them fail to meet the requirements of suitability for use in BW against this country. It is possible however to use certain germs.
- 18 *Infection:* Pamphlet No. 7, Section 5: The principal ways by which infection may be taken into the body are:
- (a) Breathing.
 - (b) Swallowing.
 - (c) Contact through wounds.

- 19 *Methods of Delivery:*** Pamphlet No. 7, Section 6: A variety of potential methods of delivery exist, including bombs, point or line sources off-shore (given favourable winds), and saboteurs—who might be used to infect water supplies, but modern processes of filtration and chlorination would reduce this risk.
- 20 *Potentialities:*** Pamphlet No. 7, Section 7: The potentialities of BW are difficult to assess. Among its advantages are the following:
- (a) The effects of suitable organisms are difficult to detect and identify.
 - (b) Disruption of industrial potential is caused by temporary or permanent loss of work through illness, or lessening of output by lowering of morale, but no damage to installations is caused.
 - (c) Infected areas are difficult to define or contain.
 - (d) Decontamination for some BW organisms is slow, laborious and uncertain.
- 21** Among its disadvantages are:
- (a) Its action may be slow and uncertain.
 - (b) It may be difficult to control, if effective.
 - (c) To be effective a BW organism must have survived the many hazards to which it is exposed before it arrives on man, and its effectiveness even then depends on a number of factors such as the hygiene measures taken against it and the resistance offered to it by the bodily defence of the individual.

D. Chemical Warfare

- 22 *Definition:*** A war gas is a chemical weapon relying on its poisonous effects and like other weapons of war its object is to kill or incapacitate. As its name implies, it may be used as invisible vapour, but it may also be released as a liquid—or as liquid droplets which are airborne and invisible; or it may be used as a liquid which evaporates either quickly or slowly to form invisible vapour—both liquid and vapour being dangerous.
- 23 *Object of gas training:*** Any form of attack which comes as a surprise and against which the civil population is unprepared and untrained is likely to achieve success. It is therefore important to know the characteristics of chemical warfare and to train in precautions against it.
- 24 *Characteristics and effects:*** Although many potential chemical warfare substances exist, there are two types which are particularly dangerous:
- (a) Nerve gases.
 - (b) Mustard gas.
- 25 *Nerve gases:*** are remarkably quick acting in their effects and can cause death as well as incapacitation. In liquid form these gases are very rapidly absorbed through the skin and eyes, whilst in vapour form if breathed in even in low concentrations they produce very rapid effects. The higher the dose the worse are these effects which range from tightness of the chest, running nose, contraction of the pupils of the eyes and difficulty in focussing, to pronounced muscular weakness, violent convulsions, paralysis, unconsciousness and death.

- 26 *Mustard gas* is effective also both as a liquid and as a vapour, but it is not so quick acting. In brief it causes inflammation of the skin (and also internally), and blisters, but it may be considered as an incapacitating weapon rather than a lethal one, and less likely to be used against a civil population than nerve gases.

Concluding Summary

- 27 The object of the lecture has been to emphasise that there are other possible forms of attack apart from nuclear weapons.
- 28 Whilst at present, priority in training is given to defence against nuclear attack, it must not be forgotten that incendiary bombs; high explosive missiles of various kinds; and biological or chemical warfare may be used, either as weapons in themselves, or in conjunction with nuclear weapons.

Nuclear Weapons—Protective Measures

PERSONAL PROTECTIVE MEASURES— IMMEDIATE DANGER

Notes for Instructor

- 1 Reference : Manual of Civil Defence, Volume I, Pamphlet No. 1, *Nuclear Weapons*. (Second Edition, 1959).
- 2 Diagrams to illustrate taking cover in an emergency, personal protection from heat radiation, shielding from gamma rays, and protection against blast, together with selected frames from Civil Defence Film Strip No. 35 will provide useful visual aids.
- 3 Use should also be made of a blackboard to illustrate points and summarise facts as the lecture proceeds.

Object of Lecture

- 4 To consider the personal protective measures which are appropriate under various circumstances against the immediate danger from nuclear explosions, viz, heat radiation, initial gamma radiation, and the effects of blast ; and also against conventional H.E. bombs.
- 5 Later lectures will deal with protection against the delayed danger from residual radiation ; instruments for the detection and measurement of radioactivity ; and the protection of food and water.

Protection against Heat Radiation (Reference : Chapter V)

- 6 Complete protection against heat burn from nuclear explosions is achieved if sufficient warning is obtained for people to take cover, and any form of building, or shield, or covered trench will suffice—although it must be made clear that such protection will not necessarily also fully protect against the effects of blast and immediate gamma radiation.
- 7 The clothing of those caught in the open (though it may itself char or catch fire) will afford some degree of protection to the skin underneath at ranges greater than $\frac{1}{2}$ mile in the case of a 20 KT explosion and 4 miles in the case of a ground burst 10 MT bomb. This is providing that the clothing is not in direct contact with the body, and that if burning it can quickly be removed or the flames extinguished. Woollen clothing offers better protection than cotton, and light colours are better than dark ones.
- 8 The importance of covering as much of the skin as possible when in the open is illustrated by the fact that the chance of recovery from burns is dependent on the area of the body burnt. If this is below 20 per cent. the chance of recovery with skilled medical attention is high, except with very old people. Even with 50 per cent. of the body burnt the chance of recovery in young people is 50 per cent.

Shielding against initial Gamma Radiation (Chapter IV)

- 9 Any form of screening between the body and a nuclear explosion reduces the dose of gamma rays entering the body. The denser and thicker the materials the greater the degree of protection. It must, however, be appreciated that clothing of any practicable kind offers no worthwhile protection.
- 10 The initial gamma rays are more energetic and penetrating than the residual radiation from fall-out, protection against which will be dealt with later, and therefore require thicker shielding, but building materials and indeed dense substances such as earth give a substantial degree of protection. For example, the dose behind $1\frac{1}{2}$ inches of steel, 6 inches of concrete, or $7\frac{1}{2}$ inches of earth will be reduced to half of that in the open. It is therefore

obvious that personal protection is greatly increased by taking substantial cover. Basements and ground floors of buildings offer better protection than upper storeys, and a room in the centre of a building is better than one with an outer wall.

- 11 At distances from G.Z. greater than $\frac{1}{2}$ mile for a 20 KT bomb and 4 miles for a ground burst 10 MT bomb the Anderson type of domestic shelter offers excellent protection, provided it has a covering equivalent in density to 3 feet of earth or sandbags, and the entrance is similarly shielded.
- 12 Trench shelters with the equivalent of 18 inches of earth overhead cover also afford very good protection at similar distances.

Protection against Blast

- 13 The type of protection listed at paragraphs 11 and 12 above also gives protection at those distances against blast from a nuclear explosion. Such shelters should not, however, be sited closer than 20 feet from buildings which could collapse on them and bury the occupants.
- 14 Protection against the effects of H.E. bombs is listed fully in Pamphlet No. 5, *Protection against High Explosive Missiles*, but in general it may be said that outside the area of complete destruction either of these two types of shelter provides good protection.

Taking Cover in an Emergency

- 15 The protective measures already described assume that some warning of the imminence of attack can be given to enable people to take cover. In the event of persons being caught in the open, the following action should be taken.
- 16 On hearing the characteristic sound of a falling H.E. bomb, people who are caught in the open and cannot reach proper shelter quickly should throw themselves flat, with the chest slightly raised from the ground, supporting the body on the elbows with hands clasped over the back of the head. Any depression or fold in the ground (or if in a street, the gutter against a kerb) is better than entirely open ground.
- 17 With nuclear weapons, however, the first evidence of an explosion is the intense pulse of light radiated—which is much brighter than the strongest sunlight—and this should give immediate and visible warning to those in the open. (*Note* : It is important to understand that if people are at a distance of several miles from the explosion they will not hear it for many seconds afterwards, and during this time those in the open are in danger—certainly from heat radiation and possibly also from initial gamma radiation, depending on the distance).
- 18 This visible warning may enable them to take cover in time to escape some, if not most, of the heat and initial gamma radiation (both of which last for some seconds)—and certainly to escape the effects of blast in the open (e.g. flying glass, etc.).
- 19 It should be appreciated that since both the heat and gamma radiation travel at the speed of light (186,000 miles per second) they reach even their extreme range of damage practically instantaneously, i.e., at the moment the intense light is seen. Very prompt reaction is therefore necessary to escape danger, and the quicker cover is reached the less harm will be taken.
- 20 But the most intense stage of the heat and immediate gamma radiation lasts only for a matter of seconds, and at distances greater than $\frac{1}{2}$ mile in the case of a 20 KT bomb and about 4 miles for a 10 MT bomb it will be over before the arrival of the blast wave, since blast travels so much slower (at the speed of sound, 1,100 ft. per second). Even buildings which may subsequently be damaged by blast will therefore offer complete protection against the heat radiation (except where it can enter windows, etc.), and a varying degree of protection against initial gamma radiation.

- 21 The best protection is obviously that which will prevent or minimise danger from all three immediate effects, and for choice this will be substantial cover of the type already mentioned. But it must be remembered that speed in reaching cover is all important if the effects of heat and immediate gamma radiation are to be minimised.
- 22 The decision must therefore be a rapid one in the light of the type of emergency cover available and the time that will be taken to reach it. Any cover is better than none, since it will protect entirely against heat radiation, if only partially against initial gamma radiation and the subsequent blast. In open country, even to throw oneself flat on the ground (as for an H.E. bomb) and shield the face and as much of the exposed skin as possible, is better than taking no action.

Concluding Summary

- 23 The object has been to explain personal protective measures against the immediate danger from nuclear explosions, viz. heat, gamma radiation and blast; and against H.E. bombs.
- 24 Inside buildings of strong brick, stone or concrete construction, it is possible to reduce very materially the gamma dose which can reach the body. Any form of cover protects entirely from the heat effect, and different types of domestic shelter or refuge will offer good protection against both blast and gamma radiation. Trench shelters outside the area of heaviest blast damage give very good protection from all effects providing they have adequate overhead cover.
- 25 If no cover of any kind is quickly available, it may be possible to mitigate the effect of both H.E. and nuclear explosions by lying flat, but the warning afforded by the brilliant light radiated from a nuclear explosion may enable some of those who can react immediately to find cover and so escape part if not most of the effects.
- 26 Protection against the delayed danger of residual radiation, the detection and measurement of radioactivity, and protection of food and water will be considered in later lectures.

Nuclear Weapons—Protective Measures

PERSONAL PROTECTIVE MEASURES— DELAYED DANGER

Notes for Instructor

- 1 Reference : Manual of Civil Defence, Volume I, Pamphlet No. 1, *Nuclear Weapons*. (Second Edition, 1959)
- 2 Diagrams to illustrate the value of cover from fall-out, and the principles of protection; specimens or illustrations of the radiac instruments described—with a Type C and a Type B radioactive source (in their carrying containers) with which to demonstrate the training radiac survey meter and the contamination meter respectively where these instruments and sources are available; and simple examples of how to protect household supplies of food and water will provide useful visual aids.
- 3 Use should also be made of a blackboard to illustrate points and summarise facts as the lecture proceeds.
- 4 The lecture should be followed by a practical lesson on the individual dosimeter and charging unit. (See G 10.)

Object of Lecture

- 5 To consider the principles of protection against the danger of residual radioactivity from nuclear explosions; to describe (and demonstrate where possible) the radiac instruments used in the detection and measurement of such radioactivity; and to explain the precautions necessary with household supplies of food and water.

Recapitulation of the Delayed Danger

- 6 As has been earlier explained, the delayed danger from a nuclear explosion arises chiefly from radioactive fall-out which is caused by ground or near-ground burst bombs. Fall-out contaminates ground, persons, and equipment on which it settles, by continuing to emit harmful gamma rays and alpha and beta particles until its activity decays in the natural course of time.
- 7 The danger is not restricted to the area of blast and fire damage alone, but may harm unprotected people at very great distances in areas quite unaffected by such damage.

Principles of Protection (Reference : Chapters VIII and IX)

- 8 Because the risk is mainly from radiation emitted by fall-out lying on the ground and on the roofs of buildings, a considerable degree of protection can be obtained by those outside the reach of blast and fire damage if they remain under cover until the activity has decayed to a safer level. The larger the building and the thicker its walls, the greater is the degree of protection given, since the two factors which matter here are:
 - (a) the distance interposed by the outside walls of the building (and its roof) between people inside and the contamination outside, and
 - (b) the shielding value, i.e., thickness and density of material, in the walls (and the floors and roof above).
- 9 Urgent work, e.g. reconnaissance, rescue and fire fighting will, however, have to be done as soon as possible in contaminated areas which have also suffered from blast and fire damage, and control of exposure is therefore necessary.

10 This control is based on the following six principles:

- (i) Detection and measurement of radioactivity to enable safe working times to be estimated.
- (ii) Avoidance of heavily contaminated areas until the activity has decayed to safer levels.
- (iii) Checking on the personal dose accumulated.
- (iv) Use of suitable clothing and equipment.
- (v) Personal cleansing.
- (vi) Decontamination of essential clothing and equipment.

(i) *Detection and measurement of radioactivity* (Chapter III)

11 Radioactivity cannot be discovered by any of the senses, but it can be detected and its intensity measured by instruments known as radiac instruments.

12 *Radiac instruments* : The three types of radiac instrument in use in the Civil Defence Corps and associated services are (a) the individual dosimeter, which measures the total dose accumulated by the user over a period of time and enables a check to be kept on his exposure ; (b) the radiac survey meter (formerly known as the portable dose-rate meter), which measures the rate at which radiation is being received, and is used for surveying and monitoring contaminated areas, so that given the measured dose-rates approximate safe working times can be calculated ; and (c) the contamination meter, which is for detecting the presence of radioactive contamination on the skin, clothing, or equipment of those who have been in contaminated areas.

13 A dynamo type charging unit is provided to re-charge the individual dosimeter after use.

14 Training versions of the individual dosimeter and radiac survey meter, which are almost identical in size and appearance with the operational instruments, have different scales for use with small radioactive sources. The operational contamination meter is able to be used also for training because of its high sensitivity. *Note*: The training radiac survey meter and the contamination meter should (where available) be demonstrated as follows:

Training radiac survey meter: demonstrate function of meter in its carrying case by exposing a Type C radioactive source (at a distance of just over 3 yards from the instrument) for a few moments after switching on, to show movement of dial needle when "contamination" is present. There is no need to go into details of the switches or the dial.

Contamination meter: conceal one of the small radioactive discs of a Type B source in the clothing of one or more of a small number of persons who pass singly in front of the instrument's probe, to show the distinction between those who are "contaminated" and those who are not. There is no need to go into details of the switches or of the dial markings.

Explain that more detailed instruction in the use of both instruments will be given to those who will be required to operate them, and that a practical lesson in the use of the individual dosimeter and its charging unit (the only radiac instrument required to be taught to all civil defence personnel) follows in a further period.

(ii) *Avoidance of heavily contaminated areas* (Chapter XI)

15 No person should be allowed to enter or remain in the open in a heavily contaminated area unless duty compels him to do so. Members of the public in such areas may have to be evacuated at the right time in a planned and controlled manner, bearing in mind the fact that for some hours while the intensity of the contamination in the open is highest they may be safer remaining indoors. The situation will be assessed as a result of radiac instrument readings. Where it is desired to give visible warning of the presence of an area of high radioactive contamination, special warning notices will be posted.

(iii) *Continuous check on the personal dose accumulated*

- 16 Those whose duty takes them into a contaminated area must keep a continuous check, by means of the individual dosimeter, on the personal dose accumulated, to see that it does not exceed the figure specified for that particular operation or spell of duty. It must be emphasised that all nuclear radiation is harmful, and it must be the aim therefore to restrict exposure to the minimum. It will obviously be the duty of those in control to weigh the importance of the task to be carried out against the radiation risk, and to issue instructions accordingly.

(iv) *Use of suitable clothing and equipment (Chapter VIII)*

- 17 No practical form of clothing can in any way protect the wearer against gamma radiation, whether from the initial emission at the time of the explosion or emanating from residual contamination. A considerable degree of protection can, however, be provided by ordinary clothing against beta particles from contamination, the degree of protection depending on the thickness of the material and its ability to prevent dust from reaching the skin; alpha particles cannot penetrate clothing or unbroken skin. Thorough personal cleansing should be carried out as soon as possible after exposure.

- 18 Suitable clothing and equipment is as follows:

- (a) Well closed denim overalls or some such outer clothing which will keep most of the dust from any other garments and the body underneath and yet be permeable to air for comfort in working.
- (b) Gumboots, or strong leather boots as used in the Rescue Section.
- (c) Strong fabric, plastic, or leather gloves to prevent direct ingress of radioactive material into the body through cuts on the hands when handling debris, etc.
- (d) A scarf or "sweat-rag" around the neck to prevent dust getting in.
- (e) A simple lint or other suitable "smog" face mask for use in very dusty areas (a handkerchief over the nose and mouth could be used in emergency). (*Note:* Only in very exceptional circumstances, or perhaps from convenience in the absence of such simple masks, will it be necessary to use any form of respirator.)
- (f) A closely fitting helmet or hat, such as a beret, which will keep dust out of the hair, since the head is more difficult to cleanse than the rest of the body.

(v) *Personal cleansing (Chapter XI)*

- 19 Most of the dust harbouring contamination on the clothing can be removed by the use of a vacuum cleaner, where such apparatus is available. If a contamination meter is available a check with this instrument will then indicate whether any remaining dust is likely to be harmful, and if necessary the actual location of the contamination can be determined by using the probe as a "frisker".
- 20 The outer clothing should be removed as soon as possible, care being taken not to shake it unnecessarily. Where possible the removed clothing should be kept apart to await washing, or disposal if it happens to be very badly contaminated. If undressing has to be done at home a rough "clean/dirty" line should be established to avoid spreading contamination, although the radioactivity is decreasing all the time in any case because of natural decay of the contamination. Wherever possible personal washing should immediately follow undressing.
- 21 Personal washing should be very thorough, liberal use being made of soap and scrubbing brushes, paying particular care to the nails and hair. Where contamination meters are available after personal washing, a final check to establish reasonable freedom from contamination is advisable. If these precautions are taken there is little to worry about.

(vi) *Decontamination of essential clothing and equipment* (Chapter XI)

- 22 Radioactive contamination cannot be destroyed. The dust or other material to which it is attached can either be removed to a place where the contamination can do no harm, or the contamination must be left to decay by natural means. These two principles underlie all the methods of decontamination which are available in civil defence.
- 23 *Clothing* : Most contaminated clothing can be rendered safe by normal washing, but a liberal use of soap powders or other detergents is advised. Clothing which has been excessively contaminated should be disposed of, preferably by burying.
- 24 *Other objects (e.g. vehicles, tools, etc.)* : Scrubbing with warm water and detergents will remove most of the contamination unless it is very firmly held in rough porous surfaces.

Food and Water (Chapter X)

- 25 Gamma radiation of the intensity emitted in nuclear explosions has no harmful effect upon either food or water, and the main problem is one of protecting household supplies against contaminated dust which might eventually find its way into the body. Food should be kept in sealed tins or cartons, and emergency reserves of drinking water (in the event of water mains being cut off) should be kept in stoppered containers. It is worth noting that one of the methods of softening water in current use (known as the base exchange process) removes most of the radioactive contamination from water.
- 26 The only other danger to food and water is from neutron irradiation, i.e., causing induced radioactivity, but this could only happen within the area of complete destruction by blast, which is unlikely in any case to remain habitable.

Concluding Summary

- 27 The object has been to consider principles of protection against the delayed danger from nuclear explosions, both for persons in the area of blast and fire damage, and also in the more extensive area down-wind, which is only affected by fall-out; to explain and demonstrate the instruments used in civil defence for the detection and measurement of radioactivity ; and to describe the precautions necessary with domestic food and water supplies.
- 28 A practical lesson in the use of the individual dosimeter and its charging unit will follow.

Nuclear Weapons—Protective Measures

PRACTICAL LESSON IN USE OF INDIVIDUAL DOSIMETER AND CHARGING UNIT

Notes for Instructor

- 1 The instructor will find that useful visual aids are blackboard list of headings, and a home-made diagram of the dosimeter scale.
- 2 The following equipment is also required :
 - (a) training type individual dosimeters (one to demonstrate and one for every two members of the class) ;
 - (b) type C radioactive source in its carrying container ;
 - (c) charging unit.
- 3 Where it is necessary during training to simulate a reading (i.e. an exposure to gamma radiation) on either the service or training types of dosimeter, this may be done by the instructor in the following manner by using the charging unit :
After removing the end cap of the dosimeter in the normal way and pushing the dosimeter fully home into the charging socket to observe the position of the quartz fibre, simultaneously touch the centre pin (in the aperture above the charging unit mirror) and the case of the charging unit with the forefinger. This has the effect of discharging the dosimeter by short-circuiting its charge, causing the quartz fibre to move across to the right, thus simulating a reading. With experience this method can be made to give the dosimeter approximately a half-scale reading, and lower variations can be produced to suit what reading the instructor wishes to simulate by rotating the milled edge cam of the charging unit to move the quartz fibre towards zero.

Object of Lesson

- 4 To describe service and training types of individual dosimeter, and to teach their use and how to recharge them.

Primary Use

- 5 To measure amount of radiation which its user absorbs whilst operating in a contaminated area. For those who happen to be within range at time of explosion, it will also be affected by initial gamma dose.

Secondary Use

- 6 To act as a simple form of radiac survey meter, i.e. to enable user to make rough estimates of the rate at which radiation is being received. By this means those who are not provided with radiac survey meters can make a rough estimate of safe working time, and if dose rate is negligible can reassure the public.

Service Types

- 7 Service types of dosimeter resemble the training type in appearance, but are calibrated in different scales. The Dosimeter No. 2 reads from 0–5 r., the No. 3 from 0–50 r., and the No. 4 from 0–150 r. (the No. 1 instrument is a training type).

Training Type

- 8 Scale reads 0-0.5r., and the instrument will react to weak radioactive sources authorised for training.

How to take Reading

- 9 With both service and training types, apply clip end of dosimeter to eye, when scale will be visible against light. Thin quartz fibre line will be seen crossing scale ; point where it crosses indicates dose received. (Each member of class to be practised in taking reading with dosimeter on which a dose has already been recorded.)

Secondary Use as Improvised Radiac Survey Meter

- 10 First read dosimeter and note reading. After period of measured time, say 10, 12 or 15 minutes (a time which will conveniently divide into 60), again take reading. The difference between the two readings, when multiplied by 6, 5 or 4, gives approximate dose rate in roentgens per hour. For example, if No. 2 dosimeter reads 2 r. to start with and after 15 minutes registers 4.5 r., average dose rate is $2.5 \times 4 = 10$ r. per hour (Instructor gives example and class practise making calculation).

Charging Unit

- 11 To maintain their efficiency dosimeters have to be reset before and after use by means of a specially designed hand-operated charging unit of the dynamo type, which imparts an electrical charge to dosimeter and enables quartz fibre line to be set again at zero. This is necessary from time to time, whether or not the dosimeter has been exposed to radioactivity, since there is a slight natural discharge from the instrument. (Instructor gives demonstration with explanation, followed by class practice, in setting dosimeter to zero.)
- 12 Proceed as follows :
- (a) If dosimeter has a metal end cap (at end farthest from the clip) push dosimeter firmly into the extractor on top of charging unit case. Pull dosimeter up, leaving end cap in extractor. (Some dosimeters have a rubber end cap instead of the metal one, and this operation will not apply. In such cases the end cap is removed by hand.)
 - (b) Turn generator handles for 2-3 seconds at 5 revs. per second. Adjust mirror on charging unit to give maximum light reflection.
 - (c) Push dosimeter into charging socket and ensure that it is correctly positioned. Look through eyepiece of dosimeter. If dosimeter is discharged (either through natural causes or from exposure to radioactivity) the indicating line on the scale will be observed to be to the right of the scale. In some cases it may not be visible at all.
 - (d) Turn milled edge cam on right-hand side of charging unit until the dosimeter indicating line is at zero on the scale.
 - (e) Still looking through the eyepiece, withdraw dosimeter approximately half an inch. It will then be seen that the indicating line has kicked slightly to the right of zero.
 - (f) Push the dosimeter back fully and then turn switch cam until dosimeter indicating line is the same distance to the left of zero as it formerly was to the right.
 - (g) Withdraw dosimeter and check reading. The indicating line should be found to have kicked back to zero.
- Note :* If the indicating line is still set to the left of zero (indicating a slight overcharging) the dosimeter cannot be set to zero unless the charge is reduced. This can be done by touching the centre-pin of the charging unit and its case simultaneously with the forefinger, causing a short-circuit, then re-insert the dosimeter, when the indicating line will move sufficiently to the right to enable it to be reset.
- (h) If a metal end cap is fitted, when indicating line has been set at zero, push dosimeter on to metal end cap which has remained until now in the extractor. Press down the disc surrounding the extractor and hold whilst dosimeter is released. If a rubber end cap is fitted care must be taken to see that it is correctly positioned by hand.

13 Dosimeter is now ready for use. Dosimeters are normally recharged at posts or depots to which personnel return after operations.

Concluding Summary

14 The object has been to describe service and training types of individual dosimeter, and to teach their use and how to re-charge them. The dosimeter has two functions. Primarily it is used to record the total dose of radioactivity received, so that an individual can keep watch on his own safety, and a leader can check the safety of his team, by consulting dosimeter at intervals and noting accumulated dose received. It can also be used as an improvised radiac survey meter to give the approximate rate at which radioactivity is being absorbed, so that safe working times can be estimated.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This section also covers the process of reconciling bank statements with the company's ledger to ensure that all entries are correctly recorded and balanced.

The second part of the document details the various methods used for collecting and analyzing data. It describes how data is gathered from different sources, such as surveys, interviews, and focus groups. The analysis section explains how this data is processed to identify trends and patterns, which are then used to inform business decisions.

The third part of the document focuses on the implementation of the findings. It outlines the steps involved in developing a strategic plan based on the data analysis. This includes setting clear goals, identifying key performance indicators, and allocating resources to support the plan. The document also discusses the importance of regular monitoring and evaluation to ensure that the plan remains effective and relevant.

The final part of the document provides a summary of the key points discussed. It reiterates the importance of data-driven decision-making and the need for continuous improvement. The document concludes with a call to action, encouraging the organization to embrace a data-centric culture and to regularly review and update its strategies based on the latest information available.

Fire-Fighting

PRACTICAL FIRE PREVENTION MEASURES

- 1 Reference : Civil Defence Handbook No. 4, *Elementary Fire-Fighting*.
- 2 The instructor requires :
 - (a) Chart giving list of precautions.
 - (b) Diagram of stirrup-pump.
 - (c) One stirrup-pump for himself and one for every three or four members of class.
 - (d) Four buckets.
 - (e) Hand axe if available.

Object of Lesson

- 3 (a) To describe practical fire prevention measure which could in wartime be undertaken, in every household, to reduce the fire danger to a minimum.
- (b) To describe the stirrup-pump ; to teach and practise care and maintenance, including remedies for possible defects ; and to explain the organisation of stirrup-pump teams and their duties.

Precautions

- 4 It will not be possible to prevent all fires caused by nuclear explosion, and the aim must be to reduce the fire danger to a minimum. The precautions fall into three categories. Firstly, making every effort to keep the heat radiation from getting into buildings. Secondly, preventing radiation from falling on readily combustible materials, such as textiles, papers, and the like, by removing these materials out of the path of the radiation or if this is not practicable by covering them with some sort of incombustible material. Thirdly, treating combustible material in such a way as to reduce their combustibility.
- 5 It is unlikely that fire will be started on the exterior surfaces of buildings. Doors and window frames may inflame momentarily, but it is unlikely that they will cause continuing fires. The main danger will come from the materials usually found indoors. The walls of the buildings are, of course, not transparent to heat and light radiation, so that this could only enter by way of windows, skylights, or doors that open directly to the outside. Exterior doors are nearly always at ground level and are often shielded by other buildings, so that the risk from this particular cause is small.
- 6 The risk of fire from heat radiation can be very greatly reduced by the simple expedient of whitewashing the windowpanes. Glass in itself offers little protection against the heat radiation any more than it stops the heat from the sun. But the whitewash on the surface will reflect about 80 per cent. of the heat and reduce its penetrating power considerably. All skylights should be similarly treated. The glass will eventually be shattered by the blast, but this arrives after the heat radiation since the blast wave travels much more slowly than the heat.
- 7 At night time a wooden " black-out " screen fitted to the window will also serve a useful purpose as a deterrent to heat radiation. The wood may be charred on the outside, but it should prevent fires being started in the room. All such screens should, of course, be whitewashed on the outside to reduce the risk of ignition.
- 8 If the curtaining material is very heavy it will also serve to keep the heat radiation out, though there is risk of the curtains themselves igniting.
- 9 Where internal lighting is not the prime consideration window spaces could be permanently blocked up. If wooden boards are used they should be whitewashed on the outside. The

boards may be carried away when the blast-wave arrives, but by then they should have done most of their useful work. In the case of buildings of exceptional importance, which might be expected to withstand the blast of a nuclear explosion, the windows may have to be permanently bricked up with very solid masonry or reinforced concrete, since at the shorter distances the blast would occur almost at the same time as the heat radiation.

- 10 An alternative protection by which it is possible to let some light into a room consists of an incombustible board fixed to the window at an angle of about 45 degrees to the window. The board could be whitewashed or some sort of reflecting surface could be fixed, and the only rays that could be reflected into the room would be those which had come from a very high angle of elevation. The radiation could also be kept out by fixing a metal slatted Venetian blind to the window, but a more permanent form of protection is desirable as a Venetian blind may be left unclosed during an attack.
- 11 In the event of shuttering being blown out, white cardboard, blankets and the like can be used as a temporary expedient.
- 12 Solid wooden furniture or woollen carpets are not likely to cause a fire from heat radiation. Any flaming will be momentary and will die down as soon as the heat is over. Paper, textiles and upholstery, on the other hand, should be regarded as possible sources of fire. Textiles, such as curtains, may be treated with a solution of boric acid and borax. The articles should be dipped in a solution made from $1\frac{1}{2}$ lb. borax to 1 lb. boric acid dissolved in two gallons of water. The materials should be wrung and dried horizontally, otherwise the solution will drain to the bottom of the fabric. Materials treated in this way are unlikely to cause a continuing fire. This solution is not suitable for the treatment of upholstery, but a white cloth, preferably not cotton, treated in this way can be thrown over furniture or over a desk containing papers. Any material not easily ignited could be used for this purpose, e.g. a woollen blanket.

Clearance of Top Floors

- 13 It is most important to stress again the need for the clearance of top floors.
- 14 On other floors, combustible material should be reduced to a minimum, with pieces separated from one another to reduce the possibility of fire spread—e.g. do not have a dressing table where a burning curtain can drop on it.
- 15 It is particularly important to clear that part of a room in direct line with the window.
- 16 In time of war, any accumulation of odds and ends in boxrooms, cellars or attics should be ruthlessly cleared. Even in peacetime such an accumulation, most of it burnable, is dangerous. Articles that will burn easily include such things as curtains, draperies, tablecloths, bedclothes, lampshades, coats, suits, dresses, wicker and wooden furniture, rags and linoleum. It will be surprising to find how many burnable odds and ends are really useless.

Access to Roof Space

- 17 One should remember the importance of having access to the roof space of a house, and if there is no trapdoor leading to this it is advisable to have one made. Another necessity is a ladder or pair of steps so that the roof space can be reached through the trapdoor. It should be appreciated that untreated or broken skylights or the absence of tiles and other roof covering, perhaps as the result of earlier blast damage, will admit heat radiation.

Simple Fire-Fighting Appliances

- 18 The stirrup hand pump, with its buckets of water, can play a useful role in any future war. An ample supply of water is required, therefore it is prudent to obtain as many buckets, or other containers, as possible and to keep them full of water. The ideal, of course, as the heat radiation from nuclear weapon can start fires simultaneously in all floors, is to have

stirrup hand pumps and water containers, or chemical fire extinguishers and other fire-fighting appliances, on all floors, but as this may be deemed to be hardly a practical proposition in a normal type dwelling house, there should at least be a reserve of water to refill the buckets, with concentration on the top floor. The practice of keeping the bath full of water can prove most useful.

- 19 It may be contended that the blast damage from a nuclear explosion, in addition to causing structural damage to a house, may also overturn the buckets inside, but whilst this may be true in many cases, it must not be assumed that every water container will be rendered useless. There will also be small fires occurring in the otherwise undamaged areas which must be dealt with quickly, or else the spread of such fires would seriously impede the Fire Service and rescue parties endeavouring to reach the inner and more heavily damaged areas.

Description of Pump

- 20 Double action piston type pump worked by hand, held firmly in bucket or water container by placing foot on stirrup attached to barrel or pump.
- 21 There are only three moving parts :
- (a) The plunger tube, to bottom of which is fitted the piston.
 - (b) The metal ball which forms non-return valve in the piston.
 - (c) The metal ball which forms foot valve in the base of the barrel.
- 22 In the bottom of the pump is a strainer which can be unscrewed and taken out when necessary. At top of the pump is the outlet to which is connected 25 to 30 feet of half-inch rubber tubing, on the end of which is fitted nozzle, some being dual purpose to give spray or jet, others just jet. Spray can be obtained from single jet nozzle by placing thumb over end.

Care of Pump

- 23 Pump should be used with water at regular intervals, once a week if possible. Hose must always be cleared of water after use and coiled in the proper manner. Keep in a cool dark place when not in use.
- 24 Pump must not be used to spray strong disinfectants or insecticides as they will corrode the valves and render the pump unserviceable.

Possible Defects and Remedies

- 25 Following defects are the most likely to occur :
- (a) Choked strainer cover.
 - (b) Choked hose nozzle.
 - (c) Ball valves stuck on seating through lack of use.
 - (d) Rusted ball valves.
- 26 The remedies are :
- (a) Choked strainer cover can be cleared by removing whatever is sticking to it.
 - (b) A choked hose nozzle can be cleared by unscrewing the nozzle and removing dirt from the hole.
 - (c) Ball valves stuck to the seating can be freed by pushing a piece of wire through the filter.
 - (d) To remedy rusted ball valves, first dismantle the pump by unscrewing strainer at foot of pump, remove handle at top and withdraw plunger from lower end of pump ; rust may then be removed from valves by scraping with pocket knife. (Note : The later models are fitted with phosphor-bronze and nylon balls which do not rust.)
- 27 Gland at the top of the pump should not be interfered with, but should it leak it can be put right by tightening the gland nut. If this fails repack with oiled string. Do not over-tighten gland nut.

G 11 : 4

Organisation of Team

- 28** Stirrup-pump team consists of three or four members, preferably four when there is a long carry for water. All members of the team are interchangeable. Equipment for team comprises one stirrup-pump and four buckets, and one light axe if available.

Duties of Team

- 29** Teams of three or four. No. 1 fights the fire, No. 2 operates the pump, Nos. 3 and 4 maintain water supply. All members interchangeable. For details of stirrup-pump drills see C.D. Handbook No. 4, Appendices A and B.

Concluding Summary

- 30** The object has been to describe (i) practical fire prevention measures; (ii) to describe stirrup-pump; to teach and practise care and maintenance, including remedies for possible defects; and to explain organisation of stirrup-pump teams and their duties.
- 31** Practice in stirrup-pump drill is included in subsequent lesson.

Fire-Fighting

PRACTICAL FIRE-FIGHTING

Notes for Instructor

1 Instructor requires :

- (a) Water point.
- (b) Fire hut, with front closed.
- (c) Supply of burning material.
- (d) Eight fire baskets.
- (e) Box of matches.
- (f) Stirrup hand pump.
- (g) Hand axe if available.
- (h) Four buckets.
- (i) Small quantity of paraffin mixed with used lubricating oil.
- (j) Some form of protection to eyes, breathing passages and lungs against smoke, dust, soot, etc., e.g. civilian duty respirator fitted with pulvasorb filter.

Object of Lecture and Practice

- 2 The object is to teach procedure for quick appreciation of and tackling of fire with stirrup hand pump and to give practical experience of fire-fighting with stirrup-pump.
- 3 With one fire hut and one instructor, the maximum number of persons that can be exercised in one instructional period of 60 minutes is four. The four persons who form the stirrup-pump team should wear overalls or old clothes and be numbered one to four. When No. 1 has dealt with the fire he will become No. 4, and other members will move up one ; this procedure should continue until all four have acted as No. 1.
- 4 As the instructor has to be in the fire hut with each person in turn he should wear some form of protection to eyes, breathing passages and lungs against smoke, dust, soot, etc., e.g. a civilian duty respirator fitted with pulvasorb filter. This should be explained to the class.

Appreciation

- 5 The closer one can get to the seat of a fire the more effective will be the means of extinguishing it. It is wise to pause to see where the actual source of fire is rather than tackle at first glance. Doors and windows should be kept closed as much as possible in order to limit oxygen supply to fire.

Opening Doors

- 6 When opening a door behind which there may be a fire, the possibility of back draught of flame caused by intake of air should not be overlooked. Obvious warning is presence of heat. If door knob is very hot, the door must be opened with care.

There may be considerable pressure in room due to expansion of heated gases, and it is therefore desirable to crouch in such a way that any heated gases or flames released pass over the head:

- (a) Door opening away from you. Crouch so that body is shielded by door, and as far as possible by wall, and with out-stretched arm turn handle and open door slightly until rush of smoke and flame dies down.
- (b) Door opening towards you. As for (a), but place foot against bottom of door to control its opening.

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Entering Room

- 7 As regards entering a smoke-filled room see paragraphs 42-44 of C.D. Handbook No. 4.

Tackling Fires with Stirrup-Pump

- 8 When fire is located, the team should be called up. No. 1 attacks the fire, making use of such cover as may be available. If there is no cover he must still attack the fire. He should direct the jet at the heart of the fire rather than at the flames, but it may be necessary for personal safety, to direct water on immediate surroundings. (When incendiary bombs are burning attention must be divided between bombs and incidental fires at the discretion of No. 1.)
- 9 When fire has been put out a careful check should be made to ensure that no smouldering embers are left which may flare up later.
- 10 Particular attention should be paid to floor boards, rafters and joists, and any smouldering spots should be chopped out.

Setting the Hut

- 11 Two well-filled fire baskets filled with kindling should be set up in the fire hut for each person in turn. Arrangements should be made so that several fires can also be started simultaneously. Fire baskets will be suitably positioned by the instructor.
- 12 The four persons forming stirrup-pump team should be positioned with their fire fighting equipment at starting point some distance from the fire hut and ready to be called up by shout of " FIRE ".

Attacking Fire

- 13 After allowing fire to get well going the instructor should summon the team by shouting " FIRE ".
- 14 The instructor must keep up with No. 1 ready to pull him back should he go into danger.

Clearing and Resetting Hut

- 15 After fire is extinguished and No. 1 has made a final check, the hut will be cleared and reset for next fire. The team returns to starting point, checks equipment and re-forms.

Fire-Fighting Hints

- 16 Some important points in fire-fighting are listed in Chapter VII of C.D. Handbook No. 4.

Concluding Summary

- 17 The object has been to give practical experience of fire-fighting with stirrup-pump. Careful handling of class will overcome natural fear of fire present in many people and give confidence.

Biological and Chemical Warfare

DETECTION AND PRECAUTIONS

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, *Chemical Warfare* and Pamphlet No. 7, *Biological Warfare*.
- 2 The instructor requires :
 - (a) Small bottle of mustard gas simulant (M.S.).
 - (b) Small bottle of nerve gas simulant (D.E.G.).
 - (c) White sheet of cardboard or woodboard about 18 inches square.
 - (d) Tin of detector powder.
 - (e) Vapour detectors.

Object of Lecture and Demonstration

- 3 To show methods of C.W. detection, to consider the problem of B.W. detection, to describe local warnings, and to teach precautions against both B.W. and C.W. agents.

Chemical Warfare Detection

- 4 Pamphlet No. 1, Chapter III. Gas bombs may be either air burst, when practically the whole of the liquid contents of the bomb will fall like spray or rain, or ground burst to give either a fine mist, or large coarse drops and splashes to ensure contamination of ground or material.
- 5 If C.W. is used its detection and identification would be of vital importance to the successful control of civil defence operations.
- 6 Protection against nerve gases can only be ensured by putting on the respirator immediately an enemy air attack takes place in the vicinity, and by keeping it on until the " gas clear " signal is given. Therefore under no circumstances should smelling tests be made until the complete absence of nerve gases has been confirmed by chemical detectors. For members of the Civil Defence Services this reduces the means of recognising the presence of war gas and identifying their type to what can be done while wearing a respirator, i.e., what can be seen, what can be felt on exposed parts of the body and to chemical detectors.
- 7 Chemical Detectors : These are :
 - (a) *Detector Powder* : Used to detect the presence of LIQUID gases and identify them. The powder is the colour of white pepper and is supplied in canisters with perforated ends so that it can be sprinkled on to any suspicious liquid. It gives different colour reactions for different liquid gases. In contact with liquid mustard gas it changes to RED and with liquid nerve gas to a YELLOW-ORANGE colour.
 - (b) *Vapour Detector* : Detector powder will only detect liquid contamination. It is necessary, therefore, to have some means of identifying the vapour. A chemical detector known as the Kit Vapour Detector (K.V.D.) is available for this purpose. It consists of apparatus and reagents which will detect the presence of nerve and blister gas vapour.

Biological Warfare Detection

- 8 Pamphlet No. 7, Part II. The detection of B.W. agents is extremely difficult. When dispersed they cannot be seen, smelt or tasted. Thus there is no means of knowing when an effective cloud is present. The only exception to this is that the bursting of a B.W. bomb may possibly

G 13 : 2

be seen during the day. But the type of bomb employed for an attack with B.W. might be similar to that designed for war gases. Consequently what appears to be the whole or part of gas bomb may, in fact, be the whole or part of a B.W. bomb. Look out for the unusual and approach with care.

- 9 Tests with the Detector Powder and/or K.V.D. will indicate whether a war gas is present. If negative results obtained it should be assumed that the bomb fragments, unless clearly those of H.E. or incendiary may be those of a B.W. bomb. In such circumstances wardens should take the following action immediately :
 - (a) Sound local warning (i.e. rattle).
 - (b) Report "suspected B.W."
 - (c) Cordon off object or area of liquid contamination.
 - (d) Take care not to spread contamination.
- 10 The task of confirming or otherwise the presence of a B.W. agent will be undertaken by specially trained personnel.

Local Biological and Chemical Warfare Warning

- 11 Warning of the presence of B.W. or C.W. agents will be given by means of a hand rattle.

Local Biological and Chemical Warfare Clear Signal

- 12 The local clear signal will be the sounding of hand bells as and when an area becomes clear of B.W. and C.W. agents.

Precautions

- 13 Reference : Pamphlet No. 1, Chapter VI, and Pamphlet No. 7, Part II.
- 14 *Respirators* : The respirator is the primary means of protection against B.W. and C.W. agents. It must be kept in good condition and correctly adjusted. Once it has been established that the enemy is using or thought likely to use B.W. or C.W., respirators must be put on immediately any bombs are heard bursting on the ground or in the air.
- 15 *House or shelter* : An intact closed house, or a shelter provided with a closely fitting blanket-covered door, offers for a limited period considerable protection from war gas vapour and/or a cloud of germs.
- 16 *When out of doors* : Civil defence workers who must remain in the open and those who are out of doors when the "Alert" sounds must take every precaution to protect themselves. They should ensure that their heads, necks and hands are protected ; in other words as little bare skin as possible should be left exposed.
- 17 *Avoiding contamination* : As far as essential duties permit, personnel should keep well upwind of any known sources of contamination, because gas and germs travel with wind. Nobody should needlessly walk on contaminated ground or brush against surfaces which may be contaminated. If clothing, boots or shoes have been contaminated they must be removed as soon as possible and not taken inside any building.
- 18 *Food and drink* : Larders in houses should be kept closed when not in use, and all food and drink which is not in sealed containers should be kept covered, e.g., by using inverted basins and saucers. Crockery, cutlery and cooking utensils should be thoroughly washed in boiling water if there is reason to suspect they have been exposed to B.W. or C.W. agents.
- 19 *Additional precautions against B.W.* : Maintain personal and domestic hygiene at highest possible level. Keep the mouth clean by washing it out with warm water or normal saline. Report any sickness of persons and animals, and any rats and mice found dead. Reduce uncontrolled movement in or out of infected areas.

Concluding Summary

- 20 The object has been to show methods of C.W. detection, to consider problem of B.W. detection, to describe local warnings, and to teach precautions against both B.W. and C.W. Detector powder and vapour detector will enable C.W. agents to be detected. For B.W. look out for the unusual and assume its presence if not proved otherwise and take immediate action to sound the warning and report. The respirator is the primary protection against both. Avoid contamination and keep food and drink under cover. Maintain personal and domestic hygiene at the highest possible level.

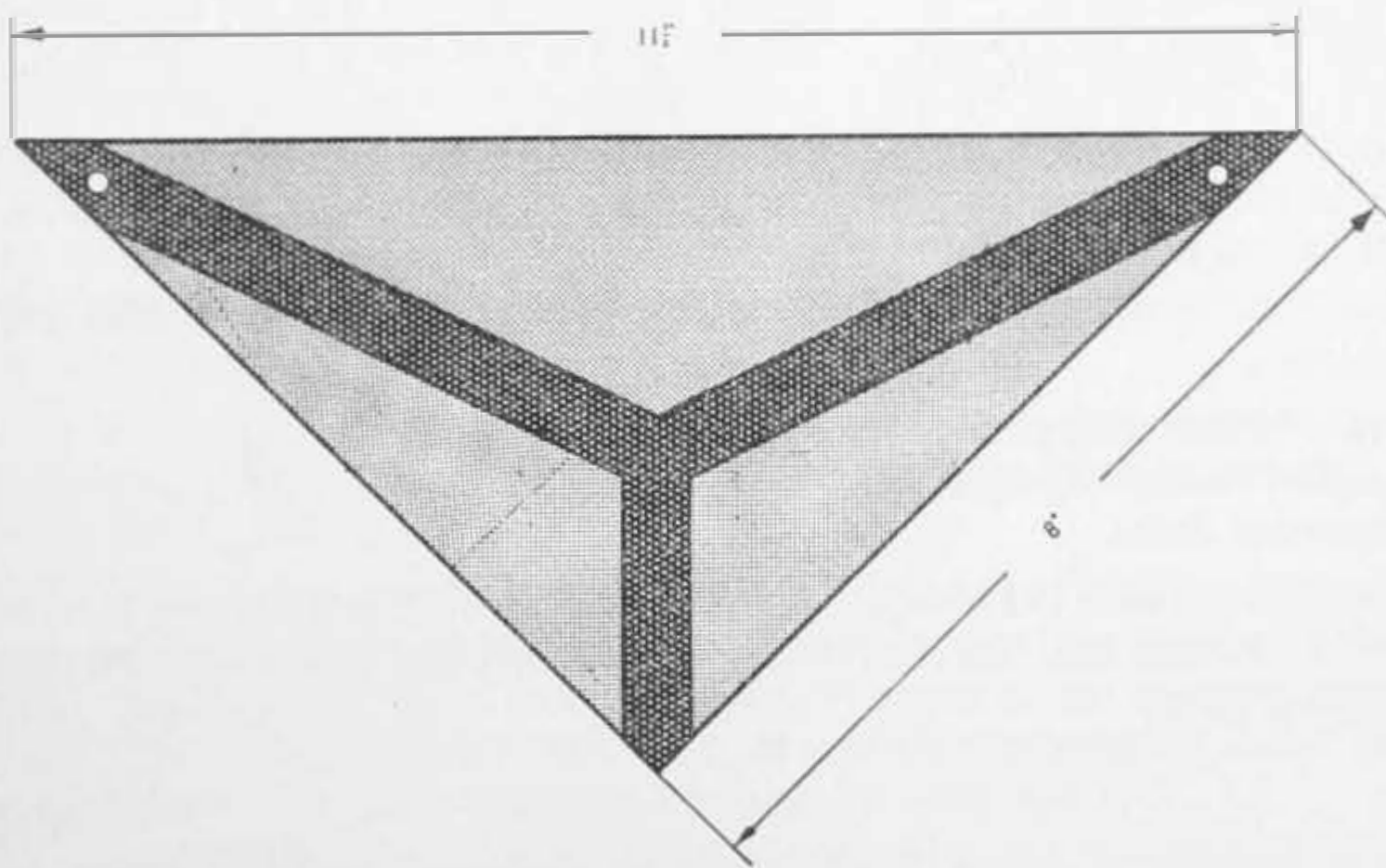


APPENDIX A

MARKING OF CONTAMINATED AREAS

- 1 Circumstances may arise when it will be necessary for Civil Defence and other personnel to work in areas which have been contaminated, and it is important that all such areas should be marked on a uniform system, so that the requisite precautions may be taken by those concerned. Accordingly, it has been agreed that the system described below shall be used by all Civil Defence Services in the United Kingdom.
- 2 All lines of approach to a contaminated area will be marked by coloured triangles made of metal, wood, composition board or other similar rigid material which may be available. Each triangle will be a right-angled isosceles triangle with the base approximately $11\frac{1}{2}$ inches long and the opposite sides each approximately 8 inches long. Small holes should be punched in each corner to facilitate fixing the marker in position.
- 3 The surface of the marker which faces away from the contaminated area will be coloured
 - (a) YELLOW for GAS contamination.
 - (b) RED with trisecting YELLOW lines for BIOLOGICAL contamination.

} See
diagram
below.:



- 4 In each case the surface of the marker which faces towards the contaminated area will be painted white.
- 5 The words "GAS" or "GERMS" (for biological contamination) are to be painted or written in black in three positions on the coloured face of the marker, so that regardless of the position of the triangle one lettered word may be read erect. Details of the contamination will be written on the white side of the marker at the time it is put in position. The date must always be marked.
- 6 Normally contaminated areas will be roped off, and warning markers could be tied to the ropes or to fences, trees, etc.

APPENDIX B

PROTECTIVE CLOTHING

1 Though properly fitting respirators will adequately protect the eyes, the covered part of the face, the breathing passages and the lungs from all forms of war gases, the rest of the body is vulnerable to liquid nerve gas and to either the liquid or the vapour of blister gases.

Oilskin Anti-Gas Clothing

2 A suit of oilskin anti-gas clothing consists of a jacket and trousers, but to protect those parts of the body still uncovered the complete anti-gas outfit also includes boots and gloves of rubber or oilskin, canvas over-mittens to protect the oilskin gloves and an oilskin curtain to be worn on the helmet to protect the neck from liquid contamination. These articles are in addition to the respirator and steel helmet.

Overall Protective Suits

3 In any future war, body contamination could occur from contact with radioactive, biological or chemical agents. It would be impracticable to have a different type of protective clothing for each toxic agent. An overall protective suit is at present undergoing trials. It is a one-piece garment made in showerproof, closely woven cotton gaberdine. It fastens at the front with double flaps secured by press fasteners. The sleeves and legs are provided with double cuffs, the inside layers being worn inside the gloves and boots respectively to prevent the ingress of liquid. The suit is reinforced at the knees, elbows and shoulders with heavier, more durable fabric which is interlined with impervious material. There is a separate hood of the same material as that of the suit. In addition the standard rubber boots, gloves and respirators would be worn if required.

The suit has been designed to give the maxim protection consistent with durability and comfort against :

- (a) Contamination with persistent chemical warfare agents.
- (b) Biological warfare agents.
- (c) Radioactive dusts.

If, after exhaustive trials, the overall protective suit proves satisfactory it will be used by members of the Rescue Section, Reconnaissance Parties and others who may have to work in contaminated areas.

Chemical Warfare

PERSONAL CLEANSING

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, *Chemical Warfare*.
- 2 The instructor requires some used lubricating oil (representing liquid gas), basin of water, soap, handkerchief, rags or other swabbing material, and water bottle.

Object of Lecture

- 3 To teach the standard first aid and personal cleansing procedure for nerve and/or mustard gas contamination.

Action to be taken

- 4 Speed of action must be the key-note of any treatment for gas casualties. Of the known war gases, nerve gas and mustard gas are the most likely to cause serious harm, but other and possibly unknown gases may also be encountered.
- 5 It may not be possible to distinguish between nerve gas and mustard gas, as appearance of liquid (if seen) will not be distinctive. A standard drill or procedure must therefore be adopted by persons exposed to the vapour of these gases or contaminated by liquid—a drill which would apply equally also to any unidentified gas which might be used.
- 6 The first and immediate object is to prevent or lessen injury by getting rid of all traces of gas as quickly and effectively as possible. In order to do this, clothing which has been contaminated by liquid or vapour must be promptly removed and affected skin rapidly cleansed. It is obvious that the individual must first be protected from further exposure by putting on a respirator (if this is not already being worn).
- 7 *For vapour* : If possible, move into fresh air and change clothing, keeping the respirator on until this is done. If practicable the whole body should be washed thoroughly with soap and water before fresh clothing is put on.
- 8 *For liquid in eyes* : Immediate action required. Wash out thoroughly with a stream of water from water bottle or other vessel, continuing for at least one minute. Should only one eye be affected, care must be taken not to contaminate the sound eye when washing out the injured one. If no help or water bottle, etc., is available, plunge the head into clean water in any available vessel (e.g. fire bucket), keeping the eyes open.
- 9 *For liquid on skin* : Immediate action required. Dab off visible liquid with wet handkerchief, rag or other swab as quickly as possible. It should not be wiped away, as this would spread contamination. Quickly follow with copious washing of affected parts with soap and water (preferably warm). (*Note* : Care must be taken in the disposal of whatever material has been used as a swab, so that it will not endanger others.)
- 10 If any injury has occurred in the contaminated area of the body, leaving the skin broken, the wound must be washed off well with soap and water before any other contaminated part is treated. If the wound itself is such that the casualty must be moved for medical attention, he should be given priority of removal over uncontaminated cases, because the absorption of nerve gas in particular is even more rapid through wounds and cuts than through unbroken skin.
- 11 *For liquid swallowed* (e.g. in contaminated food or water) : Immediate action required to produce vomiting. Tickle the throat or give a large amount of salt and water to drink. After

vomiting, an alkaline drink, such as bicarbonate of soda (a tablespoonful in a cup of water) should be given.

12 *For liquid on clothing* : Contaminated clothing must be promptly removed, and if practicable the whole body washed with soap and water (preferably warm).

13 *Additional care required for persons showing signs of war gas poisoning when found* :

(a) With nerve gas casualties the initial symptoms are dimness of vision, running of the nose, and tightness of the chest. Such casualties must be treated as seriously ill and kept lying down, because it is impossible at this stage to tell whether or not the more dangerous symptoms of twitching and convulsions will eventually appear. Early medical supervision or prompt removal to hospital is essential.

(b) With mustard gas casualties, initial symptoms of contamination by liquid are reddening of the affected skin, followed later by the appearance of blisters. Blisters should not be pricked or broken, but should be covered with a dressing until medical attention can be given.

14 *Note on use of bleach cream or anti-gas ointment. This is only for the additional information of instructors and should NOT be included in general instruction.* Bleach cream or anti-gas ointment may be in use by members of the armed services working with the civil forces. After removal of visible liquid, contaminated skin can be treated with bleach cream (which is effective against either mustard or nerve gas), but it must be emphasised that speed is most important factor, therefore, if bleach cream is not immediately available use soap and water method. Bleach cream should be well rubbed into contaminated areas with fingers and any surplus washed off with water after two minutes. Bleach cream must not be used near eyes. Bleach cream should not be applied to skin when reddening has developed. Blisters should not be opened. If anti-gas ointment is available it should not be applied before wet swabbing has been carried out because it would have an adverse effect if applied directly to liquid contamination if this should be nerve gas.

Concluding Summary

15 The object has been to teach the standard first aid and personal cleansing procedure for nerve and/or mustard gas contamination—a standard drill which would apply equally to any unidentified gas which might be used. Speed of action is essential if casualties are to be prevented or injury lessened.

Respirators

RESPIRATOR INSPECTION AND CARE

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, *Chemical Warfare*.
- 2 The instructor requires :
 - (a) Diagram of Civilian Duty respirator.
 - (b) One Civilian Duty respirator with haversack.
 - (c) One damaged Civilian Duty respirator to show examples of damage to harness, facepiece, eyepiece, container and haversack.
 - (d) Two receptacles for the instructor and two for every three members of the class, one containing lukewarm soapy water and one clean water.
 - (e) Soft pieces of cloth (one per instructor and each member of the class).
- 3 Class to be seated at tables with their respirators withdrawn from haversacks and placed on the table in front of them. Following each item of the instructor's demonstration of respirator inspection, valve testing and cleansing, these tasks should be carried out by the class using their own respirators.

Object of Lesson

- 4 To teach the working, inspection, care, valve testing and periodical cleansing of Civilian Duty respirators.

Protection afforded by Respirator

- 5 Pamphlet No. 1, Section 25.
- 6 Respirator affords complete protection to eyes, nose, throat, and lungs against chemical warfare agents, biological warfare agents and radioactive particles which may be present in nuclear warfare, provided respirator fits properly and is in serviceable condition. Correct individual fitting and serviceability of respirator are the two essentials.
- 7 The respirator is not designed to give protection against gases met in industry. It will NOT give protection against carbon monoxide.
- 8 Emphasise that respirator, although property of the Crown, is a personal issue to individual who is responsible for maintaining it in serviceable condition.

Functions of Essential Parts

- 9 Respirator consists of covering for eyes, nose and mouth, with container attached through which all air breathed in must pass. Container filled with material which removes all traces of chemical and biological warfare agents and radioactive particles (which latter may be present in nuclear warfare) from air breathed through it and is fitted with non-return inlet valve which prevents moist air passing out through it and so being breathed in again with the next inhalation. In time moisture passing through the container would also damage its contents. An outlet valve minimises resistance to breathing out and allows clear audible speech.

Description of Respirator

- 10 Pamphlet No. 1, Section 26 (iv) and Appendix B Section 5.

Respirator Inspection

Individuals should inspect their respirators regularly, at least once a fortnight. Taking each part in turn :

- (a) **Harness** : Elastic bands not unduly weak ; head pad sound ; buckles, tags and loops firmly attached and functioning correctly.
- (b) **Facepiece** : Material neither torn nor perished.
- (c) **Eyepieces** : Not damaged, screwed tight.
- (d) **Outlet Valve**: Rubber not damaged, securely bound.
- (e) **Container**: Without holes or heavy dents. Reasonably well protected by paint and free from rust. Securely fixed to facepiece by clip correctly positioned in moulded channel.
- (f) **Haversack**: No holes in canvas and no broken stitching.

Care of Respirator

2 Pamphlet No. 1, Section 32/33. As moisture is liable to cause deterioration of all parts it is important to keep the respirator dry. The following should be avoided :

- (a) **Complete respirator** : Keeping near hot pipes or fires.
- (b) **Haversacks** : Carriage of articles other than those for which haversack is intended.
- (c) **Facepiece** : Unnecessary stretching of elastics and straining of buckles ; tampering with eyepieces ; incorrect folding ; keeping respirator in haversack for long periods, since, if it is not worn frequently, it may become distorted and cease to fit with gas tightness ; careless and infrequent anti-dimming, since good vision depends entirely upon this being done correctly.
- (d) **Container** : Denting by rough usage ; allowing water to enter.

Valve Testing

3 Pamphlet No. 1, Appendix B, Sections 8, 9 and 10.

1 **Outlet valve**: Valve should be shut except when breathing out, when it should open to allow breath to escape freely. To test this adjust facepiece and it will be obvious at once if outlet valve is not opening properly because resistance to breathing out will be experienced and breath will escape past cheeks. Should outlet valve not open properly hold facepiece firmly against face with palms of the hands and blow out hard. This will often remedy this defect.

It is vitally important that outlet valve should be tightly shut when wearer is breathing in. To test this, adjust facepiece, stop the normal passage of air into the facepiece by holding a piece of smooth cardboard (or the palm of the hand if it is large enough) firmly against the outer end of the container, and test for leakage by attempting to inhale. Ensure no leakage through valve. If defective, it should be replaced without delay.

Inlet valve: Valve should be open when the wearer breathes in and remain shut at all other times. To test this adjust facepiece and it will be obvious if inlet valve is not opening because the wearer will be unable to draw any air through it.

To test if the inlet valve is closing properly adjust respirator, stop up the normal exit of air from facepiece by nipping the outlet valve, and breathe out gently. If air is escaping when the wearer breathes out gently and it is not felt passing the cheeks it can only be escaping through a defective inlet valve. If a respirator has a defective inlet valve the container should be replaced. A defective inlet valve is not dangerous as all the air breathed in comes through the container.

Periodical Cleansing of Respirator

- 18 Thorough cleansing of facepiece periodically necessary to maintain it in wholesome condition. At least once every six months. Proceed as follows :
- (a) Hold facepiece in left hand, with facepiece below level of container.
 - (b) Take clean soft cloth or sponge which has been dipped in lukewarm soapy water and squeezed free from excessive liquid, and thoroughly wipe out inside of facepiece. (Only soap of toilet quality to be used and water must not be hot.)
 - (c) Rinse cloth well in clean water, wring out surplus moisture, and wipe out inside of facepiece again.
 - (d) Take care to avoid liquid entering container.
 - (e) Allow facepiece to dry before replacing in haversack.
 - (f) Thoroughly rinse cloth in clean water after cleansing each facepiece.
- 19 Haversack should not be mechanically laundered, but if it is badly soiled it may be washed with soap and warm water (NO SODA).

Concluding Summary

- 20 The object has been to teach the working, inspection, care, valve testing and periodical cleansing of respirators. If respirator is to provide the protection it is designed to give it must not only fit correctly, but must be thoroughly serviceable, and kept in clean and wholesome condition. Defective inlet valve not dangerous. Defective outlet valve is dangerous.

Notes for

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(c) ...

3 For gas of

(a) Gas

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Respirators

RESPIRATOR FITTING

Notes for Instructor

- 1 This instructional period comprises fitting of Civilian Duty respirator and test for gas tightness, followed by gas chamber test.
- 2 For fitting and test for gas tightness the instructor requires:
 - (a) Civilian Duty respirators of both sizes.
 - (b) Three simple diagrams to show position of wearer's eyes when right and wrong size facepieces are used.
- 3 For gas chamber test the instructor requires:
 - (a) Gas chamber or gas van.
 - (b) C.N. capsules.
 - (c) Glass tip breaker or pair of pliers.
 - (d) Small spirit lamp.
 - (e) Metal dish for heating capsule over spirit lamp.
 - (f) Improvised fan, e.g. sheet of cardboard.

Object of Respirator Fitting

- 4 To ensure that when facepiece is adjusted the respirator will give complete protection to eyes, breathing passages and lungs, without undue discomfort or loss of efficiency if worn for long periods.

Explanatory

- 5 Explain that:
 - (a) The respirator will not give protection unless a proper fit is obtained.
 - (b) The facepiece will be uncomfortable if worn for long periods unless it fits properly.
 - (c) The better it fits, the less will be the reduction in the wearer's efficiency.
 - (d) The gas chamber test is necessary to confirm the correctness of fit of facepiece and to give confidence to wearer that his respirator will give him complete protection.

The Use of Spectacles with Respirators

- 6 Ordinary spectacles cannot be worn with any type of respirator since the side members would interfere with the gas-tight fit of the facepiece. Special spectacle frames with flattened side members have, however, been developed for use with Civilian Duty respirators. When these are required it is most important that:
 - (a) only the official design of spectacle frame is used;
 - (b) the correct size of frame is used since side members of different lengths are available to suit different sized faces;
 - (c) the respirator is first fitted (without the spectacles) in accordance with the instructions given below;
 - (d) the spectacles (without the respirator) are carefully fitted on the face, making any necessary adjustments to ensure that the flattened portion of the side member lies close to the skin in the temple region, so that there will be no tendency for the facepiece to be pushed away from the face; and
 - (e) the fit of the respirator is checked when the spectacles are being worn.
- 7 No type of spectacles can be worn inside Civilian respirators.

Fitting

Proceed as follows:

- (a) Take a normal size facepiece and loosen harness. (Majority of individuals will take a normal size.)
- (b) Get student to put on facepiece. (Explain and demonstrate.)
- (c) Tighten top pair of elastic bands and examine facepiece for size. If eyes are much above centre of eyepieces the facepiece is too small, if much below centre it is too large, if approximately central, the size is probably correct; before taking final decision general appearance must be taken into account. (In making this examination the fitter's eyes must be at same level as those of wearer.)
- (d) Tighten remaining pairs of elastic bands. (Do not pull them too tight as this may prevent facepiece from taking shape of face and thereby causing a leak.)
- (e) See that bands are exerting an even pull and are just sufficiently tight to hold facepiece stable on face without causing discomfort.
- (f) Examine round edges of facepiece, particularly under chin, to ascertain that facepiece is firmly on face. (The wearer's chin must fit closely into chin of facepiece.)
- (g) Check that facepiece will remain firmly on face of wearer. (Tell wearer to nod his head; if facepiece shows signs of slipping, tighten top bands. Instruct wearer to shake his head; if facepiece shows signs of slipping, tighten centre bands.)
- (h) If facepiece touches wearer's nose, check fit of chin and then tighten top bands. If this does not cure the trouble a smaller size almost certainly will.
- (i) A smaller facepiece will usually overcome difficulties with hollow temples or prominent cheek bones.

Preliminary Test for Gas Tightness

Carry out test as follows:

- (a) Stop normal passage of air into facepiece.
- (b) Tell wearer to attempt to breathe in.
- (c) If wearer unable to breathe in and facepiece drawn on to face, fit is good.
- (d) If air gets in through side of facepiece further adjustment is necessary.

Get individual to remove facepiece. (Explain and demonstrate.) Look for marks due to excessive pressure.

Get individual to put on facepiece again and repeat preliminary test for gas tightness.

Get individual to remove facepiece and warn him not to alter adjustment of harness.

Anti-dimming of Eyepieces

When respirator is worn the wearer's breath may condense on the inside of the eyepieces and make it difficult to see. This can be prevented by smearing the inside of the eyepieces with a thin film of good toilet soap. An anti-dimming compound is also available for the Civil Defence Services.

Carriage of Respirator in Haversack

Explain and demonstrate the method of carrying container in haversack and how it is returned to haversack (class copying).

Gas Chamber Test

Proceed to carry out the gas chamber test in accordance with the details given in Appendix A.

Cleaning of Respirator after Use

16 Explain and demonstrate the method of cleaning facepiece after use (class copying) as follows :

(a) Wipe inside with cloth, e.g. handkerchief.

(b) Treat eyepieces to prevent dimming.

(c) If facepiece wet and muddy wipe with damp cloth and allow to dry at normal temperature.

17 If wet and muddy, haversack should be allowed to dry at ordinary temperature, then brushed lightly.

Concluding Summary

18 The object of respirator fitting has been to ensure that when facepiece is adjusted the respirator will give complete protection to eyes, breathing passages and lungs without undue discomfort or loss of efficiency if worn for long periods and, by means of gas chamber test, to give wearer confidence in correctness of fit.



APPENDIX A

GAS CHAMBER TEST

Responsibility of Instructor

- 1 The instructor is solely responsible for admission of persons into gas chamber or van and for compliance with following rules :
 - (a) Instructor is first to enter chamber or van and remain until last person has gone out.
 - (b) No person to be admitted unless wearing respirator, properly adjusted and unless instructor is satisfied that fit is good and respirator in sound condition.
 - (c) Respirators are not to be taken off in the chamber or van.
 - (d) Not more than 10 persons (excluding the instructor) to be in gas chamber or van at same time.
 - (e) To conserve concentration, door should not be open while persons are entering or leaving airlock.
 - (f) Normal time in chamber or van for each group should be five minutes.

Putting up Concentration in Chamber or Van

- 2 The gas concentration must be put up by the instructor.
- 3 One capsule is sufficient to fill gas chamber or van of 500 cubic feet capacity, but concentration may be reinforced with further capsules, one at a time, as required. An improvised fan, e.g. a sheet of cardboard should be used to assist circulation. Concentration created by one capsule should, in normal circumstances, be sufficient for two groups of students to pass through chamber or van of about 500 cubic feet capacity.
- 4 Capsule to be heated on metal dish over small spirit lamp on shelf provided. Use of candle for heating capsule is prohibited. Capsules are made of glass and drawn-out end should be nipped off with pliers or broken off by use of glass-tip breaker provided. Contents of capsules must not be allowed to catch fire ; if they do lachrymatory effect of gas will be lost.
- 5 When heating capsule instructor will wear respirator. In event of any solid contents of capsule coming in contact with skin, the part should be immediately washed with soap and water.

Procedure before Class enter Chamber or Van

- 6 Having set up concentration instructor will :
 - (a) See that roll is correct.
 - (b) Parade class upwind with respirators.
 - (c) Explain the object of test is to confirm correctness of fit of facepiece and thereby give confidence to wearer.
 - (d) Emphasise that anyone feeling effect of gas must on no account remove facepiece, but will hold up hand.
 - (e) Tell class to adjust facepieces. Inspect each person, repeat test for gas tightness and make any adjustment still necessary.
 - (f) Lead class into chamber or van.

Procedure during Test

- 7 Inside chamber or van :
 - (a) Keep class in single rank.
 - (b) Ascertain if anyone affected. If so, send him out and attend to him later.
 - (c) When required to do so by instructor, class should talk to each other and, after a short while, the instructor should once more ascertain if anyone is affected.

G 16 : A 2

- (d) Individuals whose respirator facepieces show no sign of leaks when they are talking should then carry out some form of physical exercise, such as imitation shovelling or running on the spot, to test the stability of the facepiece.
- 8 After five minutes in the chamber or van, file out down wind of other parties, but up wind of chamber or van. Instructor leaves last of all.

Procedure after Leaving Chamber or Van

- 9 After leaving chamber or van :
- (a) Check individuals again for fit. Warn class that on removing the facepiece a certain amount of gas from their clothing may make the eyes water.
 - (b) Remove facepieces and verify absence of any severe pressure marks on face.
 - (c) Discuss any queries.
 - (d) Emphasise that harness tension must not be altered after satisfactory fitting, except for adjustment required as result of weakening elastics, and then only by a properly qualified person.

Respirators

RESPIRATOR CARRIAGE AND DRILLS

Notes for Instructor

- 1 Reference : Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, *Chemical Warfare*.
- 2 Instructor and class require steel helmets and Civilian Duty respirators.
- 3 It is better to conduct the lesson outdoors, the alternative of indoor instruction being adopted when light and other weather conditions necessitate so doing. Indoors, tables and chairs should be cleared to provide space to conduct lesson with instructor and class standing.
- 4 The two positions in which the Civilian Duty respirator may be carried, i.e., Slung and Alert positions, the removal of facepiece and its return to haversack, and adjusting respirator on another person, are not taught as drills. They should be explained and demonstrated by instructor while at the same time the class copy his actions. The instructor then inspects position of individual respirators, observes actions of individuals, and corrects faults.
- 5 To obtain protection by putting on facepiece, accuracy and speed are essential, such action therefore taught as a drill. There are only TWO drills and these are the putting on of the facepiece from ALERT position and from SLUNG position. Before teaching either drill ensure respirators are carried in appropriate position (i.e., Alert or Slung). Drill teaching must not be hurried. Both drills are taught in following sequence :
 - (a) Instructor states drill to be taught.
 - (b) Instructor explains and demonstrates the drill by first saying each part, and then doing it smartly.
 - (c) Instructor repeats explanation with demonstration whilst class copy his actions.
 - (d) Class practices drill slowly, instructor correcting faults.
 - (e) Instructor asks questions on drill.
 - (f) Class carry out drill on word of command of instructor.

Object of Lesson

- 6 To teach how the Civilian Duty respirator is :
 - (a) CARRIED in the SLUNG position.
 - (b) CARRIED in the ALERT position.
 - (c) PUT ON from the ALERT position (DRILL).
 - (d) TAKEN OFF and REPLACED in haversack.
 - (e) PUT ON from the SLUNG position (DRILL).
- 7 To carry out the standard test for putting on facepiece from Alert and Slung positions, and to teach how to adjust a respirator on another person.

Carriage Positions

- 8 Pamphlet No. 1, Appendix C.

Put on Respirator Facepiece from Alert Position [DRILL]

- 9 To PUT ON facepiece from ALERT position, sequence is as laid down in Pamphlet No. 1, Appendix C.

Take off Respirator Facepiece and Replace in Haversack

See Pamphlet No. 1, Appendix C.

Put on Respirator Facepiece from Slung Position [DRILL]

To PUT ON facepiece from SLUNG position, sequence is as laid down in Pamphlet No. 1, Appendix C.

Standard Test

Standard time for putting on facepiece from Alert or Slung positions is 15 seconds. Within this time limit accuracy is more important than extreme speed, provided that breathing is stopped throughout process of putting on facepiece. Time limit of 15 seconds does not include replacement of steel helmet or, where necessary, subsequent adjustment of respirator haversack.

Adjust Respirator on another Person

If necessary to adjust respirator on another person, proceed in accordance with the instructions given in Pamphlet No. 1, Appendix C.

Cleaning and Anti-dimming

At end of lesson wipe inside of facepiece with cloth and anti-dim eyepieces.

Concluding Summary

The object has been to teach how Civilian Duty respirator is CARRIED in Slung and Alert positions ; and how facepiece is PUT ON, TAKEN OFF, and REPLACED in haversack. Note that putting on of facepiece from Alert or Slung positions is taught as a drill. The lesson has also included the standard test (15 seconds) and has taught how to adjust a respirator on another person.

PROTEC

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MEASURES AGAINST BIOLOGICAL AND CHEMICAL WARFARE

of Notes G 13-17 and contains sufficient information to enable protective measures against biological and chemical warfare.

and a set of home made charts covering detection and personal etc., useful visual aids. In addition he should show a tin of detector Detector, a Civilian Duty respirator and a Civilian C7 respirator

Illustration

of detection available, and the personal and collective precautions biological and chemical warfare.

insured, whether against B.W. or C.W., by putting on the respirator other missiles burst in the vicinity, and by keeping it on until the "clear" signal is given. Under no circumstances should smelling to be the case before the introduction of nerve gases and B.W. protection are, therefore, confined to what can be done while wearing

are available for determining the presence of war gases. These are:

Used to detect the presence of LIQUID gases and identify them. The colour of white pepper and is supplied in canisters with perforated can be sprinkled on to any suspicious liquid. It gives different colour different liquid gases. In contact with liquid mustard gas it changes to liquid nerve gas to a YELLOW-ORANGE colour.

: Detector powder will only detect liquid contamination. It is more, to have some means of identifying the vapour. A chemical kit as the Kit Vapour Detector (K.V.D.) is available for this purpose. Apparatus and reagents which will detect the presence of nerve and

agents is extremely difficult, and is not normally within the scope laboratory facilities—except that if fragments other than those of H.E. are found, and the two chemical detector tests already mentioned B.W. agent may be suspected. Observation of the action of nearby plants may give further indication that some unusual and dangerous

the warden takes the following action immediately:

- Warning by means of a hand rattle.
- or "suspected B.W."
- Location of area of liquid contamination.

Use the presence of a B.W. agent will be undertaken by fragments, samples of earth, etc., have been collected Intelligence Officer for analysis in laboratories where such

ringing of handbells as and when an area becomes clear

primary means of protection against B.W. and C.W. condition and correctly adjusted. Once it has been established likely to use B.W. or C.W., respirators must be heard bursting on the ground or in the air.

house, or a shelter provided with a closely fitting blanket-period, considerable protection from war gas vapour

workers who must remain in the open and those who are hands must take every precaution to protect themselves. hands, necks and hands are protected; in other words as be left exposed.

essential duties permit, personnel should keep well contamination, because gas and germs travel with wind. a contaminated ground or brush against surfaces which boots or shoes have been contaminated, they must be not taken inside any building.

should be kept closed when not in use, and all food and containers should be kept covered, e.g., by using inverted every and cooking utensils should be thoroughly washed suspect they have been exposed to B.W. or C.W. agents.

7.: Maintain personal and domestic hygiene at highest an by washing it out with warm water or normal saline. d animals, and any rats and mice found dead. Reduce of infected areas.

ated area will be marked (see G 13 Appendix A).

Contamination

, but in brief the most important action required is as

should immediately be "picked" or dabbed off with absorbent swab, care being taken to avoid spreading the solely of the swabs used. Quickly follow with thorough soap and water. It is obvious that the individual must ensure by putting on a respirator (if this is not already

mediately wash out thoroughly with a stream of water or water bottle, etc., is available, plunge the head into water (e.g. fire bucket), keeping the eyes open.

(e.g. in contaminated food or water) immediately try to
ing the throat or giving an emetic such as a large amount of

e promptly removed, and if possible the whole body washed

only (and this is particularly important should it be mustard
ged, keeping the respirator on until this is done, and if
body with soap and water before fresh clothing is put on.

nd Care

ment permits, this period may be taken in part as a practical

es of respirator used in civil defence—the Civilian Duty
ers who are likely to be called upon to do arduous work in
eneral Civilian C7 respirator for the Welfare Section and

present this respirator is used by all Sections of the Civil
Welfare Section. The instructor should demonstrate the
edure (see G 16) and the drill for putting the respirator on

' : The respirator and the fitting procedure, including the use
ndix A) should be demonstrated to members of the Warden
ivilian Duty respirator. This procedure should also be demon-

er use should also be explained and demonstrated (see G 16).
and the gas chamber test is not required to be taught at present.

a the methods of detection available, and the personal and
taken against biological and chemical warfare. Although it
two forms of attack are less likely against a civil population
apons, the possibility must be envisaged and the necessary



APPENDIX A

GENERAL CIVILIAN RESPIRATOR C.7

es:

ct size of respirator for the wearer by use of the sizing cones.
or to fit.

Size of Respirator

ive sizes. For each size there is a corresponding clear plastic
ked the size number and a blue coloured band representing the
r facepiece.

ollowing way:

s by engaging the press studs, so that the size numbers can be
e outside.

pproximate size required. (See note below.)

t of the face with the coloured centre line over the nose.

ge of the cone under the chin so that the coloured band is
e chin, and lift the cone upwards on to the face.

essing lightly at the cheeks.

for the wearer if the coloured band:

f the forehead.

he eyebrows at the temples.

coloured band crosses the ends of the eyebrows or if the eye-
crosses the outer edge of the eyesockets.

coloured band lies very high on the forehead.

e equally suitable, allot the smaller size to persons over the age
v that age allot the larger size to allow for growth of the face.

l represent the size of respirator required.

approximately the right size the following may be taken as a

5 to 12 years of age	.	.	.	Size 2
12 to 16 years of age	.	.	.	Size 3
.	.	.	.	Size 3
.	.	.	.	Size 4

it

the forehead then place the selected respirator on the wearer.
vel. Lift the respirator upwards so that it makes good contact
buckle at the back of the head, just below the crown.

on, adjust the length of the centre strap so that it supports the

straps so that the rubber tabs are stretched to a point where white circles marked on each tab are $\frac{7}{8}$ inch apart.

(This distance is given on each Size Cone at the forehead.)

hook on the buckle and attach the end ring to the hook on the facepiece. Adjust the length of the strap so that it supports the facepiece. The purpose of this strap is to hold the respirator in place and should not therefore be overtightened.

Seal the respirator container with a thin piece of smooth card while the respirator must leak in around the face.

After fitting and putting on have been correctly done draw a white line on each strap along the edge of the buckle and the hook to mark the position.

When the wearer. Without altering the adjustment, secure each strap with a pin between the buckle and the hook and the facepiece. The pins should be in the same position after pinning as they were when the respirator was adjusted.

The wearer should be able to put on the respirator unaided.

Do not attempt to alter the final adjustment of the respirator; this must be done by the person who adjusted it.

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