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## Operational procedures for Mine Detection Dogs

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## Foreword

In July 1996, international standards for humanitarian mine clearance programmes were proposed by working groups at a conference in Denmark. Criteria were prescribed for all aspects of mine clearance, standards were recommended and a new universal definition of 'clearance' was agreed. In late 1996 the principles proposed in Denmark were developed by a UN-led working group into *International Standards for Humanitarian Mine Clearance Operations*. A first edition of these standards was issued by the UN Mine Action Service (UNMAS) in March 1997.

This IMAS reflects changes to operational procedures, practices and norms which have occurred over the past three years. The scope of these standards has been expanded to include the other components of mine action, in particular those of mine risk education and victim assistance.

The United Nations has a general responsibility for enabling and encouraging the effective management of mine action programmes, including the development and maintenance of standards. UNMAS is the office within the United Nations Secretariat responsible for the development and maintenance of international mine action standards (IMAS).

The work of preparing, reviewing and revising these standards is conducted by technical committees, with the support of international, governmental and non-governmental organisations. The latest version of each standard, together with information on the work of the technical committees, can be found at [www.mineactionstandards.org](http://www.mineactionstandards.org). IMAS will be reviewed at least every three years to reflect developing mine action norms and practices, and to incorporate changes to international regulations and requirements.

## Introduction

Dogs play many different roles within a mine action programme. They can be used as primary demining tools, to detect explosive ordnance and mines along roads and/or verify the presence of mines/UXO in mine suspected areas. They can also be used to verify the boundaries of minefields, to clear road verges, and to search houses and ruins for explosives. Dogs may also be used in a secondary demining role; the verification by dogs of areas already cleared mechanically has proved to be efficient, and this way of using dogs has become customary in many countries. They may also be used for quality control and quality assurance, to verify areas that have been previously cleared by dogs, manual deminers or machines.

Due to the many ways of using dogs, and the variety of demining scenarios in which they are used, it is not possible to establish uniform standards, which can be applied under all circumstances. There are, however, many common denominators for all mine dog operations that can be applied to operational procedures. This standard provides guidance about general and specific principles, which must be considered when establishing operational procedures for mine dog detection. It is specific in areas where a common global practice has evolved, and general in areas where this has not yet happened.

# Operational procedures for Mine Detection Dogs

## 1 Scope

For the purposes of this standard, operational procedures mean procedures to be applied as part of the demining operation. These include, but are not limited to: preparation, implementation, testing of dogs, maintenance of skills, search and marking principles/patterns, rewarding and rotation, assessment of meteorological and other factors and responsibilities of operational staff. This standard provides guidelines and specifications for operational procedures to be adopted during mine dog detection. The general and specific principles for vapour sampling and remote detection are not addressed in this standard, but are described in IMAS 09.43.

## 2 References

A list of normative references is given in Annex A. Normative references are important documents to which reference is made in this standard and which form part of the provisions of this standard.

## 3 Terms and definitions

A complete glossary of all the terms and definitions used in the IMAS standards is given in IMAS 04.10.

In the IMAS series of standards, the verbs 'shall' and 'should' are used to indicate the intended degree of compliance. This use is consistent with the language used in ISO standards and guidelines.

- a) 'shall' is used to indicate requirements, methods or specifications which are to be applied in order to conform to the standard; and
- b) 'should' is used to indicate the preferred requirements, methods or specifications.

All these terms are similarly used in this standard and other IMAS 09.4 Series.

The term 'national mine action authority or authorities' refers to the government department(s), organisation(s) or institution(s) in each mine-affected country charged with the regulation, management and co-ordination of mine action. In most cases the national mine action centre (MAC) or its equivalent will act as, or on behalf of, the 'national mine action authority'.

The terms 'demining organisation' and 'mine dog organisation' refers to any organisation (government, NGO or commercial entity) responsible for implementing demining projects or tasks. The demining organisation may be a prime contractor, subcontractor, consultant or agent.

The term 'target substance' is used to refer to components of a mine or UXO that the dog is trained to detect during search. A target substance may be the explosive itself or a combination of the explosive and substance from the mine/UXO casing or other by-product from the target object

## **4 Health and capability check prior to work**

### **4.1 General**

A dog's capabilities may vary on a weekly or even daily basis. A dog may search well one day, and be completely unable to search the next day. The ability of a dog to search well depends on its health and well-being. It is therefore necessary for a demining organisation to assess its dogs on a daily basis, before the dogs are allowed to start searching for live mines and/or UXO. The assessment shall typically consist of a check on health and well-being, coupled with a small detection test to give the dog handler and the project management confidence in the dog's search capability. The daily test also acts as a "warm-up" for the dog. It prepares the dog for work and tunes it in to the target substance. This daily assessment is an internal quality assurance routine, but it goes beyond this. When the tests show that a dog is ill or incapable of searching, there are certain principles to be followed in terms of record keeping and action.

### **4.2 Health check**

The capability of a dog to detect mines and UXO in a reliable way is highly dependent of the dog's health condition. Canine distemper, canine parainfluenza and Cushing' disease can seriously impair dog scent detection capability. Allergic rhinitis, nasal foreign bodies, hypothyroidism, epilepsy, diabetes mellitus and head trauma among other conditions are all known to have a negative effect on human performance, and it is not unreasonable to expect that similar effects could occur in dogs. All mine dogs shall therefore undertake a health check every day before they are allowed to start work. If the health check reveals that a dog suffers from illness or incapacity, which might affect its capability and reliability, the dog shall not be used for clearance before it has fully recovered. Procedures and principles relating to the daily health check are described in IMAS 09.44.

Dogs can sometimes be used for mine detection despite some minor health problems. This is acceptable provided that that a dog's capability to detect the target substance it maintained as well as its cheerfulness, liveliness, motivation and concentration. If a decision is made to use a dog with a minor disease or illness, particular attention must given to a close monitoring of the dog's performance and well-being during the search. Examples of diseases where the use of dogs may still be appropriate are; skin diseases, tic and insect bites and slight cuts or wounds that will not disturb the dog. If a dog has a slight health problem but is still thought to be able to work well, the responsible manager shall assess the dog's working abilities in consultation with the dog handler and the veterinary (alternatively the dog medic) before the dog is authorised for mine/UXO detection.

### **4.3 The daily test**

The aim of the daily test is to determine whether the dog is capable of detecting the target substance, and sufficiently cheerful, lively, motivated and focused to work on mine/UXO detection. The test can be undertaken in many different ways, but the following test principles are recommended:

- c) a small number of test boxes or lanes are prepared prior to the daily test search. Each box or line should measure at least 1 x 2 m and one box should be prepared for each search dog. There are no specific requirements to marking but the dog handler must be aware of the boundaries of the box or lane;
- d) old mines, pieces of mines or items that have been contaminated by the target substance are inserted into the ground. Small test items may be placed just below the surface with tweezers or forceps. Ideally the test items should be contaminated by target substance from the different types of mines likely to be found during the demining operation. Additional spots should also be disturbed;
- e) when the dog searches the box, the dog handler shall evaluate the dog's obedience, motivation, concentration and ability to detect the mines or test items;

- f) it is recommended that the daily test area is prepared some days in advance, to allow soak time for the contaminants. The same test box can be used for several days but the search direction should be varied on a daily basis. It is, however, recommended that new test boxes are prepared every second or third day. If a test box or lane is to be used several times, it is important to let the test item remain in the ground at the same location as it was originally placed. If the test items are removed the dog will still detect the previous location due to the soil contamination; and
- g) when the dog has proved to be tuned in on the target substance and is searching and behaving satisfactory, the test can be terminated and the dog can be declared fit for mine/UXO detection.

#### **4.4 Reporting**

The demining organisation shall ensure that a logbook is prepared for each dog, or group of dogs. The aim of the logbook is to provide the demining organisation and monitoring teams with a continuous written evaluation of the dog's health condition and search ability. It is important for the dog handlers, the trainers, the veterinary and the management of an organisation to be able to follow the development of a dog on a daily basis. The daily assessment of each dog shall be written into the logbook prior to starting work every morning. An assessment of the dog's work shall also be written into the logbook after the search has been completed. The logbook shall be written by the dog handler or the team leader in consultation with the dog handler. If the dog handler has not written the logbook himself, he shall sign the log after each entry to confirm its correctness.

The logbook shall be written and stored according to regulations provided by the national mine action authority, and stored for a minimum period of 12 months after the completion of demining tasks carried out by the dogs. The logbook shall be kept by the responsible manager and presented to quality control teams upon request.

### **5 Planning and preparation for clearance (area clearance)**

#### **5.1 Planning**

Before a new demining task can be undertaken it is necessary to plan where to establish safe lanes, access lanes and the location of the boxes and/or search lanes. General principles for the planning and preparing of demining operations are described in IMAS 07.10. In addition the following elements should be considered when planning mine dog operations:

- a) assessment of the threat prior to the search. If the dog is only licensed to undertake regular search for mines and UXO, it shall not be used if the presence of tripwires is known or likely;
- b) assessment of the type of mines believed to be present in the area. If some of the mine types contain different explosives or substances to those, which the dog is trained to detect, the dog shall be tested against these new mine types prior to the mine/UXO detection.;
- c) the number of dogs available for the task;
- d) the layout of a box or area, taking into account the required safety distance between each dog/handler, the wind direction (or changes in the wind direction), humidity of the soil, vegetation and requirements for the supervision and general management of the operation; and
- e) that certain spots within an area may be assessed as potentially impossible to clear immediately after rainfall due to puddles and muddy ground. In such circumstances it is recommended that the dogs work in the drier areas until the wet spots have dried up.

## **5.2 Safe lanes**

Safe lanes are prepared to provide access for the dog and handler to a box or an area. They also provide safe start lines for the dogs and handlers. Safe lanes may also be used for casualty evacuation. The safe lanes should ideally be two meters wide to allow a safe passage for the handler and the dog, and to allow casualty evacuation by stretcher team. A minimum width requirement, however, is 1 meter.

## **5.3 Boxing an area**

Currently the most common way of clearing an area with mine dogs is to divide the area into square boxes, and let the dogs clear these one by one. This clearance principle is commonly called the boxing system. When the boxing system is used the following rules shall apply:

- a) if parallel sets of boxes are set up in order to use more dogs simultaneously, the safe lanes between them shall be cleared according to the principles in paragraph 5.2. The safe lanes can be cleared manually or with dogs. The safe lanes shall be marked according to principles described in IMAS 08.30 (demining technical survey) and IMAS 08.50 (marking mine and UXO hazards);
- b) the corners of each box shall be clearly marked. Some organisations use small flags while others use tape or sticks that are driven into the ground. It is usually sufficient to mark the corners of the boxes but some organisations prefer to mark the whole perimeter of the boxes with marking tape;
- c) oil and spirit-based spray paints should be avoided when boxes are marked since the scent from these products may disturb the dog's sense of smell. If painted stones are to be used, the stones shall be painted well in advance of the search, ideally more than a week beforehand. A minimum requirement, however, is that the stones are painted well enough in advance for the paint to be totally dry. The same principle shall apply when paint is applied to marking sticks; and
- d) the whole area in the box shall be visible to the dog handler. If the vegetation is such that the dog handler is not able to observe the dog at all times during the search, the box shall be divided into several smaller boxes or lanes.

IMAS 10.20 provides guidelines for the safety distance to be kept between manual deminers. The same principles shall apply for the minimum distance between dogs and handlers in a mine suspected area. The minimum distance is established for safety purposes but it also ensures that the dogs are not disturbed by each other when two or more dogs are involved in the same search.

## **5.4 Marking upon completion of search**

When a box has been searched twice and considered free from mines or UXO, the corner marking and any circumference tape may be removed. The exact location of each box should, however, be recorded since this may help isolate any problems identified during internal or external quality control or post-clearance sampling. Records of which boxes were cleared by which dog/handler teams may also be needed in the event of accident investigation.

## **5.5 Search requirements**

All areas searched and declared mine free by at least two different dogs may be considered cleared. Both the dogs must have passed the necessary operational accreditation. (ref IMAS 09.42) Some organisations use a three-pass drill and may have gained an accreditation based on this drill. In such instances all the dogs must have passed an operational accreditation.

## 5.6 Wind direction

Wind plays an important role when using mine dogs. Too strong a wind will disturb the overall scent picture. If the dog searches in a following wind, it will typically mark the mine/UXO after it has passed the object and thus risks stepping or sitting on the mine itself. If the dog searches with a headwind it will typically mark the mine/UXO in front of the actual location. If the dog searches with a cross wind it will typically mark the mine/UXO to the side of the actual location. A well-trained dog, however, may be able to indicate the exact location of a mine when the search is undertaken with head or side wind. The following rules shall apply when considering wind strength and direction.

- a) mine dogs shall not be used if the wind speed (at ground level) is greater than 18 m/s. Mine dogs should not be used if the wind speed is greater than 7 m/s if the soil surface is very dry and dust is being raised;
- b) mine dogs should not be used to search with a following wind. The target substance may not be recognised before the dog has passed the actual location of the object. A slight following wind (1-2 m/s) is, however, acceptable under most circumstances;
- c) dogs should ideally be used to search with a side wind but can also be used when there is a head wind; and
- d) strong wind speed may reduce the indication accuracy of a dog. A general principle is that increased wind speed requires an increased area to be investigated manually after a dog has indicated. If the dog searches in a strong head wind, an increased area should be investigated to the front of the indication. If the dog searches in a strong side wind, an increased area should be investigated to the side of the indication where the wind is blowing.

## 5.7 Assessment of other factors

Mine dog detection also requires a careful assessment of other factors that may affect the accuracy of the search. Many factors influence the ability of the dog to detect the target substance. These include but are not restricted to:

- a) the chemical nature and volatility of the target substance; Target explosive substances (TNT and DNT) are moderately adsorbed onto soils. For most soils, the majority of the target substances will be bound to the soil particles (90-99% for TNT and 60 to 99% for DNT). The balance of the target substances will be in the soil water (1 to 9% for TNT and 1 to 40% for DNT) with only a trace amount in the air. When the soil particles become very dry (< 5%), there is a dramatic increase in sorption of the target substances causing a dramatic decrease in vaporisation. This effect is reversible when the soils become wet;
- b) amount of target material; The amount of target material that is present, and its surface area, will influence the release of vapour from a mine. A greater surface will enhance the vapourisation process. *A large mine tends to have a larger surface thus facilitating greater vapour emanation*;
- c) the location and degree of concealment, including the target depth; Target substances are released into the soil at different rates due to differences in mine construction and design. Mines with openings in the case causing soil to be in direct contact with the explosive produces the greatest target substance release. *Mines constructed of plastic materials will release more target substances when the plastic is more flexible and porous (for example, rubber releases more than PVC case materials)*;
- d) the age of the target material; The scent picture produced by the explosive will vary with time;
- e) target substance degradation by soil microbes; Target substances are removed from the soil by indigenous microbes. Soil environments favourable to microbes will cause increased degradation of target substances. *Favourable environments include hot and wet soil. Unfavourable environments include cold and dry soil*;
- f) additionally, environmental factors have a significant effect and it is generally believed that the following effects apply;

- g) humidity; If the soil surface and the air are extremely dry, this will greatly reduce the transportation process of target molecules from the soil to the air. Dogs may, however, be capable of sniffing in airborne dust particles (lifted by the wind or the suction) containing a recognisable amount of the target substance. The moisture in the nose of the dog is thought to displace the target substances from the soil particle and then become recognised by the dog's smelling organs. This effect, however, has not been quantified scientifically and further research is required to determine whether and how dogs are capable of detecting mines under extremely dry conditions<sup>1</sup>. *Dogs should therefore not be used under extremely dry soil/air conditions unless they have proved themselves able to detect mines/UXO well under similar conditions during training and tests;*
- h) temperature and temperature differences in soil/air; If the temperature in the soil is near freezing point the scent will diminish, impeding detection. Heat causes scent to rise and the odour plume to expand, facilitating detection. Hot and wet soil provides optimal vapour detection conditions. Soil, when warmer than the air, increases the vaporisation and consequently the transportation of target substance to the air. When the soil temperature is at its lowest (typically early in the morning) and the air temperature exceeds the soil temperature, dew may appear on the soil surface (air temperature colder than 7-8°). If the soils are very dry prior to this condensation phase, the dew can displace the target substances from the dry soil enhancing vapour detection. If the soils are already wet prior to dew formation, the dew will not enhance vapour detection. *Dogs should therefore not be used for vapour detection when the soil temperature is below or near freezing point. A preferred time for use of dogs when the soil is very dry may be after dew forms during the night;*
- i) rainfall; Rain acts to wash target substances from the surface to deeper portions of the soil. The soil particles will partially hold onto the target substances, so a short light rain will have minimal impact. However, a heavy rain over extended time will remove more of the target substance from the soil surface. If after a rain, environmental conditions cause high evaporation (warm, sunny and a light wind), target substances displaced from the soil surface will return, being transported by the evaporating water. More work is needed to make recommendations on use of mine dogs regarding how much rain and how much evaporation after a rain;
- j) snow; Snow is known to restrict scent although it is known to hold the scent well. When snow is melting, however, it may release encapsulated scent, which may make vapour detection favourable. It has however, proven difficult to use dogs under such conditions due to a wide scent plume which will make indications by a dog very inaccurate. *Dogs should therefore not be used for vapour detection in areas where the surface is covered with snow;*
- k) vegetation; If the vegetation is such that it will prevent the dog from searching the whole area, or the dog handler has limited visibility of the search, dogs shall not be used. Vegetation protects the surface soil from drying from windy and sunny conditions. Thus, low vegetation may be advantageous compared to bare soil conditions, however, more work is needed to better define this effect. Target substances in soil water may be taken in by plant root systems and expelled by the plant leaves. When the water is finally released from the plant, the target substances may be several meters from the mine. In areas where it is known that there is an extensive and widespread root system, the accuracy of the indication may therefore be greatly reduced. *Under such circumstances a larger area should be investigated after a target indication by a dog. The same effect may also appear in areas where there are big rocks or clefts in the soil, breaches in dykes and small tunnels in the ground made by rodents;*

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<sup>1</sup> Experience from Afghanistan suggests that dogs are indeed capable of detecting mines under extremely dry conditions if there is a light wind breeze. If there is no wind, the dogs are incapable of finding mines. This suggests that the dog sniffs in contaminated dust particles from the air and not from the soil surface. Thus if there is no wind there will be no dust particles in the air and the dog cannot be used.

- l) pollution from smoke and burning; Smoke, burning and pollution may disturb the dog and prevent it from working effectively. Therefore dogs shall not be used in areas where a strong smoke from burning is present or where there is a strong smell of smoke that could disturb the search. This can be the scent from burning oil products, chemicals and the scent from certain types of burning vegetation (the latter has not yet been quantified scientifically, and further research is required to determine which types of vegetation may cause confusing scents);
- m) burning of vegetation is common in some demining programmes. This may, however, have a negative effect on the dog's detection capability. *Dogs shall not be used to search in areas where the vegetation has recently been burned (after less than four days) unless they have proven, through testing, to be capable of detecting mines and UXO in recently burned areas.* If dogs are to be used in areas where the vegetation has been burned, special training in similar environments is required prior to the search. A longer period than four days between the burning and the clearance is nevertheless desired; and
- n) vegetation and vegetation cutting; Dogs have problems in working effectively and safely in densely vegetated areas. Many demining organisations have therefore established the practice of cutting the vegetation mechanically prior to the search. Vegetation cutting may disturb the scent picture above mines and increase the scent plume. However, plants may uptake target substances from the soil water by the roots. When vegetation is cut, water from the plant will vaporise releasing the target substances. The result may be increased scent, and more favourable conditions for vapour detection, but the accuracy of the indication may be diminished. This effect has not yet been scientifically quantified, but many demining organisations have reported that their dogs can easily detect mines and UXO in areas where the vegetation has been cut. More work is needed to quantify recommendations regarding cutting of vegetation and wait time after cutting. Vegetation is generally known to have a positive effect on vapour detection. *On extremely dry days the scent, which is released from the soil, may be significantly reduced. Flowers, grass and bushes, however, will continue to release humidity and thus emit the target scent. The result may be that although the dogs are incapable of picking up the target scent from the soil, they can pick up the same scent from breathing the air round plants.*

## 5.8 Recording of environmental data

Recording of environmental data is considered to be important for several reasons. When accidents occur, or where there is evidence of missed mines, an analysis of the collected data may help explain the reason for the missed mine(s). Recorded environmental data may not immediately appear useful to a demining organisation since some of the data cannot currently be analysed. Recorded environmental data is, however, important from a scientific point of view and may assist a further improvement and understanding of the limitations of vapour detection in the future. Mine clearance organisations should therefore establish procedures for a long-term recording and storage of environmental data collected during mine dog operations and training. The most important data to measure and store are:- humidity in air/soil, wind speed/direction, insulation (before and during search), air pressure, soil and vegetation type, changes in soil, and rainfall (before and during search).

## 5.9 The use of a weather station

Weather stations were previously considered to have limited application within mine dog operations. Today, however, weather stations have become better and cheaper, and should be considered as part of the "toolkit". Weather stations can typically measure meteorological data, such as wind velocity and direction, humidity, air pressure, soil temperature, ground and soil temperature. Although these measurements can be undertaken manually with separate gauges, it may prove practical for an organisation to establish a system using proprietary weather stations. Modern weather stations are easily sustainable and simple to operate. They can be connected to computers, which provide an easy way of storing meteorological data. Some weather stations have their own storage media, which allows a periodic download of information to a computer, a more practical solution for fieldwork.

## 6 The search

### 6.1 General

Several search patterns have proved useful when using dogs to detect landmines. The two most common search patterns currently in use for humanitarian mine clearance are:

- o) the figure eight pattern; The dog searches in a figure eight pattern in widths of 6-8 meters; and
- a) the search-lane system; The dog searches in a series of straight lanes that are between 0,3 m and 1 m wide. Typically the search lane length is 6-10 meters. The dog may search with or without a leash. The straight lane system is used in two different ways. Most commonly, the dog searches straight out from the handler in a 90° degree angle from a base line. Some organisations, however, establish lanes where the dogs search parallel to the base line. When the latter system is used it is common for the dog handler to lead his dog in a short leash.

Although the search-lane system has been widely accepted by the international mine dog community as the most practical system, the figure eight system may prove to have some advantages under certain circumstances. Whatever the type of search pattern to be used, the following principles shall be applied when searching with mine dogs:

- a) the dog shall search the whole area with no parts remaining un-checked. The nose of the dog shall have been no further away than 30 cm from any part of the area;
- b) the dog shall be trained to follow a steady search speed during the whole search. If the dog runs too quickly over an area, this area shall be searched again by the same or another dog;
- c) the dog shall be trained to search with it's nose close to the ground at all times during the search. If the dog searches an area with a lifted head, the area shall be searched again by the same or another dog;
- d) the dog shall follow the search pattern as described in the demining organisation's SOP; and
- e) neither the dog handler nor any other staff member from the demining organisation shall enter physically into a suspected area before it has been checked by at least two licensed dogs.

### 6.2 Medical evacuation

Dogs may also be used for medical evacuation purposes. In this role the dog typically searches a straight 1 m lane and the handler follows immediately behind the dog. A two-pass drill is normally not applied due to the urgency in opening an access lane. The dog is normally led in a short leash and the dog handler or an assistant marks the centre of the cleared lane. If a dog is to be used for medical evacuation, special attention must be paid to training the dog to work normally in situations where there are many disturbing elements, such as a crowd of watching people and screaming mine victims. The dog handler must also be specifically trained for this situation. If not, he/she may well be affected by the trauma of the situation to such a degree that he/she miss-reads the signals from the dog.

### 6.3 Road clearance

Dogs have proved to be particularly useful for the clearance of roads. When dogs are used for this purpose, there are certain advantages and disadvantages if compared to normal area clearance. It is often difficult to deploy several dog teams at the time due to the difficulties of establishing a box system on road. Thus dogs are typically used to search from one end of the road to the other or from both ends of the road towards the middle. In some cases, however, it may be possible to deploy a higher number of dogs along the road. This can be done if there is safe access to the road from the side or if there are safe tracks in or parallel to the road. It is also possible to clear a safe lane on the road and deploy the dogs from this lane.

If a safe lane is to be prepared it is necessary to consider the ordinary wind direction before determining the location of the safe lanes. If the normal wind is along the length of the road, the safe lane should be established at the side of the road and demining should be undertaken in lanes across it, which allows the dog to work with a side wind. Under side-wind conditions it may, however, be necessary to establish safe lanes across the road, and carry out the search along it.

Figure 1

Sketch showing the principles of road clearance during side-wind conditions. Safes lanes are established on one side of, and across the road at 90°. The search is undertaken in the road direction.

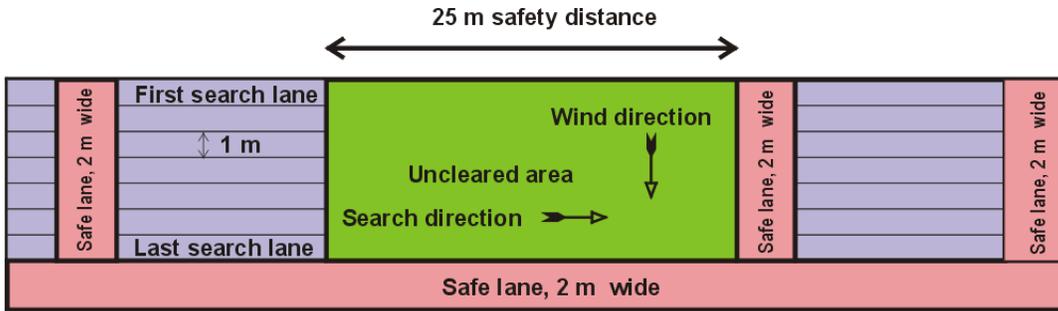


Figure 2

Sketch showing the principles of road clearance during longitudinal wind conditions. Safe lanes are established to one side of the road and search is undertaken at 90° to this safe lane, across the road.

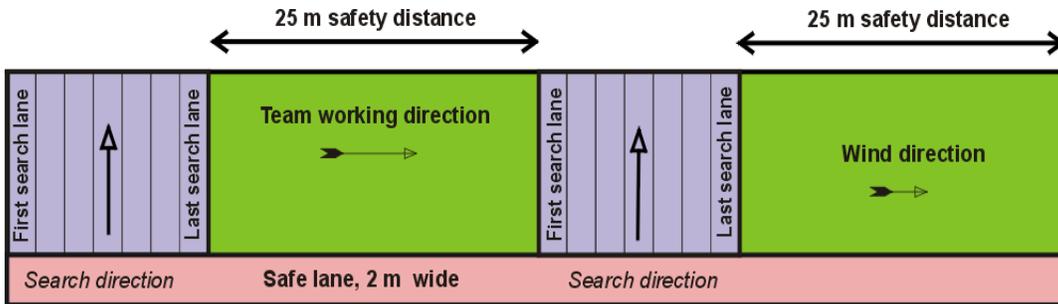
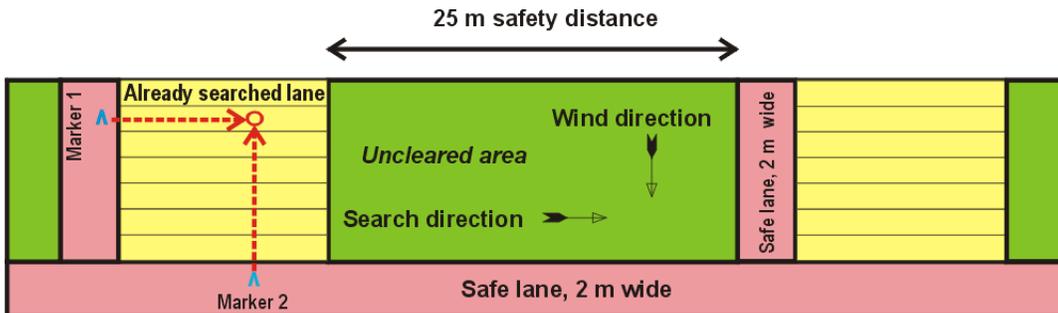


Figure 3

Sketch showing the principles of cross marking indications by dogs. The dog handler typically places marker 1 in the safe lane where he is located. The team leader or an assistant places marker 2 in the safe lane opposite to where the dog indicates



## **6.4 Verge clearance**

Verges can sometimes be difficult to clear with dogs due to steep slopes, fluctuating terrain and vegetation. Dogs can be used to search along the verges but a proven successful practice has been to search from a safe lane established on the road itself. The search lanes are normally angled 90° to the road direction. Wind direction may, however, restrict this practice and force demining organisations to choose other clearance patterns.

If the vegetation on verges is too dense, it may be cut mechanically prior to the search. Cutting of vegetation may disturb the scent picture and it therefore recommended that a minimum soak time of 2 days be established before the dog is used for mine/UXO detection. Effects related to vegetation are described in sub-paragraph 5.7.m.

## **6.5 Clearance behind mechanical machinery**

Mine dogs can be used as part of a "systems approach" where the dog undertakes secondary search or quality control in areas already cleared by mine clearance machines. Such machines can be flails, tillers, sifters, rollers, soil millers etc. Whilst there are no differences of principle between using dogs for regular area clearance and using them for verification behind machines, the following rules shall apply when dogs are used behind machines:

- a) if the machine has disturbed the soil, the dog shall not be used to clear behind the machine until at least 2 days after the mechanical preparation has taken place provided that it has rained at least one time during these days. In periods with no rain, however, it is recommended that this soak time be increased to a minimum of one week or longer. Rainfall will wash away most of the undesired contamination of the surroundings caused by the machinery. This will make the search with the dog more accurate and reliable; and
- b) if the machine has been used to clear an area with a relatively high density of mines, dogs should not be used since lumps of explosive and bits of mine casing are likely to be spread around the area. This will confuse the dog and make the search less reliable.

## **6.6 Mine and UXO indication**

When a dog has found a mine or UXO it shall be trained to indicate as described in the demining organisation's SOP. This may be by sitting or lying down next to the mine. If a dog sits or lies down on the top of the mine/UXO during operations, training or tests, it shall be taken out of service and re-trained until it has stopped doing so.

The dog shall indicate a find without physically being in direct contact with the object. If a dog scratches on target objects during operations, training or tests, it shall be taken out of service and re-trained until it has stopped doing so.

When the dog has indicated a mine correctly, it may be rewarded as described in the demining organisation's SOP. Rewarding is typically undertaken with a ball as a reward object but other forms of reward may be preferred. The reward object shall always be thrown or given to the dog in such way that the dog will not run into a yet un-cleared area to fetch it. If a dog proves difficult to control during rewarding and runs into un-cleared areas during operations, training and tests, it shall be taken out of service and re-trained until it has stopped doing so.

When a dog has indicated a mine, the location of the indication must be registered. Demining organisations have different ways of marking an indication. The indication may be registered by the use of a cross-bearing system with sticks driven into the ground outside the suspected area. A light material marker may also be placed or thrown at the indication spot. Whatever way an organisation prefers to mark an indication, the marking shall be accurate and not more than 20 cm from the indication spot. During marking of a spot, the dog handler shall never enter the cleared area physically before it has been checked twice.

Since dogs are known to have a variable degree of indication accuracy, a circle around the indication point with a radius of 100 cm shall be inspected. Some dogs may, however, not be trained to detect mines to this degree of accuracy. If this is the case the inspection area shall be increased in line with what the organisation believes to be the indication accuracy for the dog.

## **7 Rest and rotation of dogs**

### **7.1 General**

Dogs have highly individual qualities. While some dogs are capable of working for several hours at a stretch, other dogs need frequent breaks between each search period. The demining organisation shall establish a policy for the length of search periods for their dogs, and lay down the criteria for rotation. They shall also evaluate for each dog how frequently it is to be rested or rotated.

### **7.2 Length of search for each dog**

The length of each search period is subject to individual evaluation by the dog handler. Some organisations give the dog a break after 30 minutes as part of their rotation scheme. This has proven to be practical and workable in some instances. The time for which a dog can safely be used for search depends on a number of factors, such as:

- a) type, age and sex of breed;
- b) the dog's health condition;
- c) temperature and weather conditions;
- d) training methods applied prior to search;
- e) search pattern;
- f) vegetation;
- g) disturbing or distracting elements (cars, people, insects etc);
- h) rotation arrangements; and
- i) feeding and water requirements.

### **7.3 Primary and secondary search dogs**

If a dog is only used for secondary search, it may well develop a habit of detecting the scent from where the first search dog has sat, rather than the scent from target objects. The second search will then have little value and it may even generate false confidence in the reliability of the first dog. Thus, if two dogs are used as a pair, they should be rotated systematically between the roles of primary and secondary search. This rotation should take place several times per day. This may prevent the dogs from only detecting the scent of another dog.

Frequent rotation of the search dogs may, however, not be sufficient to prevent a dog from adapting the habit of detecting other dog's scent. The dog may still be able to distinguish between its roles as a primary or secondary search dog. During primary search the dog may detect the target objects, whilst during secondary search it may only detect the scent of the first search dog. Unintentional rewarding upon detection of dog scent is the cause for this. In order to ensure that the dog is detecting the target substance in both roles, it must be trained specifically not to detect the dog scent produced during the primary search.

Some organisations have targeted the problem of dog scent detection by training dogs specifically for the role of secondary search. This may prove to have certain advantages since it prevents dogs used for the primary search from adopting the habit of detecting another dog's scent. The primary search dog will always be put to search in boxes that have not previously been searched and thus are uncontaminated by dog scent in these boxes. If a dog is being trained for secondary search only, it is important to teach the dog to overlook indications from other dogs. This is typically done by only allowing the dog to search in boxes where other dogs have been sitting randomly prior to the search training.

## **8 Responsibilities and obligations**

### **8.1 National mine action authority**

The national mine action authority is responsible for the testing and operational accreditation of the dogs/handlers (IMAS 09.42) as well as the accreditation of demining organisations (IMAS 07.30). The national mine action authority should establish a country or area specific standard for the use of mine detection dogs, and provide rules and regulations for internal quality assurance and external quality control. In practice, it has proved difficult to evaluate the search capability of a dog team through visual assessments. Untrained quality control personnel will not be able to determine whether a handler and his dog search well, and according to requirements demanded by national or international standards. A dog may appear to detect the target substance whilst in reality it is unable to detect it. The national mine action authority should therefore consider employing specially trained experts, with skills in assessing and evaluating dogs and handlers. If this is not possible, the national mine action authority should ensure that monitoring staff are specifically trained to monitor and evaluate mine dog operations.

The national mine action authority should also establish a policy for the re-testing of dogs as part of the operational accreditation process as described in IMAS 09.42. It is also recommended that the national mine action authority establishes a written policy for field-testing of the dogs as part of external quality control.

### **8.2 The demining organisation**

The demining organisation shall ensure that:

- a) only licensed dogs and handlers are allowed to undertake live mine/UXO detection;
- b) a management system has been established that is sufficient to support its dog operations. This involves the provision of adequate mechanisms for: logistic support, communication, evacuation, medical and veterinary support for dogs, handlers and other staff, field management, supervision of the demining, reporting/recording and training and re-training of dogs and handlers. General principles for the management of demining operations are described in IMAS 07.30; and
- c) the mine dog team(s) have access to adequate training areas and that the training and test areas are sufficiently prepared to ensure accurate and high quality results from the training and internal testing.

There may be circumstances where no mine action authority has been put in place. Under these circumstances the demining organisation using dog detection shall ensure that a comprehensive SOP for use of dogs has been developed prior to the implementation of the demining programme. The following elements concerning the use of dogs shall be adequately addressed in the SOP:

- a) all operational procedures shall be thoroughly described, including responsibilities of staff, detailed information about the search patterns or drills, marking (internal and external), survey and assessment procedures prior to search, monthly, weekly and daily test procedures of dogs and handlers, veterinary support and health assessment of dogs, vaccination schemes and regular disease prevention, reporting procedures and supervision;
- b) training and re-training procedures.;

- c) a policy on kennel facilities, feeding and general dog care; and
- d) all principles outlined in the IMAS 09.4 series of standards on the use of dogs for detection shall be followed, and adequately addressed in the demining organisation's SOPs.

### **8.3 Site manager**

The site manager is responsible for the overall management and supervision of the demining or verification operation, which may include several different demining capacities, such as mine dog- and manual or mechanically assisted demining teams. The site manager is responsible for the establishment of adequate field management, administration, medical and veterinary treatment, and casualty evacuation. The site manager also has the ultimate responsibility for assessing the security situation in the area of operation, and ensuring the safety of his teams.

The site manager shall ensure that demining is undertaken in accordance with the demining organisation's SOP. If necessary he will cease the demining if there are serious violations to the SOP or if a particular event disturbs the demining or jeopardises the safety of his staff and dogs. A site manager may delegate some of his operational responsibility to an operational manger.

The site manger shall possess adequate skills and experience in planning, managing and executing demining operations. He/she shall also possess sufficient understanding of mine dogs and their skills to carry out his/her responsibility for the correct implementation, accomplishment and supervision of demining operations, including the leadership necessary during emergency situations, such as mine accidents.

### **8.4 Team leader**

The dog team leader is responsible for the dogs and handlers within his dog teams. He/she shall ensure that his dogs and handlers are deployed according to the demining organisation's SOP, and according to additional directions provided by the site manager and the demining organisation. He/she shall also ensure that the dogs and handlers are adequately treated, fed and trained. The team leader normally acts as a supervisor and adviser to the dog handlers during mine dog operations and training. He/she will be responsible for maintaining the dog's performance logbooks.

### **8.5 Dog handler**

The dog handler is responsible for all aspects related to his own dog. He/she may sometimes have several dogs to look after. The dog handler shall ensure that his dog is treated well and according to the prevailing SOP, national and international standards. The dog handler shall hold the necessary skills to train, re-train and operate his/her dog satisfactorily during demining. The dog handler shall also have the necessary skills related to general dog care, medical assessment and basic treatment of the dog. He/she will be responsible for assisting the Team Leader in maintaining the dog's performance logbooks. The dog handler has the ultimate responsibility in regard to making decisions about the dog's suitability for work, rest and rotation requirements, how to approach the search, and whether to stop the search due to unfavourable wind and weather conditions.

Before and during demining the dog handler shall ensure:

- a) that his dog is healthy, lively and capable of searching safely and accurately. Procedures for health control and testing/tuning of dogs prior to search is outlined in clause 4.3;
- b) that the dog's health condition, well being and it's ability to search for mines/UXO reliably during search is assessed and evaluated. If the dog handler suspects that his dog is incapable of searching satisfactory or that the dog is suffering from overheating, dehydration, insect bites or other illness, he shall immediately stop the search and take the dog out of the area for rest and further assessment;

- c) that his dog(s) is adequately fed and that it has regular access to water. The latter is particularly important during hot days when it may be necessary to stop the search frequently to let the dog drink;
- d) that his dog(s) is provided with shade during rest periods in hot weather; and
- e) that the search is undertaken as described in the demining organisation's SOP

## **Annex A (Normative) References**

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid ISO or EN:

- a) IMAS 04.10 Glossary of terms and definitions;
- b) IMAS 07.10 Guide for the management of demining operations;
- c) IMAS 07.30 Accreditation of demining organisations;
- d) IMAS 08.20 Technical survey;
- e) IMAS 08.40 Marking mine and UXO hazards;
- f) IMAS 10.20 Worksite safety;
- g) IMAS 09.42 Operational accreditation of mine dogs; and
- h) IMAS 09.44 Occupational health and general dog care.

The latest version/edition of these references should be used. UNMAS hold copies of all references used in this standard. A register of the latest version/edition of the IMAS standards and references is maintained by UNMAS, and can be read on the project website ([www.mineactionstandards.org](http://www.mineactionstandards.org)). National mine action authorities, employers and other interested bodies and organisations should obtain copies before commencing mine action programmes.

## Annex B (Normative) Quality Assurance Form

The following basic Quality Assurance form has been used in Kosovo. It can be used to develop Quality Assurance forms in other countries

### General

Task dossier number		Date	
QA Inspector		Clearance Organisation	
Team leader's name		Team Name/Number	
Name of area		Nearest Village	
Grid reference			

### Terrain and Weather Conditions

Ground		Weather		Vegetation	
Soft <input type="checkbox"/>	Uneven <input type="checkbox"/>	Clear <input type="checkbox"/>	Cold <input type="checkbox"/>	None <input type="checkbox"/>	Heavy <input type="checkbox"/>
Medium <input type="checkbox"/>	Hillside <input type="checkbox"/>	Cloudy <input type="checkbox"/>	Mild <input type="checkbox"/>	Burnt <input type="checkbox"/>	Medium <input type="checkbox"/>
Hard <input type="checkbox"/>	Open <input type="checkbox"/>	Raining <input type="checkbox"/>	Warm <input type="checkbox"/>	Grass <input type="checkbox"/>	Light <input type="checkbox"/>
Wet <input type="checkbox"/>	Confined <input type="checkbox"/>	Snow <input type="checkbox"/>	Temp. _____	Bush <input type="checkbox"/>	Grazing <input type="checkbox"/>
Dry <input type="checkbox"/>	Sand <input type="checkbox"/>	Windy <input type="checkbox"/>		Crops <input type="checkbox"/>	Agricultural <input type="checkbox"/>
Rocky <input type="checkbox"/>	Residential <input type="checkbox"/>	Calm <input type="checkbox"/>		Forest <input type="checkbox"/>	
Road <input type="checkbox"/>	Termites <input type="checkbox"/>	Wind speed _____		Grass length _____	
Canal <input type="checkbox"/>	Ants <input type="checkbox"/>				
Flat <input type="checkbox"/>					

### Briefing

	Yes	No	N/A
<input type="checkbox"/> Is a site briefing done?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is a visitor's log available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is a copy of the SOP available on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is a logbook for the dog team available on site.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Site layout

<input type="checkbox"/> Is the site layout in accordance with the SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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### Training

<input type="checkbox"/> Have the dogs been evaluated and accredited?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are the dogs periodically retrained and evaluated according to the SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is a record of retraining maintained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are there adequate facilities for daily training/testing			
<input type="checkbox"/> Date of last recorded training.	____/____/____		
<input type="checkbox"/> Date of last internal evaluation.	____/____/____		
<input type="checkbox"/> Date of the last operational accreditation.	____/____/____		

### Preparation for work/clearance operations

<input type="checkbox"/> Are pre-deployment exercises performed before the search?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is there adequate water available for the dogs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is there a shaded area available for the dog teams?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are the dogs being utilised according to the organisations SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is instrumentation available and in use for measuring weather conditions on the site, i.e. wind, temperature, humidity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are the dogs search patterns as detailed in the organisations SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Do the dogs disturb (scratch) the ground when indicating?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Do the handlers ensure that a thorough search is conducted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Do the dogs indicate a find according to the organisation's SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are all indications marked according to SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is the dog reward system applied in a safe manner (no running in uncleared areas?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is internal Quality Control carried out and recorded?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is overall clearance conducted in accordance the written clearance plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Medical Aspects**

	Yes	No	N/A
<input type="checkbox"/> Do the dogs appear to be well cared for and in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are the dog's transport arrangements in accordance with the SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is a medical kit (for dogs and handlers) on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is the medical log book available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is the medical log book maintained in accordance with the SOP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>			

**Equipment**

<input type="checkbox"/> Are the dogs drinking bowls clean and serviceable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are the dog's leashes in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Is the choke chain/collar in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>			

**Medical**

Is the following in accordance with the organisation SOP?

	Yes	No	N/A		Yes	No	N/A
<input type="checkbox"/> Qualified Medic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ambulance present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Ambulance location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stretcher present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Ambulance Driver	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Medical point within 5 min	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Contents of med. Kit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

**Communications**

<input type="checkbox"/> Is there adequate communication with the Organisation's HQ and the field operation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are communications frequently maintained (according to the SOP)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Are communications maintained with the nearest base/Senior Partner (UN etc)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Overall QA Assessment**

**Good**    **Satisfactory**    **Poor**  
                                       

**Comments and recommendations**

**Clearance Team Leader**

Were you debriefed after the QA inspection? Yes    No    N/A  
       

**Team Leaders comments**

<b>QA Inspector</b>		<b>QA Team</b>	
Signature		Date	
<b>Clearance Team Leader</b>		Team Name	
Signature		Date	

QA Team Leader (signature upon delivery to QA office)		QA Office (signature when received from the QA Team Leader)	
Name		Name	
Signature		Signature	
Date		Date	