AiMT Advances in Military Technology
Vol. 9, No. 1, June 2014

Planning Factors in Explosive Ordnance Clearance

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The manuscript was received on 9 April 2013 and was accepted after revision for publication on 23 June 2014.

Abstract:

Downsizing of armies brings the effort to return military premises and facilities back to civilian utilization. Explosive Ordnance Clearance (EOC) is an indispensable phase in the process of decommissioning of exercise ranges. Local authorities, who take over the former military areas, require safe and clean land without any environmental hazard. The left behind ammunition represents the main risk. As a rule, Army is responsible to make any procedures to achieve this requirement. Planning of those procedures is a decisive, even a sensitive factor. Local Authorities insist on the high tempo of clearance process, while units responsible for performing it have to resist of any pressure to speed up their works. This article will bring facts based on the praxis of clearance woks on the former exercise range Milovice, done from 1993 until 2001.

Keywords:

Exercise range, Explosive ordnance clearance, ammunition,

Introduction:

The former exercise range Milovice started as a military facility in 1904, when Austro–Hungarian Government decided to establish an exercise range in the vicinity of garrison towns like Prague, Brandýs nad Labem or Mladá Boleslav. This range ceased its purpose in 1991, when Austro–Hungarian, Czechoslovak, German, Czechoslovak again and Soviet armies made their training and exercises over there. Czech Government earmarked Czech Army to remove the unexploded ammunition (UXO) in 1993.

The former exercise range Milovice is positioned in the vicinity of municipalities Lysá nad Labem, Nymburk and Mladá Boleslav. The close distance from Prague is visible as well. Its position is presented on the Fig 1.

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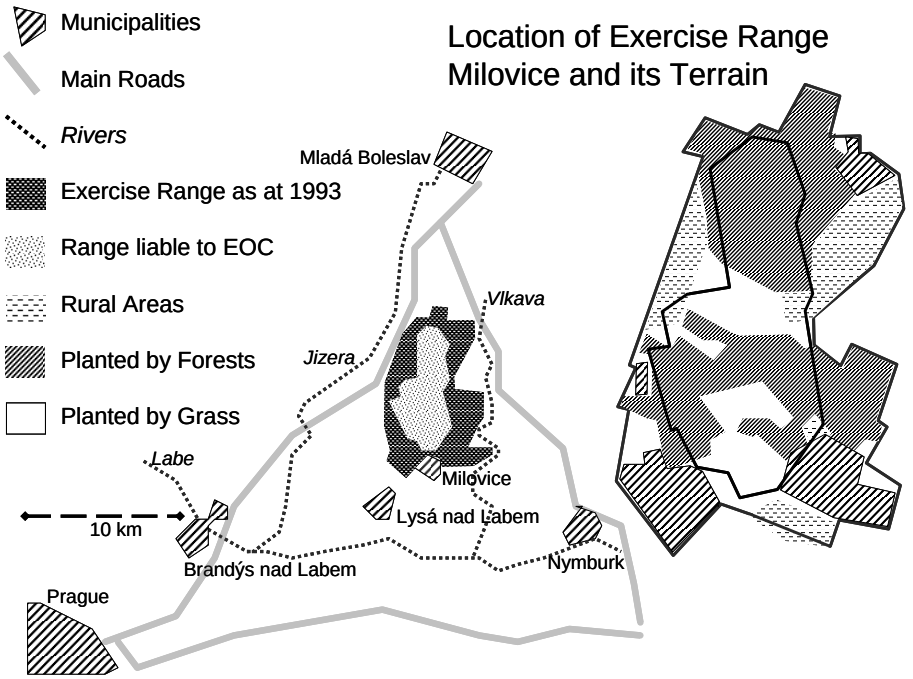

Fig 1 Location of the exercise range Milovice and its terrain

The whole size is about 50 square kilometres and the range liable to EOC procedures is about one half of the size. The sketch on the right shows the character of the terrain. From this pattern is visible, that EOC process should have been performed over forest or grass planted areas while rural land should have been omitted. The time reserved for this works should not have been exceeding four years.

1. The Subdivision of the Range

The Milovice Range was divided by two independent systems. The first one was "inertial", derived from grid system JTSK (unlike Gauss-Kruger of military maps, remember in 1993). The scale 1:5000 was decided sufficient for EOC works and the praxis confirmed it. The layout of numbered map sheets covered all exercise range. Those sheets were split into squares 500 × 500 metres marked from A to Z. Each square was split into small squares 50 × 50 metres, which was feasible for daily procedures connected with EOC works. This "inertial" system and its development are explained on the Fig. 2 on the left side. The administrative subdivision from cadastral areas to plots of land was the second system, cross connected with the "inertial" one.

The example how to utilise both systems is presented on the Fig. 2 on the right. The plot of land belonging to cadastral area Struhy was selected on the top right corner of the Fig. 2, including its position inside map sheets. The next small picture below called "Square Network" shows position of 500 × 500 and 50 × 50 squares. This network was stabilised by pickets. The big squares were marked by geodesy works while the small ones were marked by artillery compass.

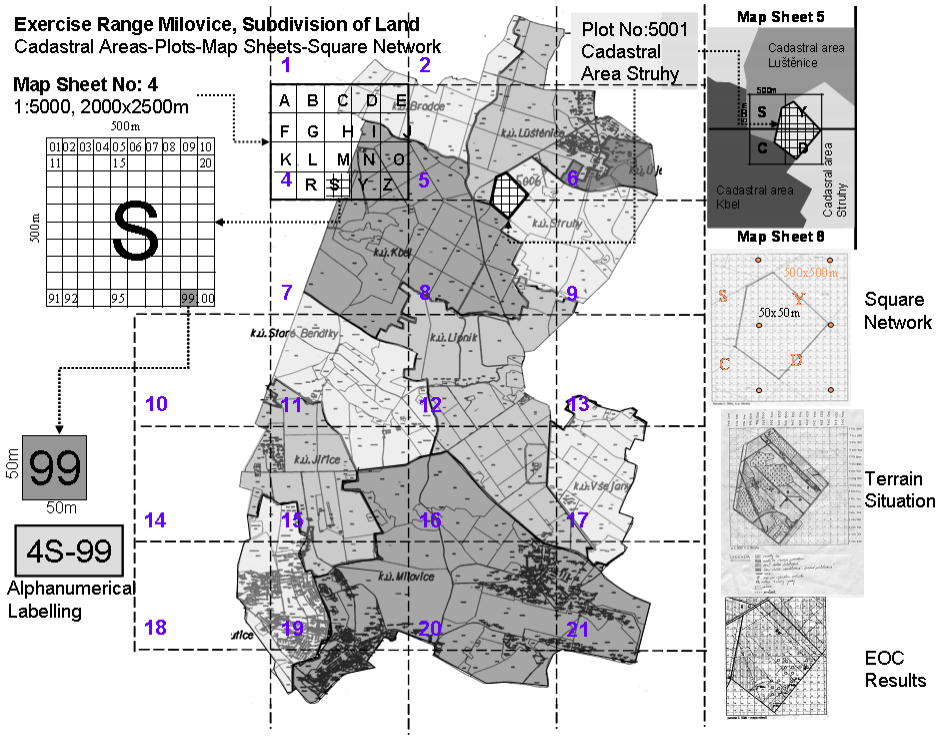

Fig. 2 Subdivision of Exercise Range

The next step marked Terrain Situation was achieved by topographer, who made a detailed map sketch focused on viability. This map was computerized and handed over to commander, whose responsibility to control EOC progress on the particular plot of land. The results are presented on the bottom left picture, where locations of UXO found are marked. The viability was recorded for any future decisions relating any respective land. For instance, newly planted trees compose dense barrier for any movement. Moreover, no cutting of trees was allowed. Those parts of any plot had to be marked in map as exempted from EOC process. The analogical procedure was taken in the case of structure ruins, et cetera. Such objects had to be marked in maps.

This process looks complicated. It requires qualified and skilful personnel. Nevertheless, it brought most important moment for EOC process. Each point, location was submitted to EOC process only once. No other methods, sometimes recommended, sometimes required or applied, brought this result. And its advantage was to speed up the EOC process and eliminated any occasional effect.

2. Planning Factors

Planning of the EOC process depends on the more factors than terrain features indicated in the previous chapter. We have to consider history of range utilisation, character of military exercises and the future exploitation of the territory.

2.1. History of Range Utilisation

The exercise range Milovice was established in 1904. The vicinity of Prague predestined this range for headquarters' units deployment. The difference brought German army during WWII, when antitank troops were trained here. Headquarters' units were trained in the small arms fire on the areas of the limited size. On the other hand, antitank troops were trained very intensively and the map recording their positions confirmed it.

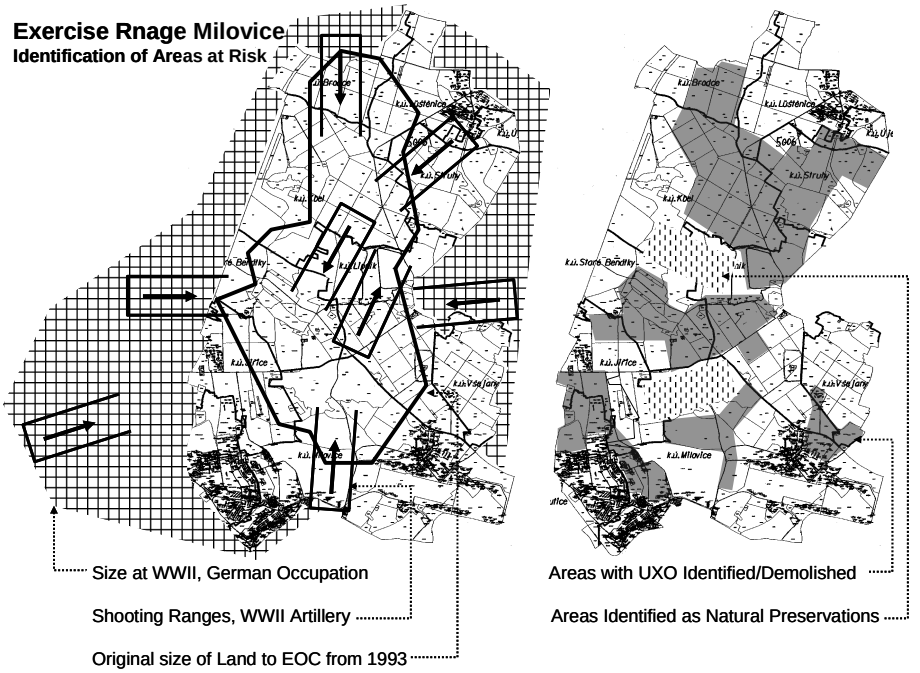

Fig. 3 Identification of Areas at Risk

Fig. 3 presents the utilisation of the exercise range during WWII on the left and density of antitank firing ranges. From this figure is visible that the size of the range was almost twice bigger than at present. The difference between area liable to EOC from 1993 (compare to Fig 1) is significant. On the basis of this material the Army decided to extend EOC process. The cleared areas are visible on the Fig. 3 on the right. They are visible on the north part of the exercise range, in the middle of it and separate areas in the vicinity of municipalities on the south. The interesting thing was that substantial parts of the target areas were designated as natural preservations. Those parts of the range were surveyed visibly without disturbing of vegetation cover.

All cleared parts correspond with locations of German firing ranges[†]. The most exposed land was in the north east part of the range (around inscription "kú Struhy" on the map). Not only German firing range was witnessed here, but air drop bomb range

[†] *The EOC unit was not allowed to exceed current boundary of the exercise range and thus big parts of the territory (marked cross line) exposed during WWII was not cleared.*

after WWII was recognized. The Fig. 3 presented very important fact: to recognize history of the area to be subject of the EOC procedure can simplify planning and makes its presumption reasonable and reliable.

2.2. The guaranties

The guaranties are most disputable aspects while EOC process has been decided. Many people consider themselves experts and try to intrude into methodology and technology of EOC works. This subchapter tries to explain how to assess this question. The guaranties are derived from two requirements:

The first one is not to omit any part of area at risk. The Fig 1 presents the process how to divide the whole land. Each square 50 × 50 m is located in field as well as in map definitely. The movement of EOC group is stabilized by textile ribbons establishing strips at width 2÷2.5 m and a length 50 m. The operator and his commander were responsible to cover each part of the marked strip by detector.

The second requirement is related to thickness of the surface layer to be cleared. The exercise range Milovice was determined to be cleared up to 30 cm in forested plots and up to 50 cm in rural plots. Later on this requirement was changed and 10 cm on any area was established. The original reason of this change was the effort to speed up the tempo of EOC works.

The praxis made an evidence of incorrectness of any "administrative" decisions in this matter. The correct decision is based on three assumptions: The former utilisation of land for military purposes, the future utilisation of land and the real capability of EOC tools including manpower and instruments.

To dispute a tempo of the EOC works, the most important fact – having been permanently confirmed – is that **decisive factor is how frequently is to dig, not the depth of digging**. The next graph makes evidence. The tempo is assumed for 10 personnel. The quality of the surface to be cleared is divided into a forested, rural and built-up area, where municipal greenery should be inspected. The horizontal axis of graph indicates the average number of objects caught by the metal detectors and the reciprocal item the size of the land per one object. There are objects contaminating land and restricting factors and on the bottom of graph.

To take a ratio AMMO/waste objects into account, a forested land is characterized from 0.5 % to 1 %, rural land less than 0.5 % and municipal greenery cannot be quantified by the respective ratio.

To determine the thickness of the layer to be cleared, it is necessary to recognize the calibre of ammunition used during military era. The bigger calibre the better detectability is presumed. The exercise range Milovice was used by infantry units mainly with exception of the WWII, where anti-tank artillery was trained. So the decisive era for EOC process was the WWII. The most frequently unexploded ordnance found was armour piercing projectiles of calibres 37 mm, 47 mm, 75 mm. Their mass varies (in the same sequence) about less than 1 kg, 1.5 kg and 7 kg. The detectors can indicate them on the distance from 0.5 to 1.5 meters. Antitank fire is aimed on the visible target at blank point range. From this fact is to assess that the projectile trajectory is sub-parallel to ground and its penetration cannot be anticipated. And the experience confirmed the reality when the projectiles were found inside of the vegetation cover regularly. From this experience the requirement of the 10 cm was proven reasonable. However, this regulation was ignored in the plots affected by air bombing, of course. The air dropped bombs were detected at depths more than 2 m.

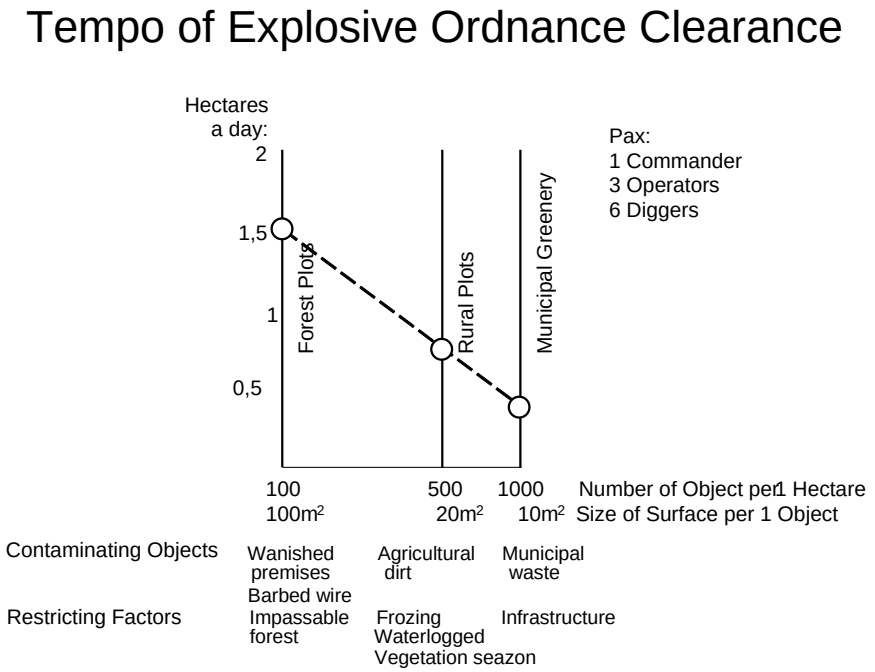

Fig. 4 Decisive factors affecting the progress of EOC

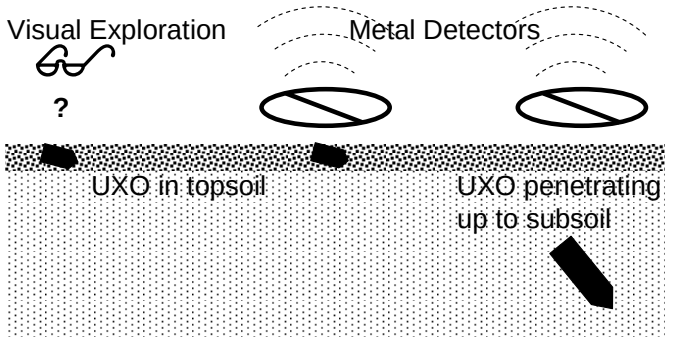

Fig. 5 Basic methods to indicate UXO

The guaranties have to be achieved the appropriate technology of EOC works, called a method. From the above mentioned aspects it is possible to express that there are three basic methods to achieve the required quality, as presented on the Fig. 5.

Visual exploration: This method is frequently used in the framework of the firing exercises finalisation. The unexploded projectiles shall be found and demolished. But this process cannot be considered an EOC method as firing range is still military property. While applied this method for EOC process, the result indicated failure. The reason was that each object regardless of origin becomes a part of the vegetation cover in the short time.

Metal detector and objects in the topsoil: The reasonability of this method was justified above. The decisive criterion to use this method is the evidence of firing at

blank point range. But this method cannot be applied on the rural land, where the topsoil is cultivated seasonally.

Metal detector and objects penetrating the topsoil: This method is applicable in regions, where heavy munitions were dropped or indirectly fired. Namely air dropped bombs can be detected at depths about 2 or more metres and excavators shall be used.

3. Conclusion

The article described and justified the methods of the EOC process on the example of the former exercise range Milovice. It was emphasized, that military history and the future utilisation has to be identified so the EOC process could be done successfully. The guaranties should be derived from the first principle "not to omit". The proper subdivision of land has to be applied. The time necessary for EOC works could be derived from Fig. 4 directly. The method of detection can be derived from Fig. 5. Not to forget that visual exploration of UXO when the EOC process has been in progress is not effective and was applied only for plots determined as natural preservations.

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