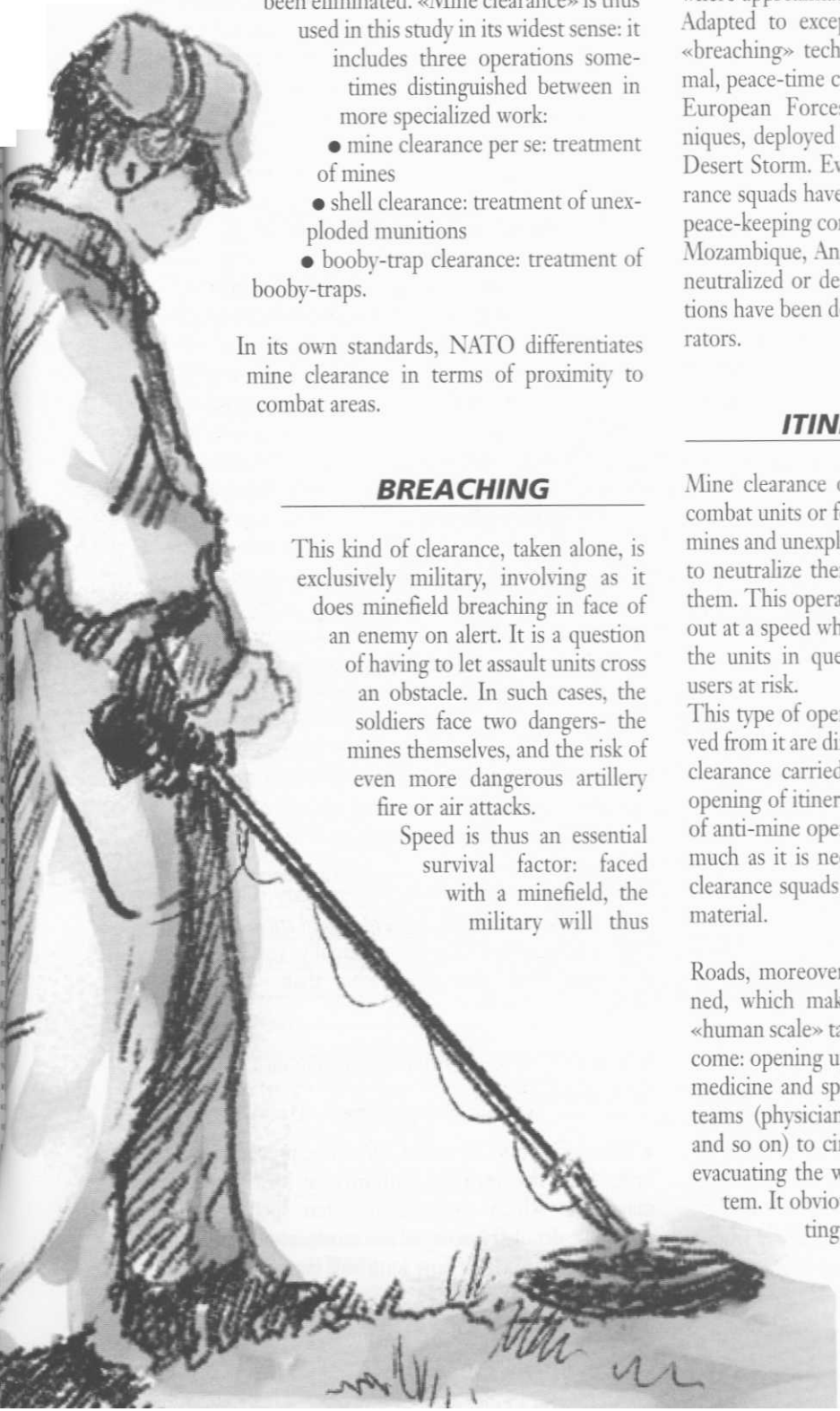
Mine clearance

1. TYPOLOGY OF MINE CLEARING OPERATIONS

Mine clearance consists in returning a mined area to normal: for that, all dangerous objects are to have been eliminated. «Mine clearance» is thus used in this study in its widest sense: it includes three operations sometimes distinguished between in more specialized work:

- mine clearance per se: treatment of mines
- shell clearance: treatment of unexploded munitions
- booby-trap clearance: treatment of booby-traps.

In its own standards, NATO differentiates mine clearance in terms of proximity to combat areas.



BREACHING

This kind of clearance, taken alone, is exclusively military, involving as it does minefield breaching in face of an enemy on alert. It is a question of having to let assault units cross an obstacle. In such cases, the soldiers face two dangers- the mines themselves, and the risk of even more dangerous artillery fire or air attacks.

Speed is thus an essential survival factor: faced with a minefield, the military will thus tolerate mine casualties in order to gain time on enemy artillery or aviation.

The military have thus developed a number of mechanical or hand methods for breaching according to standards adapted to their particular needs and above all to the war-time situation: i.e., in a very particular context where approximate results are acceptable.

Adapted to exceptional, war-time conditions, many «breaching» techniques are non-transferable to normal, peace-time circumstances.

European Forces have specific «breaching» techniques, deployed by British and French forces during Desert Storm. Even so, European military mine clearance squads have put their know-how into practice in peace-keeping contexts (former Yugoslavia, Cambodia, Mozambique, Angola, etc.). In fact, virtually all mines neutralized or destroyed on behalf of civilian populations have been done so by military or ex-military operators.

ITINERARY OPENING

Mine clearance operators need to open the way for combat units or for support logistics units by detecting mines and unexploded projectiles so as to be able either to neutralize them, to destroy them, or else to avoid them. This operation obviously will have to be carried out at a speed which is compatible with the advance of the units in question, without however putting the users at risk.

This type of operation, then, and the techniques derived from it are directly applicable to operations of mine clearance carried out in peace-time conditions. The opening of itineraries is considered to be the first type of anti-mine operation needing to be carried out, in as much as it is necessary to be able to bring the mine clearance squads into the mined area along with their material.

Roads, moreover, are delimited surfaces, clearly defined, which makes it possible to think in terms of «human scale» tasks with immediately appreciable outcome: opening up a mined area allows help (foodstuffs, medicine and spare parts) to be brought in, specialist teams (physicians, agronomists, civil security forces, and so on) to circulate and access to be provided, for evacuating the wounded, to the national hospital system. It obviously has a most psychologically liberating effect.

Unlike military mine clearance, which by definition is a short-term operation, civil mine clearance along a route needs to take into account all the public works which have to run along the route itself.

- running transmission lines,
- running telephone lines,
- cutting drains,
- road widening,
- road maintenance works,
- roadside clearance.

Itinerary opening must therefore extend sufficiently deeply, according to the current local standards, to avoid having to recommence mine-clearance operations in case of further works being undertaken on or along the route.

STRUCTURAL MINE CLEARANCE

Military mine clearance operators have to clear a given area of mines and unexploded projectiles so as to enable it to be continuously used by redeployed forces and possibly also by the civilian population. This operation, which they call «area depollution», is usually carried out outside of the combat zones and does not involve the same need for speed. On the other hand, it does require maximum efficiency so as to avoid all loss of life or serious injury.

As applied to peace-time mine clearance, «area depollution» becomes what is known as «structural mine clearance»- an essential preliminary phase before rehabilitation and, even more, to the development of an area which has been subject to war.

The clearance of infrastructures (industrial, but equally tourist, sites), will provide both a moral and a material relief to the local population via the resumption of economic activities. It is by definition kept within a limited area- which on the one hand limits the work to be done, but on the other hand means that there will be constant coming and going and that absolutely nothing can be allowed to be overlooked.

PROXIMITY MINE CLEARANCE

The purpose of proximity mine clearance is to give a rural populations the means to recover normal living conditions. It requires active participation of the populations and of local personnel trained in mine-clearance schools, and supervised for long periods of time by expatriated experts (usually drawn from NGO's).

Clearing mines from broader areas, particularly where these are not clearly delimited in any way (e.g., areas of agricultural activity and everyday life), the size of the area under treatment makes it difficult to estimate just what is involved in the job and illusory to envisage subsequent verification This type of operation is literally «interminable», so that it is a basic requirement that, whatever organization sets out on such a task, there is from the outset the assurance of it being properly taken over by locally based structures

Civil mine clearance (depollution of roads and of areas) should make possible the recovery of confidence. wiping out, partially or totally, the feeling of «anticipated terror» is in itself already a huge step: with this in view, it can often be a good idea for the mine clearance operators themselves to move around on foot or in lorries in the cleared area, so as to inspire a feeling of trust on the part of the local people in the quality of the work which has been carried out there.

2. MODES OF DETECTION

USE OF TOPOGRAPHICAL MINEFIELD REPORTS AND SURVEYS

Among the clauses of the 1918 Armistice was the obligation for the imperial German Army to give the Allies maps of the minefields they had laid in France and in Belgium. The lack of precision in those maps delayed and impaired the neutralization of those minefields.

Such a bitter experience ended up in a war tenet prevailing de facto in all major powers in the inter-war years, as the world's greatest armies were getting equipped with registering and plotting devices. «For any combatant, a non-registered minefield is like one of the enemy's minefields.» Hidden Killers, Report from the State Department with American Congress. The drafting of precise reports and topographical surveys are nowadays provided for in Protocol II of the 1980 Convention on «inhuman weapons».

Theoretically, strictly abiding by military rules should make possible the depollution of mined zones thanks to minefield surveys; the Army actually refers to that action as «mine plotting», rather than «mine clearance»

The NATO STANAG 2045 agreement clearly defines those standards:

- The decision to lay mines should be preceded by an order from the qualified Authority (at least a brigade major), in which approximately ten specific items should be detailed (nature of the mines, zone where the mines should be laid, how long will the mines remain

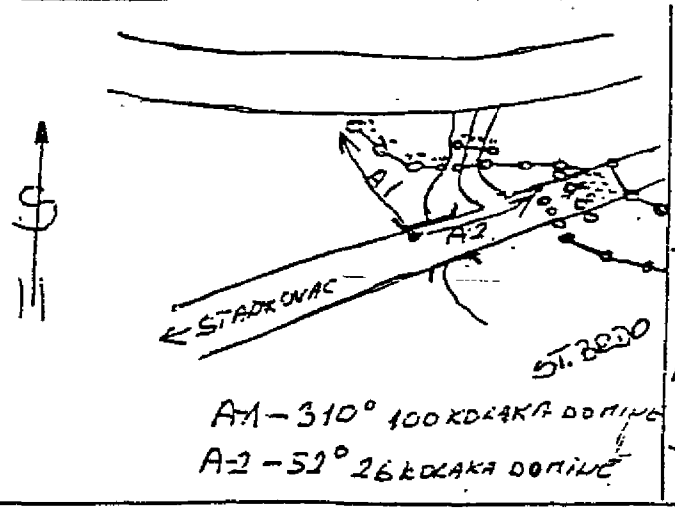
Beg. broj --
Serija --

ZAPISNIK MINSKOEKSPLOZIVNE PREPREKE (MEP)

Karta DIVAČ R 1: 50000 List broj ..... koordinate X 32100 Y 86300

Izdanje .....

A — PODACI O IZRADI



A1 – 310° 100 KORAKA DOMINE
A2 – 51° 26 KORAKA DOMINE

Orijenturne tačke

POČETAK OGRADE SA LEVE STRANE MOSTA

Raspored MES po redovima-grupama

TENKOVSKE MINE SU POSTAVLJENE U 3 REDA P.P. MINE U DVA REDA RAZMAK IZMEĐU REDOVA JE 10 KORAKA

1. Vrsta MEP - količina upotrebljenih MES:
PMA-3 45 KOMADA PMR-2A 39 KOMADA
TMA-3 17 KOMADA

2. Način izrade MEP: RUČNO, TMA-3 PMA-2 SU UKOPANE A PMR-2A JE POSTAVLJENA NA POTZ I OBEZBEĐENA SA PMA2

3. Broj redova (grupa) u MEP-količina upotrebljenih MES po redovima-grupama:
TRI REDA TMA-3 A PMR-2A I PMA2 U DVA REDA

4. Podaci o prolazima u MEP: NEMA PROLAZA

Rađeno u 4 primeraka i dostavljeno:
1. orig. K-DANU 1 BR TO
2. prim. K-DANU 1 BAT
3. prim. K-DAN PIONIRSKOG VODA
4. prim. ŠTO GUNJA

Datum izrade: 18.01.92

JEDINICA: PIONIRSKI VOD

Izradom rukovodio .....

Izmene i dopune izvršio: .....

i izvestio: ..... dana .....

B — PODACI O RAZMINIRANJU

1. Način razminiranja: .....
2. Ko je naredio razminiranje: .....
3. Količina i vrsta MES (izvađene-uništene): .....
4. Kome su predata izvađena MES: .....
5. Jedinica koja je izvršila razminiranje: .....

Razminiranjem rukovodio:

.....
(čin, ime i prezime)

Datum: .....

Exemple de compte rendu de pose
(Croatie centrale) 1992

active and such...) and the instructions on how to write reports should be repeated.

• The next step is the writing of a «report on the intention to lay mines» and the «provisional report upon completion of work», two similar documents that state again part of the order and give a preliminary topographical description of the minefield, especially the «courses» and the «corridors».

• The most critical report, called minefield «detection plan», is subsequently established. It consists of a detailed standardised form (front) and a detailed map using standardised symbols (back).

Fake minefields are subjected to those reports just like real minefields (manoeuvre, harassment and protective). STANAG does not provide for the laying of mines into a fake minefield, however according to one Italian reserve, «fake minefields should always contain a few real mines.»

Topographical surveys often turn out to be useless due to their lack of precision.

• **for technical reasons:** automatic scattering modes (by aircraft, rockets or shells) are not suitable for plotting accurate surveys.

• **for weather-related reasons:** sand winds, flooding and massive snow-falls may shift the devices, most of which are water- or sand-resistant.

• **for historical reasons:** several mine-laying episodes may have taken place consecutively in the same field etc.

DETECTION OF LAND MINES

Detection of the mines by mine-clearing teams is therefore necessary. As a matter of fact, when their own safety comes into play, the mine-clearers do not trust others.

Of all stages, the detection of the mine is the longest, the most complex and the most dangerous stage, because it involves progressing in an unknown and mined environment. However, after delimiting the zone to be treated, it is essential that each device be located.

DETECTION BY SIGHT AND TOUCH

Examining a suspicious zone may provide a series of clues to conduct spotting operations. As do all human activities, mine-laying usually leaves definite marks within any given environment.The senses of touch as well as sight have to keep alert, as track-wires are almost invisible and any resistance must be promptly interpreted. The bomb-disposal experts may want to gently brush a suspicious spot with their hand prior to moving forward.

POMZ 2M (USSR)

Most mines handled by mine-clearing squads are located by the manual method. What is meant by «manual method» are the two methods already used in World War II, they are both very slow and tedious: they are **probe work and magnetic detection**.

PROBE WORK

Probe work requires that the mine-clearance agent progresses on his knees and probes each square inch of the ground in an attempt to detect any item that could have certain similarities with a mine. Each agent clears an 80 cm (2 feet 10») wide corridor. Teams of three agents are usually constituted, and three reserve agents keep ready to relieve their counterparts.

An agent should be relieved every 40 minutes. According to the norms of a western army, a team of probing agents will clear a 2.40 by 100 m (8 by 300 feet) corridor in two hours (which is 30 to 60 square meters per hour by agent).

Prodder work

In the best possible case, the progression of such work is therefore as slow as that of an individual on his knees. It is fairly reliable, although it may be defective in treating some specific devices:

- mines with a specific oscillating pressure plate
- mines with a chemical firing system
- mines buried at a particular angle

Probe work is well suited to soft grounds (sand and damp soil) but gets extremely tedious in the case of hard, rocky or frozen grounds. As a matter of fact, the harder the ground, the more dangerous the operation: the U.N. points out that mine-clearance can be safely conducted for months in Cambodia (where the ground is very damp) whereas one week seldom goes by without an accident occurring in Afghanistan (hard barren ground). It is advisable to make sure that the probing operators do not carry any metal object that might trigger a magnetic mine.

MAGNETIC DETECTION

Magnetic detection consists in searching with portable detectors (magnetometers) the metal parts of the mine (casing, parts of the mechanism, etc...) Mine clearance is no faster than human pace. While such systems are efficient in those areas where ancient, metal mines were used, they may fail to detect more modern, non-metal mines (approximately 10% of all).

The Afghan programme chiefly uses manual mine-clearance methods. The basic team is divided into 4 sections. Each section has 3 opening units under the supervision of a section leader. Dogs and flail-equipped vehicles are sometimes used as a complement.

Today we can look back overalmost 10 years and give an approximate evaluation of the progression of mine clearance.

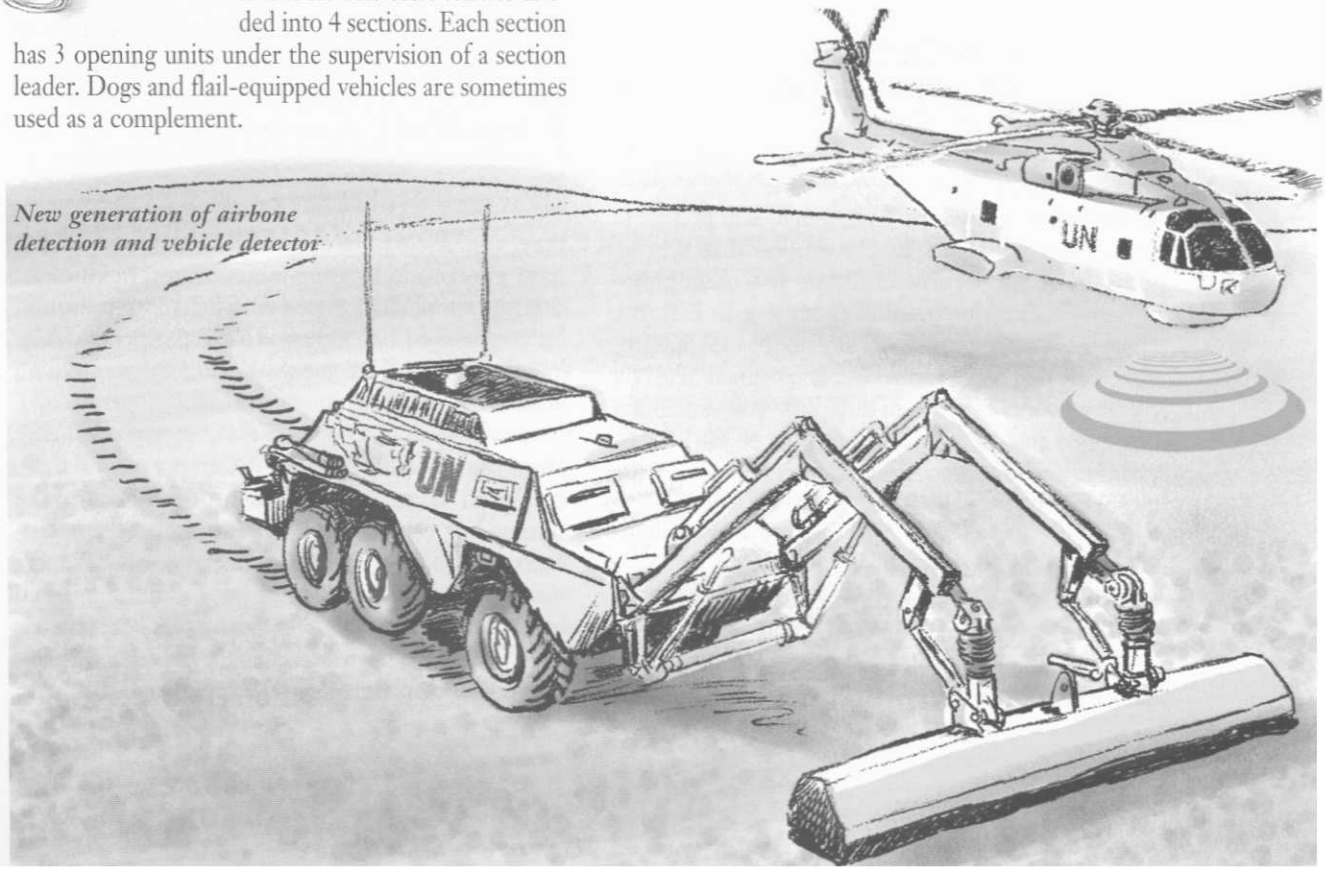
In Afghanistan, it was estimated that a team consisting of thirty experts could clear daily up to:

- 2 500 to 5 000 sq.m in an easy ground
- 1 500 to 2 000 sq.m in an average-difficulty ground
- 800 to 1 200 sq.m in a difficult ground

However, these figures may be greatly modified depending on the density of the metal objects present on the ground (either dangerous or harmless).
Planning is usually based on the estimation that a mine-clearing team will clear between 300 000 and 400 000 sq.m per year. **(See appendix 6, page 77, «The limits of magnetic detection»).**

SEARCHING FOR NEW MODES OF DETECTION

The unsatisfactory results achieved so far (and expected to be achieved), plus the prohibitive cost of the operations put the focus on research and development which will hopefully be able to provide fast substitute methods with high levels of safety, accuracy and profitability. Technology has been progressing so slowly in the area of mine detection since the development of non-metal mines that research today merely consists in exploiting concepts from other scientific areas. Many scientific discoveries formerly tested in other areas should help achieve the following objectives:



New generation of airbone detection and vehicle detector