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Explosive Remnants of War in the Republic of Croatia

Explosive remnants of war represent a constant threat to normal life and activities of the population living in mine-affected areas in the Republic of Croatia. The author considers the extent and impact of unexploded ordnance and other ERW contaminating the country as a consequence of military operations between 1991 and 1995.

by Dražen Simunović [Croatian Mine Action Centre]

Until recently, the ERW problem in Croatia was addressed simultaneously during demining projects. Records show pieces of UXO were found almost five times as frequently as mines. This disparity between UXO and mines is a result of numerous pieces of UXO being collected in landfills that were mine and ammunition depots before the war. During the war, several Serb rebel houses in the Vojnić municipality were also used as ammunition depots. These landfills and depots represented a great threat to locals in the heat of the conflict. For example, while retreating, rebels blew up these depots along with ammunition—ERW was scattered within a radius of 2,000 metres (2,187 yards). A more drastic example was the ammunition and mine stockpiling by Serb rebels in a local Catholic church in Voćin (western Slavonia) that was entirely devastated due to detonation. ERW contaminated the wider area of Voćin city. Other classic examples of ERW locations included the Volinja depot in the city of Volinja and the Logorište military barracks near Karlovac.

Between 1996 and 2005, personnel removed UXO from the following exploded ammunition depots:

- Oštarije (1996)
- Voćin (1999)
- Vojnić (2003)
- Bović (2004)
- Udbina (2004)
- Volinja (2004)
- Logorište (2005)

More than 100,000 pieces of UXO were found at these depots.

ERW have generally been found in populated places, settlements in the vicinity of towns, villages, forests and confrontation lines. Based on reports from locals, ERW were also detected in areas that were either subject to artillery activities or targeted with aerially deployed bombs and cluster munitions. Most of the ERW were found in the vicinity of ex-Yugoslav Army facilities. According to the Croatian Mine Action Centre,¹ minefield records and information gathered, a variety of mines were found. The quantity, level of threat for the local population and clearance effort associated with each vary.

Mine and UXO Contamination Analysis in the Republic of Croatia

Based on the publication of the Geneva International Centre for Humanitarian Demining, *Explosive Remnants of War (ERW)—A Threat Analysis*,² the factors affecting overall ERW threats are:

1. The type of conflict (e.g., international versus civil war)
2. The number of forces involved
3. The tactics used by the warring parties (e.g., use of air power rather than ground assault)
4. Types of weapon systems deployed
5. The duration of conflict
6. Ammunition expenditure
7. Failure rate of ammunition used
8. Terrain (soft, wooded areas will generally lead to more failures than concrete, urban areas)
9. Population density
10. Population movement in contaminated areas
11. Population awareness
12. Progress of clearance operations

The text below presents mine- and UXO-contamination analysis for the Republic of Croatia. Each of the items on the above list is described in more detail.

Details of the Conflict

The conflict described is widely known as the Croatian War of Independence or to others as the Homeland War. The basic premise behind the conflict was Croatia's desire to be a full, self-sufficient republic after being oppressed by the Communist ties of the former Yugoslavia. This attempt at independence was met with resistance by Croatian Serbs, who felt that this new republic would be a threat to them since in this new state, they would be considered minorities; therefore, Serbian rebels, with the aid of the *Jugoslovenska narodna armija* (Yugoslav People's Army), fought against the newly formed Croatian Army to determine control over the country. The conflict lasted from 1990 until 1995 with the Croatian government ultimately claiming victory over the rebels and the JNA.³

The types of weapon systems deployed during the conflict include (see story below for specific information):

- Small arms
- Cannons
- Howitzers
- Self-propelled guns (76-mm Hellcat, 90-mm M36, etc.)
- Mortars (60 mm, 82 mm, 120 mm)
- Rocket weapons (including cluster munitions)
- High-explosive anti-tank (HEAT) rockets
- Aircraft bombs and rockets (including cluster and "dumb" bombs)
- Air-to-ground rockets
- Anti-aircraft rockets

Mine Situation in Croatia

Between 1998 and 2001, records indicate 1,659 demining projects covered a total area of 160,216,393 square metres (62 square miles) of land. The projects found 17,765 anti-personnel mines, 13,030 anti-tank mines and 144,152 pieces of unexploded ordnance.

The Republic of Croatia consists of 21 counties and the city of Zagreb. Twelve counties are within a mine-suspected area, totaling 1,147 square kilometres (713 square miles) of land. Around 1.1 million inhabitants are directly endangered within the MSA; one in five inhabitants is threatened by a possible accident within the MSA.

ERW that has been located and removed and remaining ERW are placed in micro-

locations within the MSA: Surfaces where ERW has been detected are smaller, at present totaling approximately 500,000 square metres (124 acres).⁴ Approximately 30,000 people live near locations still contaminated with ERW.

Progress of Clearance Operations

One of the issues on the third international symposium⁵ organised by the Croatian Mine Action Centre and Centre for Testing, Development and Training Ltd., held from April 24–26, 2006, in Šibenik, Croatia, was UXO detection at depths over 20 centimetres (8 inches).⁶ This is an important concern for safely carrying out construction activities in certain areas where it is necessary

Ammunition Expenditure/Failure Rates



An unexpected KB-1 submunition, such as this one found in Croatia, poses a high risk during the removal process. ALL PHOTOS COURTESY OF CROMAC

Small-arms ammunition (≤ 14.5 mm). Most of the ammunition was originally packaged and represented a small threat to locals. Little effort was needed to remove and destroy them. According to the official statistics from the CROMAC database, eight persons have been wounded by this type of ammunition since 1991.

Pyrotechnics (smoke, flares). Pyrotechnics represented a small quantity of the findings and a medium-level threat⁷ for locals, and little effort was needed for their removal and destruction. The most common pyrotechnics found were the nuclear-blast simulator/INE,⁸ signal M58 P1 cartridge and cannon blast simulator. Two persons have been wounded since 1991 by these munitions.

Cannon shells and artillery projectiles (> 14.5 mm). A medium quantity of almost all types of artillery cartridges and projectiles (shells and shots) was

found in the Republic of Croatia, representing a huge threat for locals. Their removal, dislocation and destruction were of medium risk. Two persons have died from this type of ammunition and six have been wounded since 1991.

Submunitions. Attacks deploying submunitions occurred in 1991 (around the Vransko lake area, Gospić and Maslenica) and in Zagreb in 1995. The most commonly used submunition was the deadly KB-1, produced by Yugoslavia. Between 33 and 66 percent of the submunitions were found; high risk is involved for their removal. Eleven persons have died and 19 have been wounded by this type of submunition since 1991.

Hand and projected (rifle) grenades.

These grenades are common in the Republic of Croatia. They represent a huge threat for locals. It takes medium risk for their removal, transport and destruction. Thirty-three people have died and 66 have been wounded from this type of UXO since 1991.

Mortar ammunition. A huge quantity of mortar ammunition was found because it was used for destroying targets up to six kilometres (four miles) away—the range between parties to the confrontation. This type of ERW represented a high threat because it included a certain number of unexploded mortar HE shells that usually were 60-mm, 82-mm and 120-mm caliber. These require a very high risk for removal and destruction and represent a medium threat for locals. One person has died from this type of UXO and 14 have been wounded since 1991.

Free-flight rockets (ground-to-ground and air-to-ground). These rockets were found in medium quantity and are a huge threat for locals, although their destruction is relatively easy. Six persons have died from this type of UXO and 15 have been wounded since 1991.

Guided missiles. A small quantity of guided missiles was found, but they represented a huge threat for locals as it takes a medium risk for their destruction.

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Projectiles 90 and 105 mm, fuze for shell, rocket mortar and PD M51A5 fuze found in Logoriste.



Cannon shell, mortar ammunition 82 mm and ammunition 30 mm found in Logoriste.



120-mm mortar HE shell (depth 5–10 cm) found in Logoriste.



ERW on the surface of an exploded ammunition depot.



Cannon shells and artillery projectiles of various different calibers.

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No victim has been registered from this type of UXO since 1991.

Aircraft unitary bombs. These bombs were found in a medium quantity and represented a huge threat for locals. It takes a moderate amount of risk for their destruction. Most aircraft unitary bombs are found in exploded ammunition depots in Volinja, on the border between Croatia and Bosnia-Herzegovina and at the former military airport in Udbina, Croatia. In most cases, aircraft unitary bombs were found individually.

Anti-personnel mines. AP mines were found in large quantities during demining. According to the CROMAC database, since 1998, 17,765 such mines have been found and destroyed. They are highly risky to remove and create a daily threat for the local population.



Dražen Šimunović, B.S., is currently working as a UXO specialist at CROMAC. A native of Konjic, Bosnia-Herzegovina, he has been teaching students about demining and UXO at Polytechnic College Velika Gorica in Croatia since 2005 and also at the Police Academy in Zagreb since 1995. After graduating from Military University in Zagreb in 1987, he worked as a military engineer in Konjic for six years and then as a professor at the Croatian Military Academy "Petar Zrinski."

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to first survey the ground to large depths (usually up to 4 metres [13 feet]). In some of these survey areas, cannon shells may have been dropped, which represents a threat to the local population.

Also discussed were specific problems related to UXO and ERW laid within mine-suspected areas in the Republic of Croatia.

During the symposium, the following guidelines were agreed upon to improve detection and removal of UXO:

- Improvement of legislation concerning UXO
- Definition of space and location for which some indications on UXO at depths of over 20 centimetres (8 inches) exist
- Application of new methods, operating procedures and devices
- Improvement of safety measures

- A database that includes information on types of UXO found, the amount collected, location of the UXO, methods used to retrieve them and methods of their destruction.

From 2003 to 2005, CROMAC surveyed the land and concluded that 1,174 square kilometres (453 square miles) of Croatia were contaminated with mines and UXO. Included in this area, CROMAC classified 121 towns and areas within 12 counties as suspected of being within the vicinity of mined areas. As of January 2006, Croatia reduced that number to 1,147 square kilometres (443 square miles) as being contaminated with mines. There are still an estimated 155,198 anti-personnel mines and 88,078 anti-vehicle mines that need to be demined. Fortunately, pieces of UXO are not too threatening to the community as they have been well-marked and made recognisable to the public. Croatia is now working towards a goal of clearing 346 square kilometres (134 square miles) of mine-contaminated land by the end of 2009. This goal is subject

to change due to the speed of demining activities, which varies depending on the availability of funds, the cost of demining, and capacity.

Conclusion

The ERW problem has not yet been successfully solved in the Republic of Croatia. It is important to point out that all projects for ERW removal in Croatia require considerable funds to fulfil capacity requirements, equipment-procurement needs, work methodology and other expenditures. From the knowledge and experience gained so far, Croatian explosive-ordnance-disposal professionals are able to apply their expertise to other ERW-affected countries. Professional personnel dealing with ERW are CROMAC employees as well as employees of the Ministry of Internal Affairs and Ministry of Defence. The Republic of Croatia, and CROMAC specifically, will be working to solve the ERW problem as a part of the broader humanitarian-demining issue. ♦

See Endnotes, page 110

News Brief

"Devil's Garden" Cleared of Explosive Debris

The thousands of landmines, unexploded and abandoned ordnance, and booby traps located in minefields around Bagram, Afghanistan, have been successfully cleared. During the effort, two deminers were accidentally killed by mines booby-trapped to hinder clearance.

Termed the "Devil's Garden" because the area was considered to have the most dangerous minefields in the world, the land is now being used by 72,000 refugees and thousands of internally displaced persons for agriculture, habitation and commerce.

The HALO Trust conducted clearance of the minefields with financial support from the U.S. Department of State. Clearance operations began in December 2001 and cost nearly US\$5 million. Additional funding was provided by Roots of Peace and the governments of Germany, Ireland, Japan, the Netherlands, Norway, and the United Kingdom.