July 2011

The Bosnia and Herzegovina Mine Action Information System

Zoran Grujic
Bosnia and Herzegovina Mine Action Centre

Follow this and additional works at: https://commons.lib.jmu.edu/cISR-journal

Part of the Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

Recommended Citation
Available at: https://commons.lib.jmu.edu/cISR-journal/vol15/iss2/20

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
comprehensive knowledge to inform strategic decisions, coordination and prioritization of the high-risk tasks. The initial configurations performed on the system and the data quality itself will help fulfill the overall objective of efficient land release.

While IMSMA™ can effectively support land-release information management, it should remain clear that it is effective management of information that is fundamental to support land release.  

**see endnotes page 81**

---

**News Brief**

The New York Times recently reported that pro-Gaddafi forces are using cluster munitions on the civilian population in the city of Misrata.1 Human Rights Watch’s on-the-ground inspection discovered the use of Spanish-made MAU 120/250mm mortars produced in 2007, prior to Spain’s signing of the Convention on Cluster Munitions.2

A further interview with ambulance drivers conducted by HRW discovered that cluster attacks occurred before 14 April 2011.3 Despite the Libyan government’s denial of cluster-bomb use, doctors in Misrata acknowledge that patient wounds are consistent with cluster munitions.4 HRW described the damage of these munitions as anti-personnel, as well as anti-material, because the munitions are designed to not only hurt people but damage armored vehicles.5 Libya is not a signatory of the CCM. [See endnote page 81]  

—Ignatius Fancheria, CIDR staff

---

**The Bosnia and Herzegovina Mine Action Information System**

**T**he life and blood of a mine-action program is the information system. It is one of the most critical, yet frequently used mine-action tools. The Bosnia and Herzegovina (BiH) mine-action information system program, originally called “The Database,” started in 1996. At the time, Microsoft “Windows” 95 made networking simple and a must, but the geographic information systems that were available created a challenge for information-systems teams. The BiH team was tasked with developing a network-based information system that could handle scanned images. In addition, there was a need to enable standard database operations and provide abilities to use SQL statements (relational queries). Last but not least, the system would need real GIS capabilities to make accurate, quality and clearly readable maps in less than 20 minutes from the request time.

The data workload was described by the Annex 1A, Chapter 4, Parts I and II of the Dayton Peace Accords, forcing former warring factions to remove mines and submit their data on remaining minefields and booby traps. The deadline was short, so the system needed preparation and full operation from Day One. It was immediately clear that BiH had no indigenous resources that could cope with the problem; therefore, help was requested from the international community during the London Peace Implementation Conference. The international community agreed to support the effort and program implementation began in March 1996. The U.S. Department of State funded two contractors that were tasked with various assignments. Infrastructure creation and staffing were assigned to RONCO Consulting Corporation, a leading international de-mining company, and database creation was tasked to FGM, Inc., an information-technology company from Washington, D.C. (U.S.).

**Initial Configuration**

The problem had been identified; the experts were in place to provide staffing and infrastructure, and U.N. Department of Peacekeeping Operations provided the software. At the time, the database-management system was the U.N. preferred Borland Paradox® and the recommended GIS software was MapInfo®. That software combination shaped the entire Bosnia and Herzegovina Mine Action Information System’s existence. MapInfo proved to be a good system for networking a database and the program language was simple enough for new database administrators/programmers to learn in less than a week. The database continues to use Paradox (version 11) today, but the program has had many upgrades and has evolved into a more sophisticated information system.

The other half of the “software marriage,” MapInfo, proved to be an excellent tool for mapping and cartography in general. In the beginning, the Geographical Section General Staff of the British War Office provided a gazetteer, which provided basic conditions for spatial queries. Paradigm 11 and MapInfo 10 continue to work well together.

**Initial Challenges**

According to their obligations prescribed by the Dayton Peace Accords, former warring factions provided more than 16,000 minefield reports to NATO implementation task forces. Data were entered and submitted to BHMAC (then known as UNMAC), together with some 1,100 mine incident data reports also entered into the database and charted on GIS. The puzzle became more complex on a daily basis. At the time, procedures for de-mining were mostly unclear. The peculiarity of BiH’s

---

**by Zoran Grujic | Bosnia and Herzegovina Mine Action Center**

---

---
Centralization

The information system’s initial structure was created primarily around minefield data and incident data. As program development progressed, the database became more complicated.

The database was centralized. The entire data-entry process was completed and housed in Sarajevo headquarters on 10 networked computers. The server ran on the Windows NT 3.5 operating system—the best that was available at the time.

Figure 1. First version of BHMAC’s data structure.

The information system’s initial structure was created primarily around minefield data and incident data. As program development progressed, the database became more complicated. The database was centralized. The entire data-entry process was completed and housed in Sarajevo headquarters on 10 networked computers. The server ran on the Windows NT 3.5 operating system—the best that was available at the time.

Figure 1. First version of BHMAC’s data structure.

Expanding Statewide

After 1998, the information system and all assets for demining activities at the state level was handed over to BH national authorities. Foremost was the request for the necessary decentralization of the system. As a result, the system was split between the following three locations:

1. The Mine Action Centre of Republic of Srpska, which began keeping data for its territory

2. The Sarajevo location, which received an additional server for the Federation of Bosnia and Herzegovina Mine Action Center data

3. The BHMAC headquarters, which kept a consolidat-ed database for the entire state

Scanned images were also divided among these centers and program priorities were shifted from emergency response to planned mine action. The database needed to be amended accordingly. This meant that the database structure became a bit more complicated, as shown in Figure 2 below. The blue squares represent new modules added in order to enable full application of the information system into mine action. Field activities were redeshaped almost daily, and the well-structured database became the very core, not only of the information system, but also of mine-action activities.

When we were unable to put something into the information system, it indicated that business logic for the activity in the matter was wrong. Since the system was designed from the ground up, implementing operational ideas into the information system revealed inconsistencies or redundancies. The process was iterative, and as the project’s scope evolved, the system was developed according to operational needs. System changes were never cosmetic; if something needed to be added, it usually related to linked activities and the system’s corresponding information layers.

While we worked as the emergency-response project, all data were presented as dots. Several attempts were made to show no-risk and at-risk areas as shapes, but the accuracy of reports was simply too low to produce maps that were current and not misleading. Raster maps used (Scale 1:50,000) were no longer detailed enough, so we shifted to 1:25,000 scaled maps. Cadastral mapping, showing the boundaries of land parcels within a given region, was also introduced at that time, but since cadastral maps were so accurate, we were unable to register images properly and were unable to correlate the maps with the vector data we had at the time.

Between 2000 and 2003, the International Trust Fund for Demining and Mine Victims Assistance, with support from the European Commission and U.S. Depart-
The system’s previous generation is shown within the rounded square in Figure 3. All system elements are interacting; the database is level 3 normalized, meaning the database’s logical design has been improved to avoid data duplication. Yet again, data modeling proved to be the cutting edge of the system. Procedures were then amended as needed once the basic layout was constructed. As a result, the information system followed thereafter.

Slowly but surely the system grew and became more complex. At this stage, the system was comprised of around 450 tables, 250 forms and more than 400 reports. The mapping function contained BH 1,100,000, 1,300,000, 1,200,000, 1,000,000, 1,500,000, Defense Mapping Agency, 1,500 Yugoslav People’s Army (JNA), 1,250,000 JNA and targeted areas 1:10,000, 1:5,000, 1:2,500, 1:3,000. The system contains vector data describing all aspects of mine-action activities in BH.

At this time, the system network was also improved. In the beginning, Sarajevo headquarters was connected to the Internet at 128/128 KB speed. In Phase 2, the network speed was increased to 1 MB/1 MB and regional offices were connected to the Internet at a lower speed. In Phase 3, all regional offices were connected to a virtual private network using Cisco® ASA, and the data were updated daily. Current performances are as follows:

- Sarajevo and Banja Luka nodes are in full replication and updated daily.
- Regional offices, excluding Banja Luka and Sarajevo, are updated daily or on demand.
- All locations have wired network 100 Base-T and Internet access 24 hours a day, seven days a week.
- Differential GPS is the standard measuring/reporting tool. Points acquired are downloaded into the system so that nothing has to be hand typed; therefore, errors are minimal.
- Cadastral mapping is the standard backdrop for reporting since differential GPS is in effect.

- All other maps are now used for planning and wider area analysis.

The Program’s Future

The BHMAC program has evolved to a point that real-time database management is needed. That said, Paradux struggles to meet the current demands. Mapinfo might also have difficulties processing a huge data amount through a complex network. Therefore, retiring the old software combination and upgrading to a new database system is necessary. Figure 4 shows the new information system structure. The system uses an Oracle® application using a custom-made GIS application. The initial activities began in March 2009, and the system is currently in its final development phase.

The database relations and data complexity will remain much the same as they were. Mapping backdrops will be preserved, and a new layer of data, utilizing full vector coverage at 1:25,000 scale, will be implemented. The system will use digital elevation data, making 3-D mapping possible. Mapinfo will remain the main cartographic software, and the entire interface will be Internet-accessible, keeping data security in mind.

Currently, the system is in its final deployment phase, and expected implementation is sometime during this demining season.