The Bosnia and Herzegovina Mine Action Information System

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initial configurations performed on the system and the comprehensive knowledge to inform strategic decisions, effective management of information that is fundamental to support 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]

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The 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 minefields 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 demining 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.

Paradox 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. Paradox 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 1,000 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 demining were mostly unclear. The peculiarity of BiH’s...
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.

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Initial construction as of August 1997 can be described with the few squares and lines as shown above in Figure 1. The BHMAC headquarters, which kept a consolidated database for the entire state, expanded as the military forces use during the conflict. As a result, ground features referenced on maps and reports were not identical. In addition, the elevation points did not have the same heights as shown on maps used during the conflict. The only solution was scanning all Yugoslavian Army maps and registering them as future reference material. Consequently, the first and the most important lesson learned was that information systems must be able to use the same raster data across as the military forces use during the conflict.

Expanding Statewide

After 1998, the information system and all assets for demining activities at the state level was handed over to the BHMAC headquarters. Foremost was the request for the information system into mine action. Field activities were reshaped 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 in the system. 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 in the project were not new 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-
When the Japanese government provided a donation of equipment to BHMAC on 2 March 2001, the differential global-positioning service was introduced and accuracy of less than 10 centimeters (3.94 inches) that is, allowing for more accurate measurements was achievable. This provided a basis to begin developing a system to trace activities in the field and to show and keep data accurately, exactly as it was taken from the field. At the same time, the state showed increased interest in our data. On the positive side, our reports became a prerequisite for reconstruction projects. More negatively, however, a number of court cases were demanding accurate historical data. The system had to be improved once more.

**Added Capabilities**

New requests included records and mechanical tools for deminers’ accreditation and mine-risk education activities. In addition, some requests were made to record data not directly connected to mine action. We were asked to take care of some logistical and human resources issues as well.

Donors’ interest began to decrease, and public relations activities soon demanded a Web presence for the mine-action center. In November 2000, the BHMAC website was developed using HTML coding, the most up-to-date way (at the time) to create websites. The BHMAC servers hosted and updated the site. Figure 3 below dated 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.

### The Program’s Future

The BHMAC program has evolved to a point that real-time database management is needed. That said, paradoxes struggle to meet the current demands. MapInfo might also have difficulties processing a huge data amount through a complex network. Therefore, retrofitting 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 as the main database, which will keep the old MapInfo up to date. 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.