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IMSMA V3.0: Experiences From the "IMSMA Diaspora"

The Information Management System for Mine Action (IMSMA) V3.0 was released June 2003, and early experience with the system has been positive. Salient features are summarized, including geographic information system (GIS) capabilities based on ArcView GIS.

Recommendations include operations-oriented training focusing on reporting information from IMSMA. The following article describes the new version and discusses local customization. The authors also describe upgrading to IMSMA V3.0 based on experience as IMSMA administrators and trainers within their organizations.

**by Mohammed Qasim, MACA
and John Walker, former
trainer, U.S. DoD HDTC**

Introduction

Information technology (IT) is a support function within the bigger world of humanitarian mine action. IT managers strive to turn data into information and information into knowledge so we can find better mine action solutions. This expedites the following:

- Safe demining
- Impact, technical and completion surveys
- Quality control and assurance
- Mine risk education (MRE)
- Reliable, secure communications
- Training

Mine action is always evolving, which the term reflects. Humanitarian demining first focused on the physical removal of mines; worldwide, good programs are now in place doing this. As managers shift attention to education and efficiency, information system people have a bigger job to do. The first job of a management information system (MIS) is to support Operations (Ops)—not create “data processing” capability, resulting in the well-known problem of “a lot of data but no information.” The IT team should also support headquarters administration, donor reports and interagency liaison as well as give 24/7 support to decision makers through timely and accurate information

and analysis. So they need a good information system.

Information systems for mine action must be simple, economic, secure and stable. The system must be locally maintainable while following international norms and focus on the “leading edge”—not the “bleeding edge”—of technology. GIS and data export-import capabilities are essential. The system should support local languages and share information in UN languages, with full acceptance by the international mine action diaspora. Moreover, software should be easy to use and able to run on standard computers.¹

The system meeting these criteria is IMSMA, developed at the Swiss Federal Institute of Technology in Zurich (ETHZ) with leadership by the Geneva International Center for Humanitarian Demining (GICHD). No mine action center (MAC) should operate without IMSMA.

IMSMA Background

The Swiss Ministry of Defense, through the Center for Security Studies and Conflict Research at ETHZ, sponsored IMSMA development as part of Switzerland's commitment to humanitarian demining. The software development team engineered IMSMA as a highly customized Microsoft Access database; any group using small-office PCs could use the system.

In 1999, the UN Mine Action Service (UNMAS) declared IMSMA its standard

mine information database.² The GICHD, founded in 1998, began training and implementation as a partner with ETHZ. Using ArcView software, ETHZ developed IMSMA GIS, a custom version of ArcView optimized for mine action. GIS allowed presentation and analysis of mine action information (vector data) on maps and imagery (raster data).

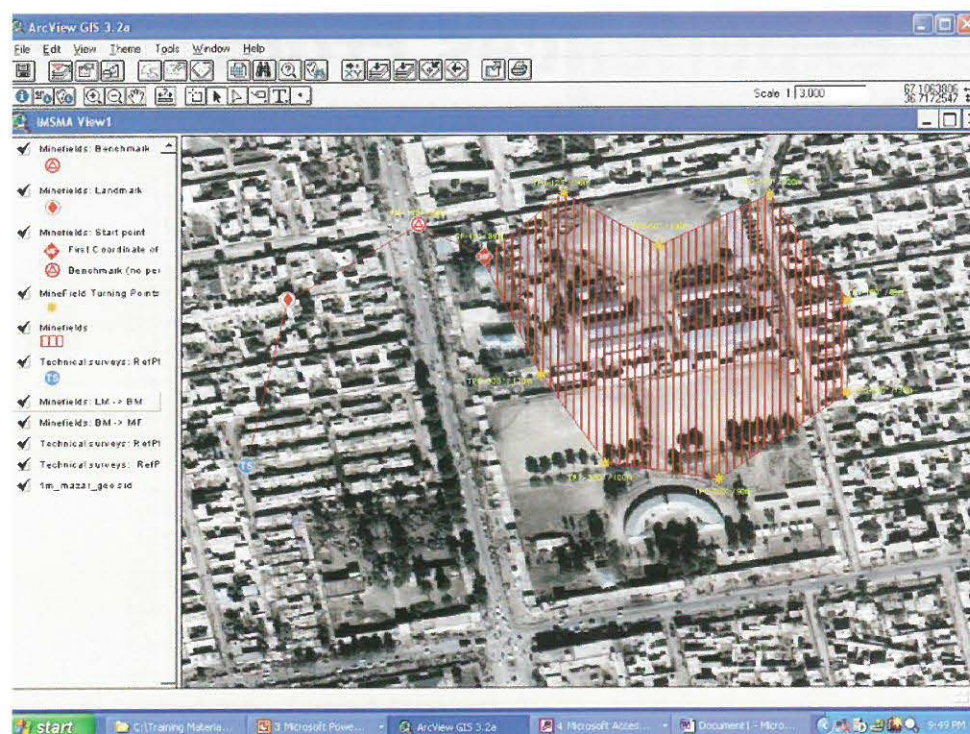
UNMAS and the U.S. government began encouraging use of IMSMA. IMSMA V2, developed and distributed from 2000 to 2002, added a tasking tool and improved the GIS engine. ETHZ's development team was recognized by the Environmental Systems Research Institute (ESRI) for outstanding GIS work.

Use of IMSMA by MACs accelerated. The U.S. Department of State and Department of Defense accepted it as their mine action standard, superceding the expensive Demining Support System (DSS). ESRI worked with the GICHD to provide ArcView 3.2a to mine action programs, giving many lesser-developed countries their first GIS. Nicaragua and Afghanistan pioneered IMSMA use.³ During 2002 and 2003, with at least 28 mine action programs running IMSMA, the GICHD assumed responsibility for training and implementation support. ETHZ developers began work on the IMSMA “new generation” using extensible markup language (XML) technology. This will be an exciting and positive development.

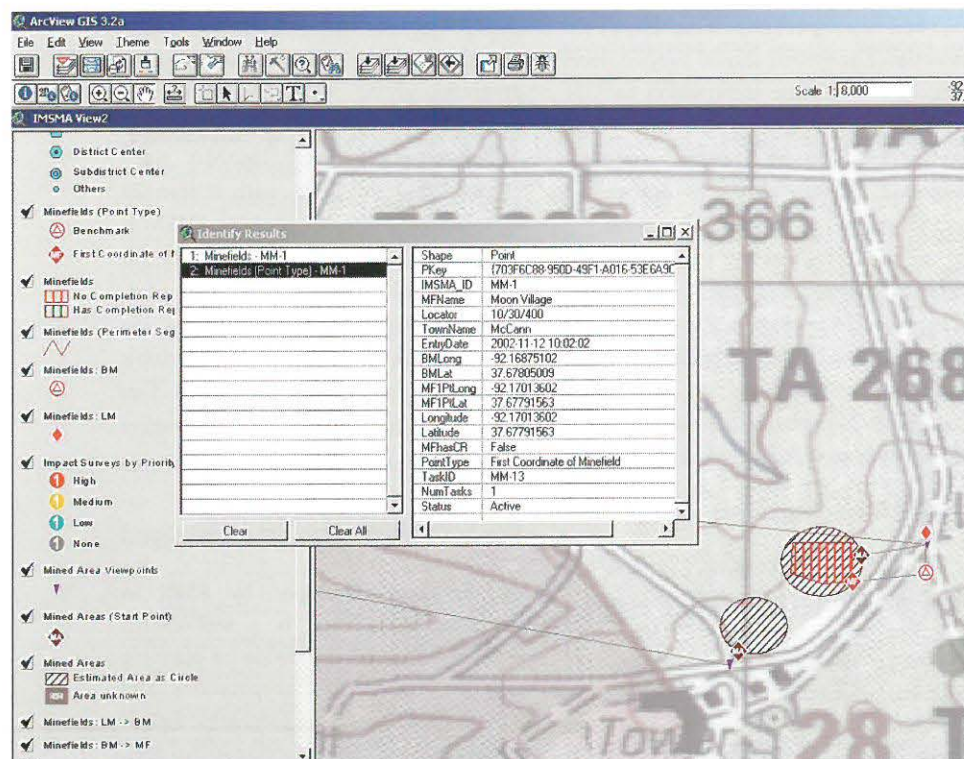
ArcView and IMSMA GIS

ArcView, developed by ESRI in Redlands, California, is a well-known desktop GIS used worldwide by planning agencies, universities, corporations and anyone needing accurate geographic data. It has powerful tools for querying spatial data.

ArcView GIS does not require strong skills for basic use, although it does take training to become proficient. People experienced with graphics software (e.g.,



Satellite imagery of Mazar-e-Sharif, Balkh province of Afghanistan (northern area) is the ArcView GIS raster data base layer of the MACA minefield perimeter plot (vector data from IMSMA datapool). c/o MACA, Kabul



GIS view of the HDTC Moon Village area, where U.S. Special Operations Forces train in humanitarian demining, shows minefield information pulled from the IMSMA V3.0 datapool by ArcView's identity tool. The ability to query the datapool by clicking on a map is a powerful IMSMA GIS feature. c/o DoD HDTC

Adobe Photoshop) or mapping programs such as FalconView learn quickly since they understand "layers" of data ("themes" in ArcView). Quantitative skills are useful, and a skilled SysAdmin may add functionality through custom ArcView extensions.

IMSMA V3.0

ETHZ developed IMSMA V3.0 between 2002 and 2003 and the GICHD released it in June 2003. This is a complete, well-organized and full-fledged information system. Advances include the following:

- MRE management
- Contacts and organizations tables
- Data quality explorer

IMSMA V3.0 strengthens structure, functionality, platform, security and performance. Proper chain-of-action and business rules must be followed when updating information; for example, a clearance operation cannot begin until a technical survey is completed. Structured Query Language (SQL), the International Organization for Standardization (ISO)-approved coding used in Oracle and other powerful database systems, is now used. The Microsoft SQL Server back-end is more powerful, more secure and easier to back up and restore than older Microsoft Access versions. But IMSMA V3.0 retains the familiar Access front-end.

The SQL Server dismantles IMSMA V2's restriction of few concurrent users. An unlimited number of users can access the system with no performance degradation. Smaller mine action programs may run compact (and free!) Microsoft Desktop Engine (MSDE), allowing five concurrent users but in practice supporting more. MSDE easily runs SQL on desktop or notebook PCs. Humanitarian Demining Training Camp's (HDTC's) uses MSDE with good results while the much larger Mine Action Center Afghanistan (MACA) runs the full SQL Server. SQL gives us the following:

- Data export-import with native SQL files (NAT files)—small and fast to transmit—as well as good performance, even over slow dial-up connections.
- Easy protection of information using IMSMA censor tools and public key encryption. This should expedite two-way sharing of information.

- Multi-layer security on the domain-based network: network authentication bypass login name and password (trusted connection), IMSMA login authentication and password, and IMSMA server security and policy make the system secure and reliable.

- New status control features, improved task management and process tools and revised GIS themes for SysAdmin and "Ops," IMSMA V3.0.

New Functionality and Decentralized Data Entry

Getting past technical improvements, IMSMA V3.0 has more everyday functionality. This functionality includes the following points:

- New MRE module for the tracking and analysis of educational and outreach activities.
- Contacts and organizations tables for complete information on key individuals and organizations.
- More than 70 summary and statistical reports in tabular and chart formats.

IMSMA template reports enable MACs to revise IMSMA's reporting tools according to local requirements. Older versions provided fewer reports, and non-technical managers often called IMSMA a "black-hole"—put a lot of data in the system, retrieve less from the database. Harsh criticism now resolved!

Decentralized data entry works nicely at MACA. Granting geographical areas of responsibility to Area Mine Action Centers (AMACs) and giving each AMAC responsibility for data entry streamlines synchronization with headquarters in Kabul. MACA's large AMACs correspond to the regional mine action centers (RMACs) of smaller programs.

Upgrading

Enhancements clearly justify upgrading to IMSMA V3.0. Afghanistan (MACA), Lebanon (the UN Mine Action Coordination Cell [UN-MACC]) and the United States (HDTC and Survey Action Center in Washington) upgraded as soon as it was available with good results. The Azerbaijan National Agency for Mine Action (ANAMA) customized IMSMA V2.2 to meet its needs and is now

considering upgrading with help from the GICHD. Others will follow.

Training for IMSMA V3.0 was needed. SysAdmins attended GICHD-ETHZ "Train-the-Trainer" (T-t-T) in Geneva during April 2003. The actual upgrade is straightforward.

Software Requirements

ETHZ's development team recommends Windows 2000 Professional or XP Professional. IMSMA V3.0 will run on Windows NT, although this is not recommended. HDTC installed IMSMA V3.0 on older NT machines, which worked but did not seem "happy." NT machines are now upgraded to Windows 2000. Additionally, IMSMA V2.2 must be present, so if an earlier version is installed, upgrade to 2.2 first. Microsoft Office 2000 Professional, not Office XP, is required. Finally, ArcView 3.2a, the same version used by IMSMA V2.2, is used.

Hardware Requirements

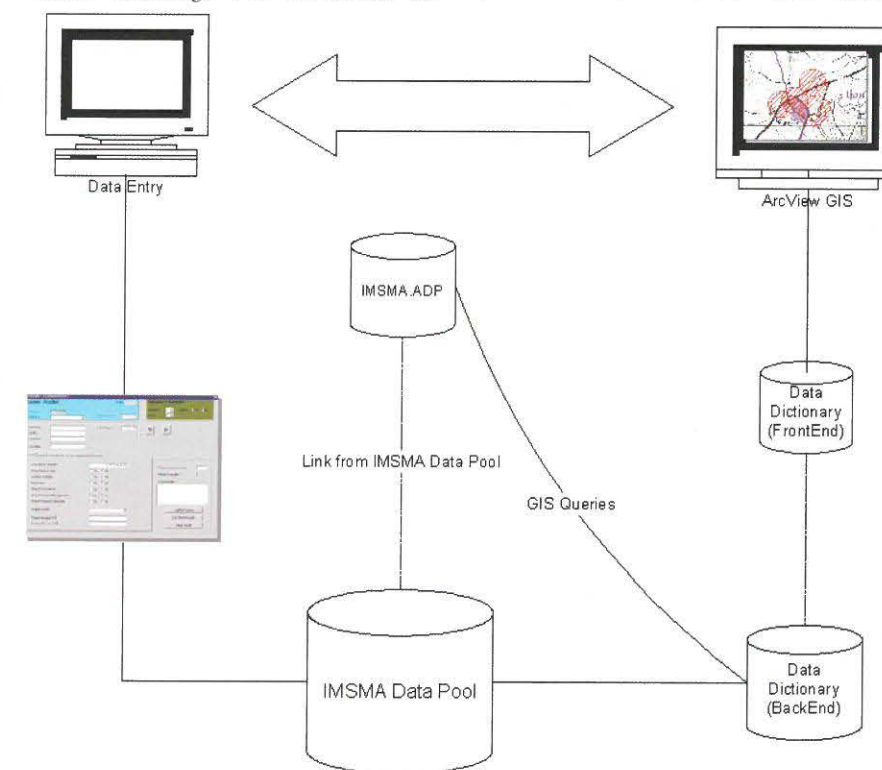
The SQL Server back-end may want a better home than the old Access database. HDTC runs IMSMA V3.0 and MSDE on newer mid-range PCs (Windows XP

Professional, Pentium 4 1.8 GHz, 256 MB RAM, 40 GB hard disk) with good results, but the database is small. UNMACA runs the full SQL Server on a Pentium 4 with 512 MB RAM and a 150-GB hard disk. Client workstations are similar to HDTC's server: 256 MB RAM and 40-GB hard disk.

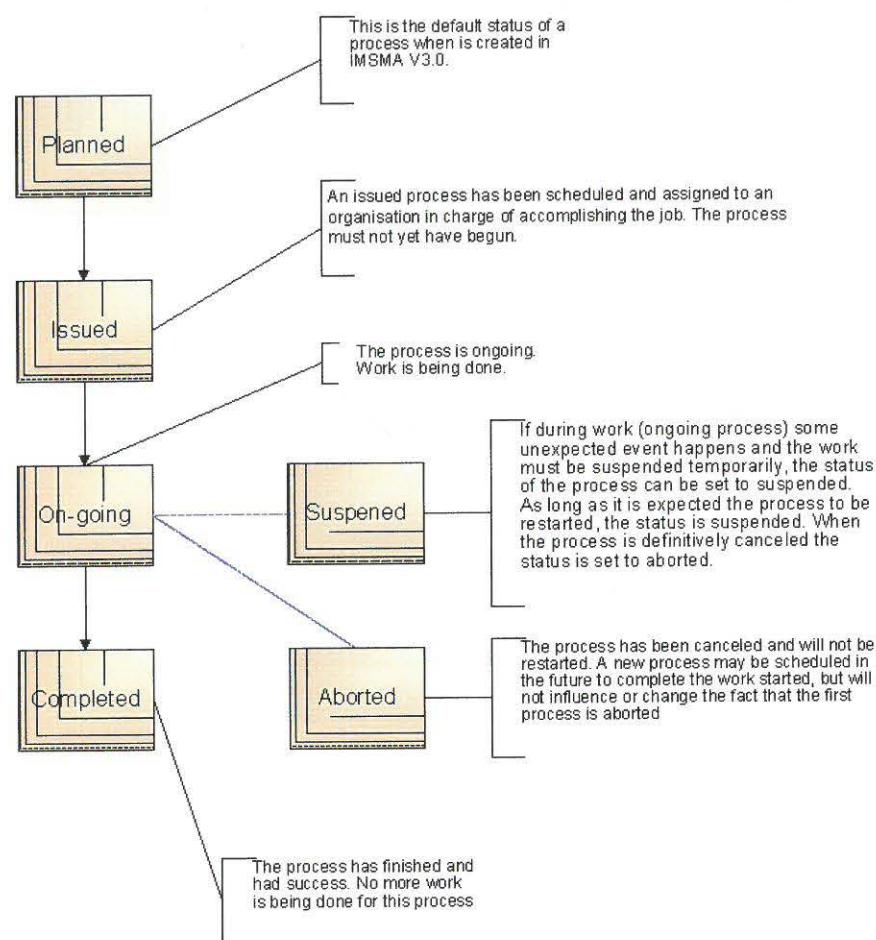
Running the Upgrade

First, make the usual full backups. Be aware of the following:

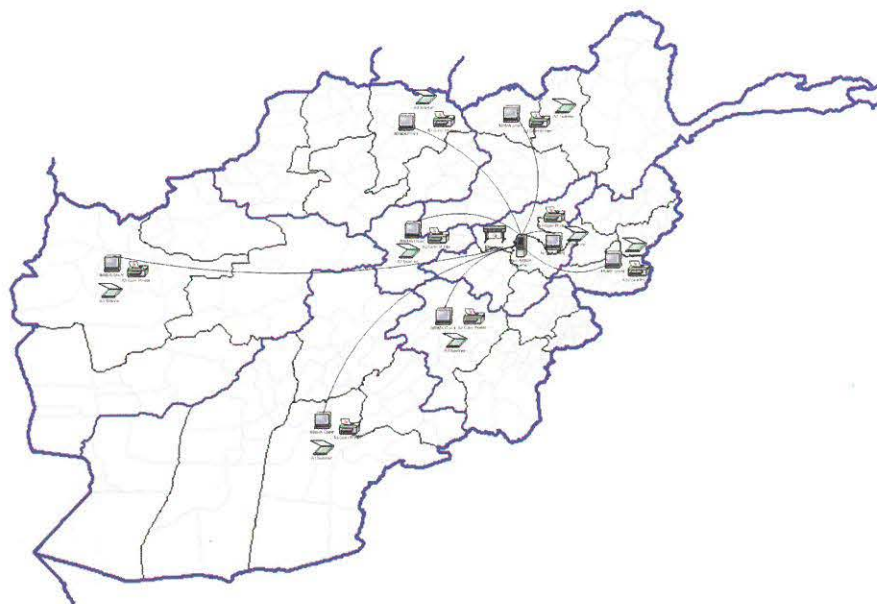
1. Any customization on the IMSMA V2.2 needs to be configured after upgrading. The best practice would be to review and update documentation for all customization—forms, reports, queries, etc.—before the upgrade process.
2. IMSMA's upgrade utility will take you first to the Data Cleaning Tool. All tables in the IMSMA V2.2 datapool containing the *clnOrganization* field need to be standardized and cleaned up because content of the new *tblOrganization* in IMSMA V3.0 will be formed from *clnOrganization* fields of the tables.
3. If you are running IMSMA V2.2 as Server/Client solution, upgrade the server first, then run client installations.
4. After upgrading, the status for all processes and status for areas must



IMSMA V3.0 users need only work with the Access front-end and ArcView GIS interface; high-performance back-end and datapool are transparent to all but SysAdmin. c/o MACA, Kabul



Process management in IMSMA V3.0 follows accepted mine action business rules, with each task's status based on the correct chain of action. For example, IMSMA will not allow clearance operations in a mine-affected area until technical survey is completed. *c/o MACA, Kabul*



Afghanistan's MACA manages the world's largest mine action information network, running IMSMA V3.0 and the full SQL Server back-end in Kabul, with decentralized data entry at MACA's eight AMACs. *c/o MACA, Kabul*

be corrected by IMSMA V3.0's Data Quality Explorer tool.

HDTC and MACA found IMSMA V3.0's powerful data-cleaning tools effective in cleaning minor data entry errors such as misspellings or different spelling of organization names. The upgrade easily imported names into the new contacts table. HDTC students ran full IMSMA V3.0 and MSDE installations on different PCs, which went well. Sometimes there would be a little "IMSMA bug"—this is normal with highly customized non-commercial software. SysAdmin should report these to the development team but not worry. Installations always ended up running fine.⁴

Consult with the Swiss support team if you are uncertain about upgrading. Read the manual—it's a good one!

IMSMA in the MAC

Training Issues

Great tools are of little use without adequate training. One week of local training will work for sharp data entry people familiar with IMSMA V2.2. Managers should realize that added data fields mean some tasks will take longer. SysAdmin, quality assurance and trainers should attend the Geneva T-t-T. They should first be completely familiar with IMSMA V2.2 and ArcView, understand relational database theory and have experience writing SQL queries.

The GICHD runs successful Partnership for Peace seminars in cooperation with the North Atlantic Treaty Organization (NATO) and special GIS conferences. Other training may evolve as IMSMA use accelerates:

- A one-week "IMSMA 101" course could cover management issues but not technical details.
- A second week "IMSMA for operators" course (follow-on to "101") for advisers and Ops could cover reporting and GIS in detail without developing SysAdmin skills.

Training within the MAC creates a progressive working environment and expedites day-to-day activities. IT cannot be lazy or impatient about training less technically oriented colleagues, and Ops must not have an attitude that they are

above doing basic IMSMA tasks. IT people must not have a "knowledge is power" attitude toward sharing information; Ops should not look at IT as "geeks" who cannot understand demining. Hands-on mission-oriented training, using IMSMA reports and GIS queries to develop useful operations information, teaches valuable skills in a practical way. Cross-training where Ops and IT learn about each other's work enhances team building. U.S. Army Special Forces teams constantly cross-train. An ideal IMSMA training team might be an experienced, patient, technical person working with a similar operations person.

Customization

Mine action managers sometimes criticize IMSMA for not supporting actual demining—for being a "headquarters toy" to impress visitors. This may be a valid criticism but is clearly not the intention of IMSMA developers or local SysAdmin. IMSMA can give powerful support to field operators.

Perhaps something in standard IMSMA doesn't match local needs. This is why IMSMA is designed to be customized. Local teams should continually think about new development of their system. Any customization must

be fully documented in accordance with good software development practice. IT should encourage non-technical feedback and do required development—but avoid unneeded customization.

Customization possibilities include normal Access modifications, e.g., adding data fields to forms. Reports can be customized and completely new reports written; good IT work will make them available to customers. If new fields are correctly written, and necessary Access work done, the language translation capabilities of IMSMA V3.0 will be retained. Custom GIS themes can be created, which requires higher-level SysAdmin skills since custom SQL queries are needed to support the themes. Local customizations must be undertaken only by well-trained people and may not be retained during upgrade, thus the importance of full documentation! Upgrades will be more complex in MACs where a lot of IMSMA customization was done.

Management Within the MAC

In mine action programs around the world, IMSMA technical personnel are utilized for report and map printing by operations. But IMSMA is designed to be

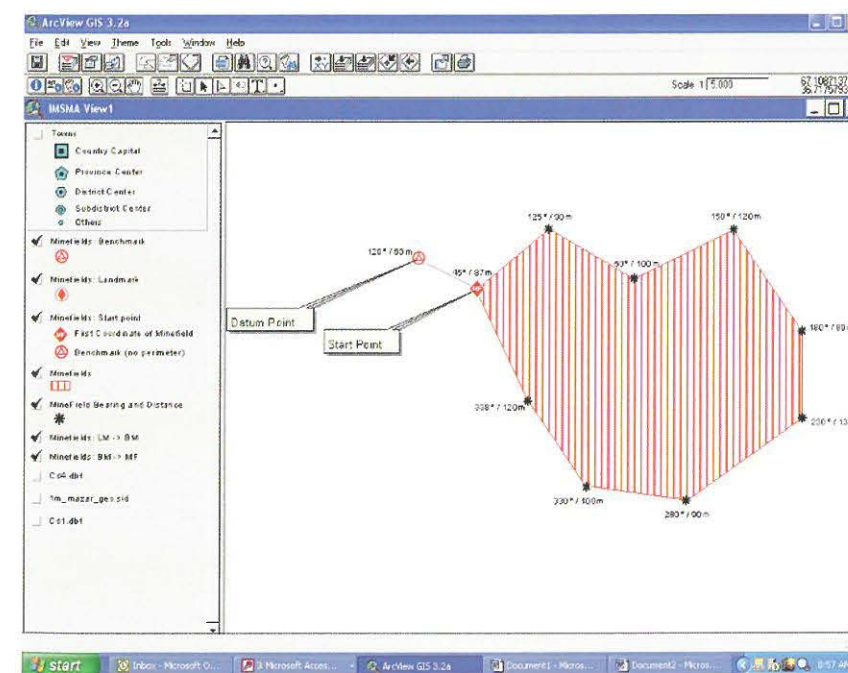
used directly by Ops for such tasks. Reporting tools are user-friendly, and basic GIS skills like producing maps and overlays are developed with practice and perhaps an ArcView tutorial. Being able to do this within "Ops," without having to wait for IT, means faster information. Misunderstandings are avoided and accuracy increases.

Similar circumstances occur in other business situations. Legacy databases, with complex reporting tools, were beyond the ability of anyone except specialists to extract reports from. Executives would write report requirements and submit to IT, waiting days to get the information they needed. Often the report would not meet their needs, so a change would be requested and the process repeated. Mine action cannot wait for this to happen!

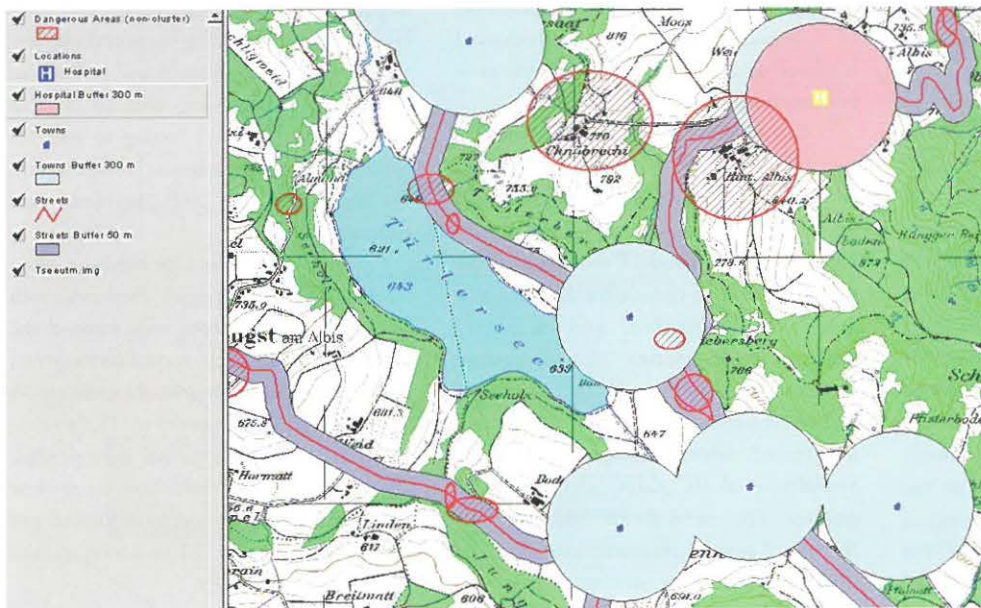
Modern desktop (or notebook) databases changed that. A big part of the beauty of IMSMA V3.0 is that it retains the friendly Microsoft Access front-end to connect with the powerful SQL datapool. Mine action managers extract the information they need in minutes without waiting on IT—who may be in the middle of repairing the network, getting an RMAC back online or any other essential task. IT can then spend more time training users, optimizing the system for better performance and doing higher-end analysis in support of management.

Distributed IT

To accomplish all of this, a distributed approach to IT within the MAC may prove helpful. That is, IT may give up some centralized control of information management and give greater responsibility to "Ops." IMSMA allows this to be safely done with various administrative accounts and user logins. Read-only terminals allow extraction of information, while other terminals may allow data entry but not customization. With proper training, Ops may take over certain data input activities, e.g., survey and clearance reporting. Ops may even be faster and more accurate getting this information into IMSMA's datapool compared to data entry people unfamiliar with the field environment. Quality control procedures may need revision in distributed IT; this may be



Minefield plot (vector data) by MACA shows local customization (using ArcView extension) adding bearing and distance information to turning points with IMSMA GIS. *c/o MACA, Kabul*



This IMSMA plot shows how ArcView's powerful spatial analysis tools help establish clearance priorities. Note how buffers show the impact of mined areas on civilian activities. c/o ETHZ, Switzerland

similar to requirements with decentralized data entry. MACA has accomplished much of this, with read-only terminals as well as decentralized data entry and advanced data quality capabilities.

Conclusion

IMSMA V3.0 is a "mission accelerator" for mine action operations and planning; no MAC should run without it. Process management tools expedite day-to-day activities and track actual work on the ground. IMSMA connects operations staff and managers with each other and the outside world, in real time if they have strong communications. A properly used IMSMA system reduces administrative burdens.

The powerful SQL database allows fast export and import of data among mine action partners and other agencies (e.g., socio-economic or infrastructure data). GIS functionality allows map display, spatial analysis and quality control of data. IMSMA offers a wide selection of preformatted forms and reports and can be customized for local needs.

With IMSMA V3.0's improved management tools, Operations can efficiently task and plan, sometimes without visiting the field. Using IMSMA this way doesn't require deep IT

knowledge, just an interest and willingness to learn—and some helpful "IMSMA geeks" who will share their knowledge!

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1. See "Interoperability: Sharing Information," by Mary Ruberry, *Journal of Mine Action* (5.2) and "Data Integrity and Reliability Conference," by Whitney Tolliver *Journal of Mine Action* (6.2).
2. IMAS 11.22.33.
3. See "IMSMA and Its Use in Nicaragua," by Nicole Kreger, *Journal of Mine Action* (5.2) and "The Mine Action Program for Afghanistan," by Susanna Sprinkel, *Journal of Mine Action* (6.1).
4. For further information on IMSMA setup and training, see the following sources:

- Geneva International Centre for Humanitarian Demining (GICHD), IMSMA implementation and training: www.gichd.ch.
- Swiss Federal Institute of Technology Zurich (ETHZ): IMSMA technical support, web reports, forums: www.imsma.ethz.ch.
- U.S. Department of Defense Humanitarian Demining Training Center: www.wood.army.mil/hdtrc.
- ESRI, ArcView GIS training: www.esri.com.

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