GIS and defence

Mapping for Virtual Reality

A Real World Case Study

In 1999 Gardline Infotech, a Great Yarmouth-based GIS services company, embarked on a major contract to produce a vector map dataset, combining paper and digital information, covering various zones throughout the world, which would ultimately form the basis of the visuals for a military flight simulator. ***Phil Hall****, the project manager, explains the principles and practice behind the virtual reality mapping which supported this major VR implementation.*

Simulators come in a variety of forms, from simple PC-based trainers to full flight simulators with replica cockpits mounted on hydraulic rams. The principal markets for simulators are the entertainment industry, and civilian and military pilot training and mission simulation. Although not cheap, simulators offer huge savings in operating cost when compared to flying real aircraft, and the synthetic environment offers the capability to simulate emergency situations or specific missions which would simply be unsafe or impractical in the real world.

Realism is crucial for a simulator, and the key to realism is that of powerful graphics, achieved through one of two methods. The first is to combine aerial photography with a digital terrain model to produce a visually effective, but perhaps over-smooth landscape. For the second, a vector map can be used, with a realistic quality added by draping texture maps over polygons, the same principal that most 3-D PC games employ.

Realism is crucial for a simulator, and the key to realism is that of powerful graphics, achieved through one of two methods. The first is to combine aerial photography with a digital terrain model to produce a visually effective, but perhaps over-smooth landscape. For the second, a vector map can be used, with a realistic quality added by draping texture maps over polygons, the same principal that most 3-D PC games employ. The visuals can then be displayed to stunning effect, through a monitor, wide-angled or domed screen, or a headset.

The dataset Gardline Infotech was contracted to supply, combined with the realistic texture maps, would be used to train aircrews in new low-flying jet capabilities, through mission simulators, navigator avionics system trainers and desktop PC-based training. Simulators would be networked, and through synthetic environments, would bring together live forces, artificially intelligent forces, and simulated scenarios for team-working, tactics and mission rehearsal.

Because of the way the graphics engine relies upon a polygon-based dataset for application of bitmaps, the format of the data had to be carefully considered. This agreed format was VMAP Level 1, a strain of the NIMA (US National Imagery and Mapping Agency) VPF (Vector Product Format), the military standard for mapping. VMAP Level 1 is the medium resolution product (1:250,000) used for the military basemaps around the world. VMAP Level 0 & Level 2 are low resolution (1:1,000000 Digital Chart of the World) and high resolution (1:50,000) respectively, although, at present, VMAP level 2 has not progressed beyond draft stage.

The format produces a tiled dataset based upon 1 degree cells at the Equator. Split into 12 topologically correct layers (or coverages), each with thematic data consistent throughout the world, the emphasis on global use and full topology made VMAP the best option for the project.

VMAP Level 1 does have its limitations, however: our task involved incorporating existing 1:250,000 digital data with information taken from 1:50,000 and 1:500,000 paper maps. Due to the level of detail included at 1:50,000 scale, VMAP Level 1's specification was often inadequate, being designed for detail of a medium resolution. To reach a specification whereby additional features where placed into similar but vacant classes within the format took some considerable planning. The final format variation was successfully achieved through working closely with the client, and testing on a variety of global data.

The final product had to cover large geographical areas at 1:500,000, with specific zones at 1:50,000, where low-flying training would be performed. This required slotting the more detailed areas into the smaller scale data. Again, realism is the key to a good flight simulator, and a straightforward edge-join of data creates a very obvious boundary between the two scales. To overcome this, it was necessary to blend the edges together, extending roads, rivers and area features to a natural end point. The results were a seamless dataset, richer in information in specific areas.

Gardline Infotech has been digitising maps since the mid 80's, including a number of contracts for the military, battle simulation data included, but producing VPF data was a new step, and could not be done at the click of a button on a translator.

Although data capture itself was relatively straightforward, it was vital to take a 'top down' approach when

Eurofighter 2000 in a simulated landscape
(© Evans & Sutherland 1999)

designing the processing/production flowline, and to understand fully the nature of VPF before production began. Data had to be captured in a specific way, to ensure correct topology, and stacking of area features, holes and nested polygons within them. Forcing a square peg to fit a round hole won't work with VPF!

Our flowline was built around capturing all lines, and building a clean framework. From this framework, the operator would create roads, rivers and area features using the same original feature where boundaries were coincident. An effective flowline, but often time-consuming, particularly where large area features were present.

An example of this problem was highlighted during production of Scandinavian datasets. Our initial expectation was that these were reasonably sparse countries; however, much of the landscape consists of large areas of forest, with scattered smaller areas of lakes and marsh. This can prove a topological headache when defining the limits of woodland and nested marsh and lake areas within. Resulting polygons can be extremely complex, containing in excess of 40,000 points each, with resultant heavy processing overhead.

The entire process of data capture, data combining and VMAP export was done at Gardline Infotech's offices using Laser-Scan software. LAMPS1 was used for the data capture, and LAMPS2 for the VMAP processing and export, using both systems to carry out quality and topological structure checks. The dataset is now almost complete, with only a few countries left to capture, and the final dataset should be ready by early October 2000.

More and more GIS's, desktop and high-end alike, now come with VPF viewing capabilities as standard. Although production of VPF data, such as VMAP Level 1, can be a painstaking task, the results are worthwhile, producing a more intelligent dataset, primed for spatial and network analysis. It looks good in a flight simulator too! GI News

Phil Halls is a Project Manager with Gardline Infotech.
phil.halls@gardline.co.uk

Defence Mapping for the 21st Century

"I have a theory that, while the battles the British fight may differ in the widest possible way, they have invariably two characteristics – they are always fought uphill and always at the junction of two or more map sheets. This battle was to be no exception. The brigadier named four separate sheets of the one-inch map, and you are to imagine half a dozen field officers in a restricted space, each trying to fit together four large squares of paper. Some seated themselves and tried to spread them over their knees, some to hold them against the wall. My colonel carpeted the ground with his and used them much as a devout Mohammedan uses his prayer mat. There was such a rustling, flapping and crackling, such an undertone of cursing, that we missed the paragraph of the order headed, "Information, our own and enemy forces'"

Unofficial History, Field-Marshal Sir William Slim

Timely and accurate geospatial information has always been essential for success on the battlefield, in the air and at sea. For the mapping agencies of the British armed forces the requirement to deliver map-based information on paper and in digital form at short notice has rarely been greater as the country increasingly deploys its military resources in support of United Nations and NATO peacekeeping initiatives throughout the world. ***John Fox-Clinch*** *looks at how the UK's defence mapping and imagery units have been reorganised into a new agency, the Defence Geographic and Imagery Agency, to cope with these new challenges.*

Following the end of the Cold War, Britain's military forces have been redefining their role on the world stage as a rapid reaction force. As a result, there is increasing demand to deploy them at short notice – as recent operations by British military forces in Sierra Leone, Kosovo, Bosnia, the Gulf and many other parts of the world have demonstrated.

A number of medium to long term factors were identified that pointed to the fact that although the Military Survey and the Joint Air Reconnaissance Intelligence Centre (JARIC) had previously been highly successful standalone organisations, in the future they would be operationally more effective within one organisation.

Unlike the Cold War scenario, where useable maps were readily available because everybody knew, more or less, where everybody else would be, this new environment has thrust Britain's military map makers into a highly demanding new situation where they have to work against the clock to provide mapping and imagery for areas where such data may be unreliable or unavailable.

Against this background, the Defence Geographic and Imagery Intelligence

Agency (DGIA) was established at the beginning of April this year. It grew out of a series of studies and consultations, and partly as a result of the Strategic Defence Review. A number of medium to long term factors were identified that pointed to the fact that although the Military Survey and the Joint Air Reconnaissance Intelligence Centre (JARIC) had previously been highly successful standalone organisations, in the future they would be operationally more effective within one organisation.

As a new defence Agency, DGIA's mission is to provide imagery intelligence and geographic support to defence policy, planning, operations and training. Its aim is to meet future UK defence requirements for all types of operations and training "in a digitised battlespace environment", delivering maximum value for money while exploiting information and new technology efficiently.

All parts of the Agency have retained their identities as units but Military Survey has been renamed the Defence Geographic Centre, although its old name lives on in the title of The Royal School of Military Survey. The other two units are JARIC and 42 Survey Engineer Group, which formerly was under the Military Survey umbrella.

Who's who and who does what?

DGIA headquarters is located at Feltham, Middlesex.

- The Defence Geographic Centre, which is spread across four sites, also has Feltham as its major site. It is responsible for the acquisition, production, dissemination and management aspects of the DGIA geographic output. The centre comprises 700 personnel, the vast majority of whom are civil servants.
- Joint Air Reconnaissance Centre provides DGIA's imagery intelligence output. It is located within RAF Brampton and comprises around 500 staff, most of whom are RAF personnel. Within JARIC, Production Squadron provides survey support.
- 42 Survey Engineer Group provides the DGIA's geographic support in the field. These are the people who plot safe routes along which military forces can move, taking account of topography, the availability and capacity of bridges and the condition of roads. The Group comprises 525 personnel, most of whom are Army personnel. The main site is at Hermitage, with 14 Independent Topographic Squadron in Moenchengladbach, Germany and 135 Independent Topographic Squadron (Volunteers) at Ewell, South London. The Group also includes the Royal School of Military Survey (RSMS) which is located at Hermitage. GI News

The UK Hydrographic Office

Charts from Cook to the digital revolution

By John Fox-Clinch

The UK Hydrographic Office is responsible for producing, managing and updating Admiralty sea charts, used by around 60 per cent of the world's commercial shipping, in addition to supplying the Royal Navy and other NATO navies. Only two other hydrographic agencies (the US and Russian) offer a comparable but less universally popular service.

The Agency, based in Taunton, Somerset, devotes about 25 per cent of its resources exclusively to producing navigational and oceanographic information for UK military use. Typically, this could be in the form of detailed charts covering bathymetry and the coastal zone that could be useful for amphibious landings.

Although it has obligations to the Ministry of Defence, the Agency has the same Trading Fund status as Ordnance Survey. This means it has to generate enough income to sustain and improve its services. As a result it is using its various databases to develop projects such as Additional Military Layers (AML) digital charting where several kinds of navigational and hydrographic information can be overlaid such as bathymetry, coastal zone mapping, seabed environmental data, mine counter-measures contacts, sea exercise areas, and classified sea routes. Some information may not be freely available on security grounds, but the aim is to develop a package that can be marketed to defence forces worldwide.

Meanwhile the agency has sub-contracted the task of digitising its new generation of electronic navigational charts (ENCs) to a company in India (IIC Ltd of Hyderabad). UKHO will concentrate on quality assuring the outputs, and ensuring that the high standards of accuracy and reliability for which its paper charts are known, are maintained in the digital versions.

Barco has won a contract in open competition to supply the United Kingdom Hydrographic Office with a LithoSetter V digital platemaking system with integral plate punch. The introduction of computer-to-plate is part of a £3 million investment programme to re-equip the UKHO with new technology and to benchmark it against the commercial world.

As a government agency within the Ministry of Defence, UKHO operates as a commercial trading fund with a turnover of £40 million a year and a staff of more than 850. It is responsible for the compilation, print and production of Admiralty Charts, as well as many other navigational publications. Its portfolio comprises 3500 chart products (including electronic versions), 212 publications, each of which is about 300 pages, and an archive of more than 2.5 million charts of the world seas and coastal areas, dating back to Cook's original charts from his voyages to Australia and New Zealand.

UKHO's portfolio comprises 3500 chart products (including electronic versions), 212 publications, each of which is about 300 pages, and an archive of more than 2.5 million charts of the world seas and coastal areas, dating back to Cook's original charts from his voyages to Australia and New Zealand.

Currently, UKHO produces one hundred plates a day but they are looking towards doubling this figure with the new

LithoSetter. At any one time, they hold three quarters of a million charts in stock for supply to chart agents which are printed in four special colours on chart paper.

Three years ago, when the UKHO was established as a Trading Fund, a Corporate Plan was approved which set out an ambitious programme to modernise the infrastructure and working practices. David Reid was brought in from the printing industry where he had worked for thirty years to head up production and supply and to see through the change. Due to the size of the task, the BPIF (British Printing Industry Federation) was appointed to provide external consultancy support. In January 1998 Reid and his team from the BPIF began reviewing the UKHO's products and systems and assessing what was required. Even during the review process, several improvements to working practices increased printing output and significant savings were made by renegotiating external supply contracts.

The initiatives for change covered four areas: to introduce a PDF digital prepress workflow, to upgrade from computer-to-film to computer-to-plate, to install a new AO press to replace Crabtree Sovereign presses and to establish a print specific Management Information System.

"As a wholesaler of paper charts and publications we print for stock and pick to order," Reid explained. "In order to supply fully corrected, up-to-date information – which we have to do in order to meet the UK's obligations under the Safety of Life at Sea Convention – we have been making hand corrections to this stock, which is labour intensive and costly. Our initiatives are based around automation with just-in-time print production from a digital database. This means very short runs – our average print run is 300 on an AO press – and quick make ready in the prepress department, in platemaking and on press. At the same time, the equivalent data is made available in digital format to customers using our electronic versions, via CD updates."

The UKHO went out to tender and, to date, has awarded two contracts – for a LithoSetter V CTP system and a Man Roland press (R904-5).

Reid continued, "The decision to go to CTP will give us the potential of greater throughput and reduce our overheads by automating some of the manual processes. As well as being more environmentally desirable, digital plates will give us a consistently high quality output on press. We also decided to go for standard CTP technology using silver image rather than thermal plates as this required less of a learning curve."

The tenders were judged independently for technical and financial competence. Barco's LithoSetter V met all the criteria and performed exceptionally well in the benchmark testing.

Currently raster data in TIFF format generated by LaserScan's GIS system is used to produce the charts on a mix of Macs, PCs and Sun workstations. The files, which range on average between 20 and 30 Megabytes, are output to a film imagesetter. "It was an important part of the verification process to ensure that the new platesetter was an open system that could take in original TIFF files, PostScript files and PDF files," Reid maintained. "I believe that PDF is probably the most significant development in the printing industry since PostScript was introduced in the mid eighties. In our organisation it will allow large files to be sent faster and more easily with fewer problems in file management."

Reid is now looking at other issues such as Investors in People and ISO 9002 accreditation. "The investment in change is all encompassing," he explained. "We are revisiting the skill sets of our personnel to ensure that they are able to take these radical changes on board and maximise the benefits of this new technology." GI News

Mapping the Electronic Battlefield

By Michael Politt

For Britain's armed services, Electronic Warfare (EW) is essential for maintaining effective superiority over potential enemies. To support this objective, the Defence Electronic Warfare Centre (DEWC), an element of the Air Warfare Centre (AWC), provides map-based EW information wherever and whenever it is needed. Through the use of commercial off-the-shelf GIS software from ESRI (UK), the DEWC has brought the electronic battlefield to life.

Established in 1995, the DEWC's EW mapping operations are based at RAF Waddington in Lincolnshire. As a multidisciplinary unit, the DEWC's role is to provide EW mission support for the UK military, the MOD and other agencies. Working within the DEWC, a specialist team turns EW data into high quality mapping.This vital work helps users around the world visualise the electronic battlefield in a new and more productive way.

Electronic Warfare includes electronic surveillance and information gathering, radar warning and countermeasures. There are active and passive EW systems fitted to aircraft, ships, submarines and ground vehicles. Before the new facilities were established at the DEWC, the armed services used individual resources for mapping EW data. The DEWC's new role has meant increased efficiency, economies of scale and greater information sharing.

GIS and defence

The DEWC previously relied on a mapping system developed by the Royal Air Force. GIS software extracted EW data from a relational database to produce annotated maps. Although effective, it was largely bespoke and difficult to change for new requirements. It also depended on a map server maintained by a third party. "We required specialist skills to get the best out of the mapping system. There was a fair degree of manual intervention to achieve the right results," said a DEWC spokesperson.

At the same time, the DEWC was supporting a shipborne Royal Naval system for tactical plotting. This used EW information as a data source, manually extracted from an EW database. Creating a single integrated system to produce maps for all the services would make the DEWC's support role easier. "Once we were a multi-service operation, the demand for mapping increased. Because of the problems with our bespoke system, there were growing bottlenecks in map production."

In 1997, the decision was taken to look for a new cost-effective solution capable of providing timely and accurate information. Although there are regular reporting timetables, maps are often requested within hours of gathering new EW intelligence.

"We also wanted more than a basic GIS or mapping package. The new solution had to be smart and flexible with a powerful analytical capability. We needed to have higher quality presentation of more data."

One particular problem with the old system had been poor text placement, leading to manual intervention when labels overlapped and obscured data. The DEWC also required an intuitive graphical interface for improved ease of use. Another important objective was to retain the existing relational database storing EW datasets. It was soon realised that modifying the existing system would not be cost-effective.

By talking to other groups within the services, including the then Military Survey, the DEWC was able to assess the available options. It compared several commercial mapping and GIS solutions for features, costs, usability and database integration.

To test the solution, data was extracted from the EW database and, using ArcView and ArcExplorer for mapping, sent to a remote user. Never achieved within hours before, it proved a pivotal moment for DEWC's management. The trial completely satisfied the goal of creating and distributing EW maps as quickly as possible. It also confirmed a purchasing decision based on ease of use, flexibility, cost-effectiveness and future potential.

In Autumn 1998, ArcView, ARC/INFO, ArcView 3D Analyst and ArcView Spatial Analyst were installed by an in-house team. None were cartographers but had mainly been transferred from frontline technical jobs. Backed by ESRI (UK) technical support, the new system went live after a short in-house development.

GIS is now an important facility for the DEWC. Military data can be spatially related and processed in a number of ways to extract the maximum amount of information. Digital military maps provided by Military Survey (now the Defence Geographics Centre) allow worldwide mapping coverage, giving the DEWC complete autonomy for map production. It has also developed extra symbols and colour coding for EW data alongside new working practices for a more timely service.

Users are now provided with EW information in a readily-understood form, helping them to visualise the electronic battlefield. The careful use of labels, shadings and colours draws attention to interesting locations. Clearly separated labelling helps improve the perception of an ever-changing battlefield. High quality maps are available to different scales, levels of detail and output sizes.

Rich in detail, the EW maps produced use EW data extracted from a separate relational database. Previously evaluated by analysts, the datasets contain information on assets of potential interest. For example, the database might store the locations of air traffic systems in a particular country. The information is also published for reference as tables within briefing documents used alongside the maps.

Users are now provided with EW information in a readily-understood form, helping them to visualise the electronic battlefield. The careful use of labels, shadings and colours draws attention to interesting locations. Clearly separated labelling helps improve the perception of an ever-changing battlefield. High quality maps are available to different scales, levels of detail and output sizes. And where time is of the essence, maps can be transmitted for local viewing and printing anywhere in the world. "We can now extract and display different elements of the EW datasets which provides us with more flexibility than before. It's given the DEWC an edge in the speed of doing business. And, as far as we know, no other country does this work in quite the same way," said a spokesman.

Although mapping is the primary purpose, the use of standard GIS tools such as ArcView's 3D Analyst and Spatial Analyst has led to some new developments. For example, it's now possible to gain a 3D perspective into the electronic battlefield. Topological and other features can be brought to life with shading, emphasising the relationship between points of interest and the surroundings. Helping answer "what if" questions, standard GIS techniques build up an operational picture for planners, analysts and military commanders.

"We are leading the way in the visualisation of the EW battlefield using GIS tools. It allows a quick assimilation of an operational task and thus an increase in military effectiveness."

Perhaps the biggest achievement is that everything has been created using commercial off-the-shelf software (COTS). Only a few years ago, such systems would have been bespoke with costly and lengthy technical evaluations. The COTS approach is perfectly in line with slimmed-down Government spending on Britain's defences. Furthermore, the investment has proved an important catalyst for the EW mapping business. Given its growing experience, the EW mapping team has become a valuable source of defence GIS advice.

Now the DEWC's mapping services have been improved from days to hours, users can combine up-to-date mapping, analysis and other data for more effective decision making. The DEWC is starting to focus on the visualisation of the electronic battlefield for senior commanders. The next logical step may be secure web-based delivery, using standard browsers and the new Internet map server software, ArcIMS, to disseminate EW information across military Intranets. For all those engaged in Electronic Warfare, the DEWC is reassuringly well prepared for any future conflict. GI News

Michael is a freelance writer specialising in the IT industry.

Defence Geographic Centre implements major new map production system

By John Fox-Clinch

Britain's defence forces are now being supported by one of the world's most advanced map production systems at the Defence Geographic Centre (DGC), formerly the Military Survey Defence Agency.

Known as the COTS Production Workgroup (CPW), it has replaced an ageing product generation system and was procured primarily to ensure continued operation beyond the Y2K rollover.

At the same time, the DGC recognised that recent improvements in commercial map production software presented an opportunity to move away from bespoke systems to a more flexible and responsive COTS environment that would enhance its capacity to respond rapidly in times of crisis.

A number of solutions were evaluated to ensure that CPW could use its existing data holdings, meet the exacting specifications for product output and still provide best value. Because of Intergraph's long experience in supporting military map production agencies, including the DGC, most of the production workflows were available off the shelf. This enabled Intergraph to deliver CPW on time, on budget and well in advance of the Y2K deadline.

It provides end-to-end capabilities ranging from the exploitation of imagery for the revision of maps through map compilation to the generation of the large-format film separates required for printing high-volume hard copy maps.

At the heart of the £4 million solution is a powerful mix of modular COTS software including Intergraph's established MGE product suite together with newer technology such as GeoMedia and Dynamo. This has given operators considerable flexibility to harness functions for data conversion, topological validation, conflation and merging as well as cartographic symbolisation.

Optimised workflows are created by using combinations of modules that can be flexibly reconfigured as priorities change. The workstations are capable of performing any of the production assignments. This flexibility to switch production assignments in response to crisis demands was a key requirement for the DGC.

Production management has the benefit of using commercial workflow management software linked to a geographic display to help supervisors in scheduling work. This use of proven, commercially available software, running on a standard Windows NT platform, allows major savings over the kind of bespoke systems implemented in such environments in the past.

At the heart of the £4 million solution is a powerful mix of modular COTS software including Intergraph's established MGE product suite together with newer technology such as GeoMedia and Dynamo.

The CPW system consists of 53 workstations and 10 servers divided into a number of workgroups, all running Microsoft Windows NT. Associated peripherals include an Intergraph MapSetter 6000 combined filmwriter/scanner.

During installation, particular attention was paid to "human factors" to ensure a comfortable working environment for the operators, many of whom spend their entire working day at a particular workstation.

The system has improved the rate at which DGC can supply traditional hardcopy maps and charts as well as newer digital mapping products to its customers. Products from the system have already supported Britain's defence forces operating on deployment.

"Possession of this system certainly keeps us at the international forefront of producers of mapping for defence purposes. It handles routine production of topographic charts, aeronautical charts and also digital geographic information," commented Peter Parkinson, Assistant Director of Production Support at the Defence Geographics Centre.

He added: "Increasingly these days we need to support Coalition operations meeting the requirements of our allies. There is a pooling of resources and co-production activity among the allies because that is the most efficient way of doing it nowadays." Indeed, the mapping software underlying the system is in use at the mapping agencies of many NATO member states.

Mr Parkinson said the introduction of the new system had gone well and DGC would go on using it to develop new products. He added: "We continue to bring in additional software to enhance our capabilities but it is true to say that the new system has already enabled us to make efficiencies in the way we work.

"For example, it offers us more scope for generating rapid revisions when there is a crisis. Emergencies tend to happen in areas nobody has anticipated and there is often a need to pull together very quickly data from multiple sources in the form of up-to-date mapping that rapid response forces will be able to use."

One of the enabling applications in the system is the latest version of Intergraph's advanced generalisation software, DynaGen. The rule-based software employs knowledge of the feature topology to produce simplified datasets while allowing the operator to control this rather subjective task. This allows the agency to generate efficiently multiple products at various scales from a single set of vector data.

Intergraph's Alastair Ritchie commented: "One of the real strengths of CPW is in the system architecture which allows the DGC to take advantage of developments in commercial software running on standard Windows PCs. CPW is already a success in production terms but as production needs change, this flexibility will ensure that DGC is best equipped to support Britain's Defence Forces well into the future." GI News

GIS and defence

Mapping Military Objects with MOLE

(ESRI's Military Overlay Editor)

For several years now, armed forces around the world have employed GIS technology as a support tool. GIS has been utilised in the visualisation of battlefield terrain, in analysing the "go-ability" over that terrain, and in determining line-of-sight through that terrain. GIS has also played an increasingly important role in forming the foundation of a number of command, control, communication, and intelligence (C3I) systems. These systems typically employ GIS as the underlying "canvas" upon which military features are displayed.

ESRI has recently released a new symbol editor, designed to assist military users and developers in displaying military symbols on maps. The Military Overlay Editor (MOLE) is a standalone Windows application, designed to implement the U.S. Department of Defense (DoD) MIL-STD 2525 specification for the display of common military objects. The 2525 specification includes rules for depicting symbols for these objects and their associated attributes using a library of CGM graphic components, determining the makeup of an individual symbol by interpreting an object's fifteen-character message string. MOLE implements this standard, interpreting object message strings, along with the other object descriptors specified in the standard, creating the complex symbols needed to describe today's modern battlefield situations.

The Military Overlay Editor (MOLE) is a standalone Windows application, designed to implement the U.S. Department of Defense (DoD) MIL-STD 2525 specification for the display of common military objects.

MOLE is not a mapping tool, but a symbol generator and editor. Geographic data can be added to its display for reference, facilitating the accurate composition and positioning of object symbols. This map data can be stored in traditional vector formats (ESRI shape files, coverages, VPF, and CAD data) or stored in a wide variety of raster image formats. MOLE has been built using ESRI's MapObjects component GIS technology, enabling MOLE to project and display a plethora of geographic data.

Military objects can be created manually, permitting the user to build up a military situation display over time. MOLE's built-in editor enables the user to provide all of the relevant data needed to accurately render any 2525 compliant object. Alternatively, a collection of existing military objects can be read in from any Microsoft ODBC compliant database. MOLE automatically symbolises and renders the imported objects on its map display.

MOLE has a number of tools that allow the user to automatically or manually leader many symbols that occur at the same location. MOLE will also stack symbols belonging to identical units that occur at the same location. The user can enable or disable both these features and can control the distance tolerances employed. MOLE is even able to de-clutter the map, automatically adjusting the positions of multiple leaders to ensure that all symbols can be clearly seen.

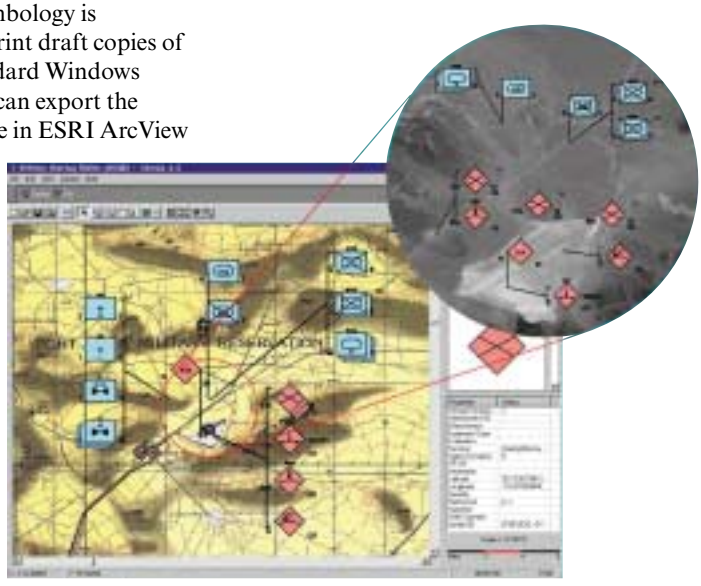
Once battlefield symbology is composed, users can print draft copies of their maps to any standard Windows output device, or they can export the symbol graphics for use in ESRI ArcView GIS software or ArcInfo's ArcMap. In ArcView, symbols become standard graphics that can be further edited, although the object intelligence they had in MOLE is no longer available.

MOLE is designed to be an easy-to-use tool for battlefield planning, annotating the results of image analysis, and creating complex symbology quickly and easily. MOLE is designed to accompany ArcView, but can operate standalone to create the symbols, their fifteen-character message strings and associated fields, then export that information for other uses, all within a simple, map-based application.

Anyone who has a need to create, edit, map or display MIL-STD 2525 symbology can use MOLE, either as a standalone application or, using ActiveX technology, as a separately licensed set of reusable MOLE components. Developers can even add 2525 compliance to their existing C3I applications. The symbol sets that MOLE exports are platform neutral, enabling UNIX ArcView users as well as Windows-based ArcView users to use MOLE generated graphics in their applications.

The MOLE installation program installs everything needed to get started using the software. ESRI has included the graphics primitives to create symbols in compliance with MIL-STD 2525B, Appendix A, Table A-III through A-IX. These include over 1000 symbols depicting objects in the space, air, ground, sea surface, sea sub-surface, and special operations forces battle dimensions. In addition to the MOLE, ESRI (UK) has also done some development work with the APB 6 standard used in the UK. GI News

email info@esriuk.com, web www.esriuk.com



Delivering Estate Solutions for Defence Needs

The Ministry of Defence is one of the UK's largest landowners and the task of managing these assets falls to Defence Estates, the MOD Agency established in 1999. Many of us would have historically associated military owned land with plains covered in tank tracks, no-go areas around training grounds or large airfields. But the role of the Agency ensures that the defence estate is managed in line with government policy on the environment i.e. to conserve actively MOD land, its properties and its wildlife, including maintaining public access, and to protect the environment across the vast expanses of particularly rural property it owns.

So it is easy to appreciate how geographic information management is fundamental to Defence Estates in fulfilling its mission to "deliver estate solutions to defence needs" whilst at the same time preserving land that is home to rare wildlife, ancient monuments and buildings listed as of archaeological or historic interest.

DE strikes GOLD!

Recently, Defence Estates' GOLD (Geographic On Line Data) application has been in the spotlight, when it won two awards for the use of GIS. The first award, in April, was from ESRI (UK) which awarded Defence Estates the Robert Melville award for excellence in implementation of ESRI technology. The second award, presented at ESRI's 20th Annual International User Conference in San Diego, California at the end of June, was for Special Achievement in GIS. The award is given to the organisation that undertakes outstanding work in the GIS field. DE was selected to receive this prestigious award from over 60,000 organisations worldwide.

The main aim of GOLD was to raise awareness of GIS within DE, make information from the Defence Property Register (DPR) accessible to staff on their desktop and allow users to display that information in both text and map form. Additionally, the system provides an on-line internal telephone directory and detailed location maps and instructions to DE offices. Defence Estates staff have been able to access GOLD information via DEWeb, the internal intranet, since March 1999.

GOLD is due to be enhanced later this year, when it will be directly linked to the Defence Property Gazetteer (DPG) which is currently under development as part of the Property Information Management Study (PIMS). This study is investigating how data can be drawn from the various systems operated by DE, including Skyline and PROM2, into a Property Management Information System. The DPG system will, on completion, enable estate-related data to be held in a corporate, integrated and consistent manner, thereby providing DE staff with more current and accurate data on which to base decisions and answer questions. In addition, it is also planned to incorporate site boundaries and plans into GOLD.

Defence Estates is standardising on BS7666, the standard for managing land and property information including spatial representations of features. Many still associate BS7666 only with local government, but the increasing adoption by MOD and other public and private sector organisations is proving otherwise. Prior to the adoption of the standard, the core land and property information was held in simple spreadsheets with only very limited access. Now that data will also be well managed and easily accessible in the Oracle database, allowing various systems to integrate to a common standard. GOLD also draws information from this.

The use of geographic information is now rapidly advancing into many areas of Defence Estates' business units, including the future development of the 'Electronic Terrier' that provides distributed access and maintenance across the country, with up to 1000 browser users, all online, using ESRI's ArcIMS technology. Forests and woodland account for some 7% of defence land, and a forestry application is now being investigated which will help manage use of training areas whilst minimising adverse environmental impact.

GI News