

# **The Use of Information and Communications Technology in Land Based Search and Rescue with Particular Emphasis on its Role in Incidents Involving Missing Persons Searches**

**Carl Hamilton**

**The Centre for Search Research**

**September 2015**

# Introduction

Information and communications technology plays an ever developing and expanding role in every aspect of modern life and Search and Rescue (SAR) is no exception. SAR Teams have benefitted in many ways from these technologies, for example paging systems, SMS text messaging and applications such as Sarcall to initiate call outs and the very reliable and stable operational communications platform teams are now able to access via the Airwave network.

Search, as a discreet element of search and rescue has also been subject to the attention of the ICT developers who have used various mapping and satellite technologies in the production of a number of tools to aid in the planning and execution of a search based incident.

It is important to recognise at the outset the limitations of these tools, and to understand that they are not able to provide 'the answer'. They are unable to tell us where to search or how to search and, put simply, they are an adjunct to the search plan, a means to an end and not an end in themselves. Whilst their capacity to monitor the progress of an incident and record details of a missing person (misper) can be of immediate use, they are unable to provide any analysis or develop scenarios of what may have happened. This still requires the knowledge, skill and experience of the search planner to draw together the key elements of misper profile, incident history, local knowledge, map analysis and missing person behaviour statistics in order to produce likely scenarios which postulate where the misper may be this time and how they may have got there. It is only then that the technology should be used to translate plans on to maps. We should be careful not to be drawn into the situation where we are making maps to give us plans - surely the tail wagging the dog!

Another important consideration, and possibly a limiting factor, are the potential vagaries of electronic equipment, especially in the challenging environmental conditions sometimes encountered during a search. Batteries can run out, power supplies can fail and equipment can malfunction or 'crash'. All of which could lead to a complete loss of information and data were it the only means of recording. This

could obviously have potentially fatal consequences if the search was to be delayed whilst the information lost was collected again. It is worth remembering that a traditional map has never run out of batteries or suffered an equipment failure.

## What is Available

Let us take a look at what is currently available and in use by teams to a greater or lesser extent. The following list is not hierarchical and does not intend to convey support or suggest preference for any particular product.

### SARMAN

Sarman (Search and Rescue Management Solutions) was developed by Mapyx, working with Mountain Rescue England and Wales (MREW), and functions as a plug-in with their Quo professional digital mapping software to give a comprehensive and flexible package which is able to assist the search manager during the whole lifespan of an incident. Missing person details and incident history can be recorded and assets, both human and physical, can be logged and assigned. Search groups can be created and assigned to tasks in the form of routes or 'lines' to search or areas to search if such tactics were appropriate. A consensus can be calculated and recorded to identify priorities and concentric distances from the IPP (Initial Planning Point) can be shown on the map. The mapping can also be used to identify search tasks in the form of lines and points or search areas and the system is able to record and display which assets have been assigned to each given search task. Each route or area created can be colour coded, thus simplifying complicated descriptions over the radio when describing further tasking hence groups could simply be directed to the red route or the blue area for example. The mapping utilises Ordnance Survey maps and is fully zoomable from 1:250,000 through 1:50,000, 1:25,000 down to 1:10,000 plus the latest development has Mastermap (1:2,500 and 1:1,250) being the most detailed mapping available. There is also the very useful capacity to zoom in to satellite imagery, giving the controller or search manager a clearer picture of terrain type and thus assisting to inform the planning

process. There is the capacity for live asset tracking via GPS enabled radio mics or via various handheld satellite mobile devices. The system also provides a 'black box' facility to monitor and record all aspects of an incident, which can then be printed to provide contemporaneous post incident documentation for evidential purposes.

Sarman does require a degree of training and practice in utilising its functions prior to operational use. In practice, it has been found that it works best with a person who is tasked to operate the system for the duration of the incident. This does therefore remove them from performing an operational role. In use it has become apparent that there is a very heavy workload placed on this individual, especially in the early stages of an incident, as they attempt to enter misper details, identify lines and points, log the attendance of personnel and team equipment, create search groups and assign personnel to these groups, assign equipment to the search groups and then task each group whilst maintaining an incident and radio log

In early 2015, however, the latest iteration of Sarman, known as MX Sarman became operationally available and has alleviated the heavy workload placed on an individual as experienced in earlier versions. This is entirely thanks to the proactive approach adopted by Mapyx and their willingness to listen, take on board and address issues flagged up by operational use. MX Sarman is a multi-user platform and allow several users to input data and work upon the same incident simultaneously. This enables the workload of the Sarman operator to be eased considerably by enabling tasks to be performed concurrently and hopefully shortening the set-up time required at the beginning of an incident. The extra personnel utilised at the beginning of an incident could then be tasked operationally themselves as the set-up of the incident completes and the workload of the operator lessens significantly. There is also a feature in the multi user version to allow for remote input to the incident where internet access is available. This potentially frees up personnel in attendance to allow them to perform a more directly operational role. Before this version is released to Mountain Rescue Teams, operators will be required to undergo formal training from Mapyx to ensure a minimum standard and allow users to be fully cognisant of the functions of this highly capable software.

Mapyx has just completed a new product MX Response, which provides the key graphical features of MX Sarman, without overburdening the user with too much search management functionality. Similarly the MX Response system is single or multi-user and the database can also be read by MX Sarman, making the system scalable horizontally and vertically.

## **MX Tracker**

This is another plug-in developed by Mapyx for its own Quo professional mapping. Mostly, it utilises satellite tracking devices carried by individuals and registered with Mapyx, though was originally designed and still operates with GSM and Radio Tracking. The satellite tracking devices must be carried with an unobstructed view of the sky, in the same way as a GPS receiver, in order for them to communicate with the satellites. At pre-set intervals the location of the device will be transmitted and a precise location is then able to be displayed on a Quo digital map. Tracks can also be displayed in order to record precisely where someone has been. Further, pre-programmed text messages can be sent via the device to mobile phones, email addresses and the computer screen and there is also a function for dropping the message onto the map screen. It is becoming more common for these devices and this technology to be used by school and youth groups giving leaders the ability to access precise tracking and location information and allowing real time progress to be monitored. This technology has the capacity to eliminate the requirement for a search altogether. As long as the person or group have stayed with the tracking device, a response could be made to a precise and known location to render whatever assistance may be necessary. There is a new system called MX Track SMS, which permits the users to text the Mapyx server, which then texts back the location of one or more trackers.

## **SARLOC**

SARLOC (Search and Rescue Location Software) was developed by Russ Hoare of Ogwen Valley Mountain Rescue Organisation and is a system which provides a tool

to highlight the precise location of a casualty or missing person therefore eliminating the need for a search and enabling a response to a known location. The user (misper or casualty) must connect to the SARLOC website which in turn interrogates the users smartphone and uses the GPS information it contains to precisely locate the person. This is then relayed to the SAR Team and displayed on a digital map to enable a response. The system works on i-phones and several phones on the Android platform. It relies upon the user having access to a smart phone and also a connection to a mobile network and internet access.

## **CASIE**

CASIE (Computer Aided Search Information Exchange) is a non-commercial product which was developed in the USA in the 1980's and has subsequently been widely used there as a planning aid in search related incidents. It has undergone development since its inception and the current version is CASIE III, it is available to download free of charge from the website [www.wcasie.com](http://www.wcasie.com) It can be used to log an incident and provide prompts for necessary actions; it can provide a platform to conduct a consensus in order to assign priorities and can perform probability calculations in order to determine PoD (Probability of Detection), CPoD (Cumulative PoD) and PoA (Probability of Area) for example for any given search task. It can also carry out automatic updating of PoA calculations each time an area is searched. Summaries of lost person behaviour are also provided and there is an option to access the data from the UK Missing Persons Behaviour Study. Whilst also a powerful and adaptable tool, CASIE does not link directly with any mapping software and is perhaps of more direct benefit in the intermediate and final phases of an operation when a greater emphasis is placed on searching areas and PoD, CPoD and PoA become of greater significance.

## **View ranger**

ViewRanger is an application developed for mobile phones and is available on both Apple i-phone and Android operating systems. It works by utilising a smartphone's

in built GPS capabilities in combination with tracking, navigation and location sharing utilities developed by ViewRanger. Whilst the GPS location, mapping and navigation features can be used when in areas without mobile coverage, a mobile signal will obviously be required to communicate a present location in order to find the misper.

## **MR Map**

This is a mapping technology developed for Mountain Rescue use and allows for live asset tracking of team members under operational conditions via the use of GPS enabled radio microphones. These transmit a signal which then displays the location of the radio in real time on a digital Ordnance Survey map. MR Map may also be used in conjunction with Viewranger to display the location of mobile phones transmitting a buddy beacon. Transmission times for buddy beacons can be set to a variety of different time intervals but the shortest at five minutes give almost real time tracking. A mobile phone signal is of course required for the transmission of the buddy beacon. MR Map can also be used in conjunction with SARLOC in order to display the missing persons location.

## **Unmanned Aerial Vehicles (UAV's)**

Looking to the future the potential for the deployment of Unmanned Aerial Vehicles (UAV's), sometimes referred to as drones, to assist us in the Initial Response phase of a search operation cannot be over looked. Such technology is becoming much more robust, ever more reliable and costs are falling to a level which would fall within the purchasing power of most teams. The most common form of UAV which could be deployed to assist in SAR operations would be the quadcopter, hexacopter or octocopter which have four, six or eight independent rotors respectively. These UAV's can be combined with high definition, gimbal mounted cameras which have damping systems in built in order to transmit a fully stabilised real time video image to the operator. This therefore means that the UAV's are capable of being flown and controlled out of the visual range of the operator. A limiting factor for such vehicles in the past has been the relatively short battery life. This factor is improving rapidly

and typically flight times of between twenty and forty minutes are now available. This increase in flight time obviously significantly extends the serviceable range and operational effectiveness of such vehicles. These UAV's, importantly have fail-safes built into their management software which will monitor battery levels and compute them against the distance flown away from home base. They will automatically retain enough power to return to base and do so when battery levels are becoming low. They also communicate with GPS satellites to locate themselves at all times and again are capable of automatically returning to base and landing if the radio signal with the operator is lost. There is potential in the future to utilise the on board GPS functions of UAV's to pre programme flight plans. This would give us the potential to identify search hot spots and to choose from a bank of pre-programmed routes and places (lines and points) to search according to a consensus of likely scenarios from the UKMPBS etc. UAV's could also be deployed to search hazardous terrain without exposing searchers to unnecessary risk.

Whilst there are obviously many benefits in exploiting the potential for developing UAV's in search related tasks it is worth remembering that there are also limiting factors. Weather conditions will remain significantly important and UAV's will be unable or unlikely to be able to be deployed during high wind conditions, during low visibility due to mist, fog or cloud level or indeed during the hours of darkness, though it is possible to imagine some limited use at night, in the future, with the addition of infra-red or image intensifying cameras. There will also be significant training implications for teams wishing to utilise such technology. Lastly, and perhaps the most important limiting factor, is the fact that UAV's are unable to administer any assistance to a casualty and there will still be a time lag whilst team members make their way the misper to render any necessary help.

## Summary

Whilst the advantages of using ICT to assist in our search for missing persons are many, and the capability and reliability of such technology will undoubtedly develop into the future, we must always be mindful of its limitations. If an over reliance is placed on ICT at the cost of applying the practical skills of the search manager, there is a risk that it could delay, impede or hamper the search effort.

There is also a danger that the inexperienced search manager could begin to be lead by the technology rather than guided by the established principles of search management.

It is indisputable that if employed as one of the tools to aid search managers in the planning and execution of a search, the various ICT applications can prove to be of great benefit and indeed, in some instances potentially eliminate the need for a search altogether.

To date, however, ICT can not offer us a catch all solution to the problem of searching for the misper but, if employed with proper thought alongside established search management strategies, it can significantly aid the process.