



Unearthing New Technology in Crime Scene Responses with Forensic Mapping

By: Mike Byrd

We must never limit ourselves or our abilities in finding ways to enhance and improve our work product. We must continue to build our knowledge and constantly be aware of the new technologies being used or introduced into our discipline or field. I recently had the opportunity to attend a 40 hour course in "Forensic Mapping". It was a tremendous learning experience that needs to be shared.

As a specialist in crime scene response, we are always looking for new ideas to make our job easier, more time manageable, more accurate and more efficient. In an organized approach to processing a crime scene one of the important stages in processing that crime scene is scene documentation. The scene documentation is a vital stage because it is the stage that's functions create the permanent written or visual record of the scene, the conditions at the scene and the evidence on the scene. One of the steps in this stage is the taking of measurements to construct a sketch.

The sketch is drawn as an overhead view replicating the scene to show items of evidence, the position of items of evidence and the relationship of items to the evidence. We use the term sketch for our drawing because it is usually an accurate representation of the scene which is not done to a scale. This is usually indicated by illustrating "not to a scale" on our finished drawing. Scale mapping of a site or location are usually done by trained professionals such as architects, engineers, or surveyors. Until now!!!

Circumstances for sketching:

In law enforcement responses sketches are drawn for the following circumstances;

- vehicle crashes.
- crime scene responses.
- bomb blast or explosion responses.
- disaster responses.
- conducting evacuations.
- report writing.
- planning:
 - security measures.
 - organized raids.
 - public events.

Measuring & sketching Instruments:

For decades the crime scene specialist has relied on devices like the 25 foot steel retractable tapes and 100 foot non-conducting fiberglass tapes. The last decade introduced us to the 1000 foot walking wheel and the Electronic ultrasonic measurer (EUM). The EUM is an electrical device that

sends a pulse, up to 250 foot in range, to a fixed surface.

Various rulers, protractors, compasses, french curves, flexible curves, T-squares and templates are available and used to assist in hand drawing our sketches.

Pantograph:

To achieve an accurate to scale replicate, an overhead photograph and a pantograph could be used. A pantograph is a device that copies (traces over) a design and enlarges or reduces it in the process. The tool is simply clamped to a drafting table and is adjusted to a desired scale. As one hand traces over the original design (aerial photo of scene) the second hand guides an attached pencil that draws the copy.

Practical measuring techniques:

After assigning and completing the taking of notes and photographs the crime scene specialist is able to start his/her measurements and a rough scene sketch. Usually 2 people are needed to take the measurements. The measurements are taken from 2 fixed points of reference. There are 5 practical measuring techniques used to determine the position of reference points and items of evidence to be put in the crime scene sketch.

1. Rectangular coordinates: This is the easiest and most used method for most crime scene specialist. Measurements are taken from 2 fixed areas at right angles of each other.

2. Triangulation coordinates: This method is designed to measure to an item from 2 fixed points by forming a triangle. This method allows the specialist to measure all items of evidence from the first fixed reference point then move to the second fixed reference point to complete the measurements.

3. Secondary reference points coordinates: This method would be useful for long distance areas or multiple scenes spread over a large area. A primary fixed reference point would be measured to 2 secondary reference points. Items of evidence can then be measured from the secondary points. This would not be a recommended method for someone with limited experience in sketching crime scenes.

4. Transecting baseline coordinates: This method would require the specialist to lay a measuring tape from 2 fixed positions. Each item of evidence would be measured from the baseline at 90 degrees. The length along the baseline would be measured giving the specialist his/her 2 measurements.

This was a method that had to be used in a high profile shooting case that we were asked to assist in where the second



dary scene, the final stand off scene, was more than 2 miles from the primary starting confrontation scene at a major intersection. The secondary scene was a long stretch of wooded roadway bordered on either side by a canal, with no fixed reference points.

5. Polar coordinates: This method would require a bit more training and knowledge than what most crime scene specialist are accustomed to. This method would require either of two coordinates, the radius vector or the polar angle, that together specify the position of a point in a plane.

This method would be made more simple with techniques using an electronic measuring device known as a 'total station' to document the needed angles and distances for mapping.

Mapping is not new. Surveyors, Engineers and Architects have been using the concepts of mapping systems for more than 15 years. Law enforcement has been using this technology since the early 1990's in traffic crash investigation and reconstruction. Its introduction into the forensic field as a tool for the crime scene specialist is just being unearthed. Its use as another tool for crime scene specialist to capture and accurately plot items of evidence is revolutionary.

Introducing "Forensic Mapping":

The word forensic is defined as relating to, used in, or appropriate for courts of law or for public discussion or augmentation.

The word mapping is defined as a representation, usually on a plane surface, of a region of the earth or heavens.

Forensic mapping has been described as both a science and an art. A science in that it accurately collects measurements and an art by drafting or mapping a finished product.

The instrument is known as a total station. The total station determines a distance and an angle between itself and a prism. It is a state of the art measuring device. The system needs 2 people (preferably 3) for operation. The measurements are recorded and stored by a small data collector. At the office the information is downloaded from the data collector into a computer with mapping software. After the information is downloaded into the computer it takes about 15 minutes for a completed sketch with an inserted legend to be printed.

I can remember 2 high profile police shooting cases in the early 1990's with multiple scenes where this device would have been tremendous. After spending hours on the scene taking all of the necessary measurements, later at the office the finished product of multiple scene sketches taking a dozen or more hours to hand draw. Quite a difference!

The 1st case involving a large area with items of evidence sporadically scattered over several miles of a major state roadway. Due to the heavy traffic which routinely travels this roadway, a section of more than 3 miles had to be closed down and detoured for the longest part of a day. This had to

be done in part to secure the evidence but more important was the physical (traffic) hazard to the crime scene specialist. This was completed with primitive equipment, long before the walking wheel used for measuring became a standard item of equipment for the crime scene specialist. A combination and variation of a secondary reference point coordinate measuring system and a gridding system (used in surface skeleton investigations) were incorporated to measure for a series of sketches. The subjects vehicle (looking like swiss cheese) was also measured and sketched to illustrate trajectory flight path interpretation.

The 2nd case involved a police shooting between members of multiple law enforcement agencies and several fleeing armed subjects. The incident covered an area of several square blocks with multiple scenes. Along the escape route of the fleeing subjects, each encounter with law enforcement created a stand off developing another secondary scene. Assigned the task of handling only the sketching of the scene or scenes required more than 15 hours of measuring at the original response. Afterwards approximately 30 hours were used to construct a series of 1/2 dozen individual hand drawn sketches. Which received much praise and commendation for their effort to detail.

Vertical mapping:

What we may have identified in the past as an elevated or standing wall, building, or a view of the side or front of a vehicle is known as vertical mapping in "Forensic Mapping". This is a useful option when certain dimensions are necessary from a vertical surface. This is also an area which limits have not been fully explored to this point.

- a. blood spatter or cast off pattern on wall.
- b. focal point of trajectory angles or projectile flight paths in a fixed surface.
- c. Ricochet marks, angles or directionality in fixed surfaces.

For those of you who are doing crime scene reconstruction or bomb scene reconstruction, take a long hard look at this new application of technology. The precision accuracy, vertical mapping ability and to scale representation is remarkable. As a pioneer in the application of this technology, it is exciting to see the untapped potential of a system whose time is coming. ■

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