H13 Controlled Research Utilizing Geophysical Technologies in the Search for Buried Firearms and Miscellaneous Weapons

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This presentation will impact the forensic community by providing guidelines to forensic investigators regarding which geophysical tool, or combination of tools, is appropriate for a search for metallic weapons at a crime scene or suspected weapon burial site.

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Locating metallic weapons such as firearms that have been discarded or buried by criminals often involves the use of a variety of search methods and technologies. Depending upon the size and composition of the suspected weapon, forensic scene professionals may incorporate advanced methods such as geophysical technologies into their investigation. The application of geophysical technologies in forensic investigations is a growing practice, creating a need for research in the area. One way to determine the applicability of geophysical search methods in a forensic investigation is through controlled research. This type of research provides opportunities to test the applicability of various geophysical technologies and also to improve standard geophysical detection methods, which can then be applied to real- life searches.

This research was designed to demonstrate the utility of geophysical technologies at a crime scene or a suspected weapon burial site through controlled testing of buried weapons. Utilizing two types of metal detectors and a magnetic locator, the following objectives were addressed: (1) to test the ease with which these geophysical technologies may be used to detect buried weapons with little operator training, (2) to determine what effects the metallic composition of the weapons have on their detection, and (3) to determine which instrument is better at detecting specific weapons.

The geophysical tools used in this research were chosen due to their accessibility and efficiency at detecting metal objects. Most law enforcement agencies will find these tools easy to purchase, relatively inexpensive, and perhaps most importantly, easy to use. Included in this research project are:
(1) a Fisher M-97 basic all-metal detector, (2) a Schonstedt GA-72Cd® magnetic locator, which detects buried ferromagnetic objects such as iron and steel, but ignores non-ferric items such as aluminum and copper, (3) and a Minelab Explorer II advanced metal detector, which allows for metal discrimination by providing "signature" ferric and conductivity readings.

The 30 metal objects included in this research are fourteen decommis- sioned street-level firearms (including a rifle, a shotgun, revolvers, and pistols), ten blunt or bladed weapons, and six pieces of assorted scrap metals. The scrap metals and miscellaneous weapons have been included to test the discrimination function of the advanced metal detector and to allow for a wider variety of metals to be tested on all three of the geophysical tools. The weapons were tested both on the surface as discarded weapons, and at a number of depths.

Initial results have shown that using factory presets and medium levels on the geophysical technologies allows for detection and readings at multiple depths. The all-metal detector was able to detect each item on the ground surface; however, items made of aluminum and copper and some of the smaller miscellaneous weapons were not detected, even at the shallowest tested depth. As expected, and for both pre-burial and buried objects, the magnetic locator was able to detect ferric objects made of iron and steel and not those of copper or aluminum composition. Overall, the advanced metal detector was successful at detecting many of the weapons, including the firearms, while eliminating the trash metals of iron composition. Through the discrimination function of the advanced metal detector, valuable search time and resources are saved by not digging up false targets (trash metals) that the all-metal detector would detect. The magnetic locator would be an appro- priate tool when searching for ferric items.

Geophysical Technologies, Forensic Archaeology, Metal Detectors

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