

White Paper

BRASSTRAX™:
Overcoming Barriers to the Efficient Processing of
Evidence Associated with Firearm-related Crime



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ABSTRACT

This paper examines some of the major barriers to efficient firearm identification and how technologies developed at Forensic Technology can help overcome them. Obstacles identified and discussed include: Resource Limitations and Backlogs, Selective Analysis, Time and Distance, and Subjective Information Sharing. As the creator of IBIS™ (Integrated Ballistic Identification System) the world's leading automated ballistics identification tool, Forensic Technology is uniquely qualified to address these challenges with proven state-of-the-art technologies.

BRASSTRAX™, an efficient and cost-effective solution that creates greater levels of efficiency and leverages IBIS technologies currently in place, is identified as the solution of choice.

Founded in 1991, Forensic Technology is dedicated to helping governments around the world create safer societies by providing innovative solutions that assist in the fight against crime. We create cost-effective solutions that help police and forensics experts with firearms identification, property and evidence management, data analysis, laboratory information management, intelligence dissemination, and forensic training. Our partnerships with law enforcement and public safety agencies allow governments to better protect their citizens.

It was Forensic Technology's dedicated team of engineering, forensic, and law enforcement professionals that pioneered automated ballistic identification, creating IBIS in the early '90s. Today IBIS is used by law enforcement agencies in more than 30 countries and territories to collect, store, and analyze fired bullet and cartridge case evidence related to criminal investigations. Harnessing the power of computers, IBIS technology captures digital images of the unique markings left on fired ammunition components and sorts them with lightning speed. IBIS then ranks the pieces of evidence most likely to produce a match in order to maximize the productivity and effectiveness of human experts.

Despite advances in the use of automated technology to process shooting-crime evidence, there are only about 350 automated ballistics systems operating in the world today. The United States accounts for about 235 of these and the remainder is distributed among 30 other countries. With 18,000 police agencies in the U.S. alone, and tens of thousands more around the world, there are not enough automated ballistics systems to meet the world's needs. Additional tools that can

improve upon efficiency to create a more effective network of automated ballistics systems is required to service the growing needs of police agencies around the world. To this end, Forensic Technology has developed BRASSTRAX, an innovative tool that allows current IBIS systems to be used more effectively and overcomes barriers to efficient firearm identification. BRASSTRAX is dedicated to cartridge case exhibits and allows people with basic computer knowledge to electronically collect and submit evidence data to a central processing point. As an extension of IBIS, BRASSTRAX provides greater levels of efficiency and raises the overall effectiveness of an IBIS system.

Barrier One - Resource Limitations and Backlogs:

Firearms experts are in short supply and backlogged cases in the United States alone are estimated at more than 14,000¹. Resource limitations are the principal cause of backlogs, and delay both crime-solving and the criminal justice system. BRASSTRAX breaks through this barrier by providing automated collection systems to help law enforcement be more efficient and effective in an environment where valuable resources are limited and backlogs are inevitable.

Barrier Two - Selective Analysis:

In order to cope with resource limitations and backlogs, some labs are forced to implement evidence prioritization policies in order to select what evidence will be analyzed. This puts the criminal justice system at a disadvantage right from the start, as it is important that all of the evidence available to law enforcement is examined in a way that can be sustained.

The strength of the IBIS / BRASSTRAX technology is that it can compare all pieces of evidence in the system at speeds well beyond human capacity. In this light we can view the large volumes of evidence not as a barrier but as a force that helps to drive success by allowing police to “see it all.” BRASSTRAX breaks through this barrier by saving time and maximizing resources so that law enforcement can perform comprehensive analysis of all shooting crime evidence.

1. Testimony of Susan Hart Johns, American Society of Crime Laboratory Directors, before the United States Senate, Committee on the Judiciary, Subcommittee on Administrative Oversight and the Courts, July 31, 2003.

Barrier Three - Time and Distance:

This paper considers all of the tasks to be performed and coordinated in the transmittal of an estimated 555,000 pieces of evidence generated annually, from one of the 18,000 agencies that do not have a ballistics lab to one of the 235 that do. Problems are exacerbated when the need arises for evidence to be exchanged between multiple agencies and across state and international borders in order to facilitate a thorough investigative process. It is absolutely critical to the investigative process that the data required for the forensic comparison of evidence found at crime scenes be transferred to the laboratory for comparison to other evidence and test-fires from recovered crime guns.

Furthermore, time and distance have been identified as factors that affect the solvability rates of murder cases. Time is always a factor even when distance is not. As stated by IBIS users, it is not unusual for the same evidence to be submitted and resubmitted to the laboratory by the investigating agency several times during an investigation, thereby wasting weeks of precious crime-solving time.

BRASSTRAX transmits evidence data electronically and is therefore able to overcome many of the time, distance, and resource obstacles that the transportation and exchange of actual physical evidence raise.

Barrier Four – Subjective Information Sharing:

In contemporary society the ability for law enforcement agencies to efficiently exchange critical information is vital to preventing and solving crime. This paper quotes police experts who attest to this fact. Today's world demands that critical public safety information be shared.

BRASSTRAX networking facilitates systematic and collaborative information sharing within and across law enforcement jurisdictions.

In summary, BRASSTRAX will help law enforcement break barriers by using automated collection systems and electronic data transmission to speed the delivery of critical data to the lab, sustain the comprehensive analysis of large volumes of evidence, including seemingly insignificant evidence, and facilitate the systematic and collaborative sharing of information between forensic scientists and investigators.

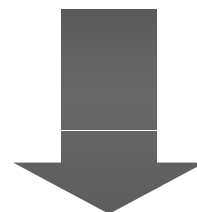
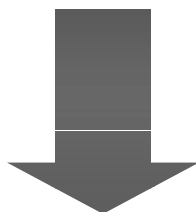
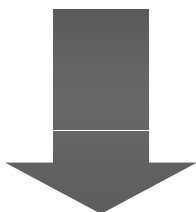
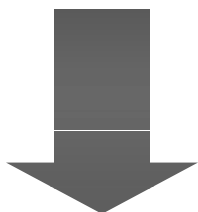
Restraining Forces Preventing Success

Resource Limitations & Backlogs

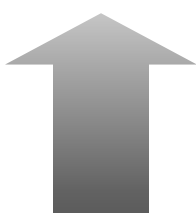
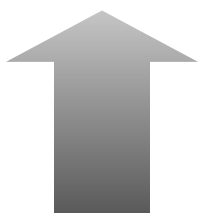
Selective Analysis

Time & Distance

Subjective Information Sharing



Processing of Shooting Crime Evidence



Automated Collection Systems

Comprehensive Analysis

Electronic Transmission

Systematic Information Sharing

BRASSTRAX Driving Forces Facilitating Success

Fig. 1: Driving and Restraining Forces Model

INTRODUCTION

For 80 years, police have relied upon the science of “forensic ballistics”² to link fired bullets and cartridge cases to each other and to crime guns in police custody. The court-tested theory has remained unchanged. Every gun leaves unique microscopic markings on the surface areas of fired bullets and cartridge cases. Experts compare these markings in an effort to identify similarities that positively link them together, subsequently concluding that the ammunition components were fired from the same gun. Until the advent of automated ballistics technology, this was a time-consuming and resource-draining process.

IBIS is in use today by law enforcement agencies in more than 30 countries and territories throughout the world to collect, store, and analyze fired bullet and cartridge case evidence and test-fires. As the backbone of the National Integrated Ballistics Information Network (NIBIN), in operation today in 235 police laboratories across the United States, IBIS is used for the analysis of fired bullet and cartridge case evidence related to criminal investigations.

IBIS has been comprehensively reviewed in a university study and shown to significantly increase the number of evidence matches made by law enforcement agencies, and to make matches that otherwise would not have been made.³ In the same study, IBIS has also been shown to generate investigative actions that add value to ongoing firearm crime investigations, and to facilitate information sharing within and across law enforcement agencies. Furthermore, the study has shown IBIS to be associated with a six-fold increase in the productivity of a forensic firearms lab. Cost effectiveness estimates and qualitative evidence suggest that IBIS allows police to make evidence matches that would not have been possible using traditional methods. Many examples of how IBIS has helped police in the United States as well as in other countries around the world to better do their jobs can be found under the category of success stories on the Web sites of the Bureau of Alcohol, Tobacco, Firearms and Explosives (www.atf.gov) and Forensic Technology (www.forensictechnologyinc.com).

2. “Forensic ballistics” is the layman’s term for the science of firearms identification, which is primarily concerned with determining if fired bullets and cartridge cases, or other ammunition components, were discharged from a particular firearm.

3. “Linking Crime Guns: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department’s Ballistics Unit” by Dr. Anthony A. Braga, Harvard University, and Dr. Glen L. Pierce, Northeastern University.

Composed of two parts, BRASSTRAX is a natural extension of IBIS and is dedicated to cartridge case exhibits. The first part is an imaging device called the BRASSTRAX acquisition station, usually located in remote police stations. The main purpose of the acquisition station is to automatically image specific marks left on fired cartridge cases. Automation is a key factor in BRASSTRAX because it allows a user with little to no firearm expertise to acquire consistent high-definition images of these specific marks. The second element of the system is a storage device called the BRASSTRAX data concentrator, usually located at a forensic laboratory. The purpose of the data concentrator is to congregate the images acquired from multiple acquisition stations within a central location and to store and convert the information into an IBIS-compatible format. The images are then processed as though they were locally acquired on IBIS.

BRASSTRAX was developed because electronic transmission of evidence information is more efficient than manual methods. BRASSTRAX expedites the labor-intensive process of drafting transmittal letters, transporting physical evidence, and performing certain preliminary evidence processing in the forensic laboratory. The timely generation, coordination, and sharing of high quality information is crucial for efficient and effective crime solving. BRASSTRAX employs the latest automation and imaging technology, allowing it to yield consistent high-quality images. These enhanced digital images are rapidly transmitted, allowing the firearms examiner to make a better “on screen” determination before calling the physical evidence for final confirmation.

Despite the advent and application of ballistics technology, there remain barriers to the efficient and effective processing of shooting-crime evidence, including firearms and fired ammunition components (for example, bullets and cartridge cases), by forensic laboratories. The adverse impact of these barriers extends far beyond the crime lab to the police officers on the street and to families who live in the neighborhoods where violent crime occurs, not to mention its effects on the social fabric of our communities and the economic vitality of our cities.

This paper discusses these barriers and presents our views as to how BRASSTRAX can be used by law enforcement authorities to overcome them and to achieve greater productivity in the analysis of violent shooting-crime evidence.

How Police Can Use BRASSTRAX to Overcome the Barriers Affecting Investigations

Barrier One: Resource Limitations & Backlogs

The shortage of firearms and tool-mark examiners in the forensic world is a well-known documented fact.⁴ It takes at least a year or more of formal training and a period of practical hands-on experience to develop an examiner. The lack of available firearms examiners is also a direct cause of backlogs in processing firearms-related evidence.

In labs using automated ballistics technology to assist in firearms identification, two distinct types of human resources can be employed. The first is the firearms examiner who performs the comparative analysis of exhibits, renders an expert opinion, and may ultimately be required to testify to his or her findings in court. Automated ballistics technology cannot replace expert examiners; it can only make them more efficient and effective in applying their craft. The second type of resource that can be employed to help make the expert examiner more efficient is the technician who is specifically trained to enter the evidence into automated systems such as IBIS. By using technicians to enter evidence into the system, the expert can focus more of his or her time on making comparisons and identifications. A technician can be trained to enter data into IBIS in a week.

Many forensic laboratories, however, have no technicians, only expert examiners who perform all the firearm examination duties in the lab, including entering data into an IBIS system. The image acquisition process is fairly speedy for a single piece of evidence. However, time spent on the data-acquisition activity is time diverted from the primary work of evidence comparison and the rendering of the conclusions that provide investigators with leads and prosecutors with evidence that result in adjudication.

Resource limitations result in backlogs that necessitate the implementation of evidence prioritization policies. This puts law enforcement in a horrible no-win situation; they should not have to pick one victim over the other.

4. A paper presented on the ATF National Firearms Examiner Academy by M. Ethridge at the 13th INTERPOL Forensic Science Symposium, Lyon, France, October 16–19, 2001.

Unfortunately, establishing priorities results in some evidence in possession of the police not being analyzed. Usually it is the seemingly insignificant pieces of evidence that are first to go unexamined. However, in some labs, prioritization can have a much broader effect; evidence that forensic examiners see an apparent need to process may have to forgo examination or be placed in backlog.

A RAND survey found that respondents experiencing problems meeting the time requirements for firearm evidence analysis overwhelmingly cited backlogs and personnel shortage as the reason⁵.

In testimony before the U.S. Senate Committee on the Judiciary, Subcommittee on Administrative Oversight and the Courts, Ms. Susan Hart Johns, president of the American Society of Crime Laboratory Directors (ASCLD), said:

The lack of resources in laboratories causes significant delays in evidence being analyzed, resulting in delays in the courts as well as in the investigation of crimes. Work is prioritized according to court dates. In some cases, it is not even brought into the laboratory. Many laboratories establish case-acceptance policies to limit the number of cases coming into the laboratory. Sometimes the laboratory may return evidence if it cannot be analyzed in a timely manner. In New York, for example, over 2000 drug cases are annually returned to the submitting agencies without analysis.⁶

The ASCLD president also indicated that there were 145,849 backlogged cases reported to her and that 10 percent of them were firearm-evidence related.

The backlog is the worst obstacle to solving crimes. Backlogs delay both crime solving and the judicial processes. Backlogs can make the difference between having a suspect in custody and not.

Backlogs also can deter some agencies from submitting all of their shooting-crime evidence for examination, such as evidence linked to less-serious crimes. Having to prioritize and limit what evidence is examined puts crime-solvers at a disadvantage right from the start. In fact, experts know that complex relationships between what was thought to be non-connected data can be discovered if small

5. Lois M. Davis, Brian A. Jackson, Challenges and Choices for Crime-Fighting Technology, RAND 2001.

6. Testimony of Susan Hart Johns, American Society of Crime Laboratory Directors, before the United States Senate Committee on the Judiciary, Subcommittee on Administrative Oversight and the Courts, July 31, 2003.

and apparently insignificant items of data are included in the analysis.⁷ In other words, a firearm found in a field and identified as discarded or lost property can be linked to a serious crime such as a murder, but only if that weapon is test-fired and the evidence produced is compared against all other similar types of evidence on file in the lab. The sustainability of this process has a direct impact on the number of criminals that can be linked to the crimes they have committed.

Breaking Barrier One: Automated Collection Systems

Technology can maximize the use of human resources. BRASSTRAX technology accomplishes this because it is automated and simple to use. Its networkability can transmit crucial electronic data obtained from evidence across entire countries in just seconds for examination any time of day or night, and its small footprint allows it to be placed just about anywhere.

BRASSTRAX maximizes resources because it requires only the most basic of computer skills to operate it. Anyone can enter cartridge-case evidence into the system for analysis. BRASSTRAX automates the data acquisition process, ensuring the consistency and quality of the data. The automation in BRASSTRAX also makes the outputs more systematic, and thus facilitates the comparisons the IBIS system performs so that the expert's time in reviewing the system's output is optimized.

BRASSTRAX maximizes resources by eliminating the need for the unnecessary transportation of physical evidence and by moving time-consuming activities, such as case preparation and image acquisition, outside the lab. The electronic networking features of BRASSTRAX provide direct connectivity to compatible IBIS systems in the laboratory, where the new item of evidence is systematically compared to all evidence previously entered into the system. This saves time for both the submitters of the evidence and its analyzers by minimizing paperwork and simplifying evidence-handling and transportation issues, as well as inventory and chain-of-custody procedures.

7. Evolutional Reasoning and Analytical Techniques in Criminal Pre-Trial Fact Investigation; Richard Leary, doctoral thesis.

The BRASSTRAX and IBIS combination also allows the firearms examiner to concentrate only on the results that have the highest probability of achieving a match. Contributing to a far-reaching database of criminal evidence that includes both the seemingly insignificant, and the apparently more key, pieces of evidence provides the best chance to operate successfully in an environment of backlogs. Furthermore, this also sustains the generation of more information for investigators and prosecutors in a timely manner.

The strength of the technology is its ability to compare all pieces of evidence in the system at speeds well beyond human capacity. With BRASSTRAX the examiners can concentrate on the analysis portion of their work and be assured of the high quality of the data they have to work with.

Barrier Two: Selective Analysis

There are generally three types of shooting crime evidence in the form of fired ammunition components (for example, bullets and cartridge cases) processed by forensic laboratories: Type I) Evidence directly related to homicides and firearm victimizations in which the victim was shot or shot at; Type II) Test-fired evidence from the firearms seized from crime suspects; Type III) Evidence related to the unlawful discharge of weapons for which no victim is identified (for example, shots fired into a building or on a street corner). Type III can be considered as seemingly insignificant. It is evidence that a crime occurred but the return on the investment of time and resources to pursue it is not readily apparent.

We will try to estimate just how much evidence of the type for which the need for examination is readily apparent, and the type that is seemingly less significant is generated every year. We can estimate a rough order of magnitude of Type I evidence from data published in a report by the U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics, titled "Weapon Use and Violent Crime National Crime Victimization Survey, 1993-2001."⁸ The BJS Survey found that of the average 847,000 violent victimizations committed with firearms, 11 percent, or about 93,000 victims, were shot, or shot at but not hit. The survey also

8. U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics Special Report: Weapon Use and Violent Crime National Crime Victimization Survey, 1993–2001, September 2003.

found that of an annual average of 17,822 murders of persons age 12 or older, 70 percent, or about 12,500, were killed with a firearm. We can estimate the total number of victims shot or shot at, and the number of victims killed by a firearm, to be about 105,000. If we were to assume for illustration purposes only that in each of those victimizations just one bullet or cartridge case was available as evidence, we can then estimate that just more than 105,000 pieces of evidence per year would have to be examined in the Type I category.

The volume of Type II evidence can also be estimated for illustration purposes only by considering the number of crime-gun trace requests made to the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) each year. According to the ATF's Performance and Accountability report for 2002⁹, on average over the past three years the ATF has received and processed about 227,000 annual requests to trace crime guns recovered by various law enforcement agencies. Although the total number of guns seized by police each year may well exceed the number of guns for which traces were requested, we can use the number of crime-gun traces requested to estimate at least a minimum workload for Type II evidence.

Assuming that all of the 227,000 firearms were capable of being test-fired, as many as two exhibits (a bullet and a cartridge case) could be generated per gun, resulting in approximately 450,000 exhibits that would have to be processed by laboratories per year.

The volume of Type III evidence is much harder to estimate because statistics cannot be found from which to draw a reasonable assumption. This is not surprising since evidence of this type may be unaccounted for because of its very nature as seemingly insignificant (e.g., unlawful discharge of a firearm, drive-by shooting, property damage only, etc.). However, this type of evidence is important and worth mentioning for two reasons: First, in the analysis of crime data, it is often the seemingly insignificant pieces of information that will lead to the identification of the more critical evidence needed to complete the crime-solving picture.¹⁰ Second, we can use this missing category of data to assure ourselves that our estimates of the total volume of evidence tend to be on the low side.

9. ATF Performance and Accountability Report 2002, produced by the Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms.

10. "Evolutional Reasoning and Analytical Techniques in Criminal Pre-Trial Fact Investigation," Richard Leary, Ph.D.

In summary, we can estimate that some 555,000 pieces of Type I and Type II evidence and exhibits (105,000 + 450,000) are required to be processed by the 235 NIBIN Program sites in the United States each year, as well as some additional but unknown quantity of Type III evidence. Considering the time that it takes an examiner to prepare the case (e.g. unpacking, report reading, sorting, cleaning, etc.), conduct an examination, prepare a report, and preserve and store the evidence, this can certainly be viewed as a barrier considering that each of the 235 NIBIN sites would have to process about nine cases per day (assuming a 260-day work year).

Breaking Barrier Two: Comprehensive Analysis:

BRASSTRAX can help transform large volumes of evidence from a "stumbling block" into "a stepping-stone." BRASSTRAX greatly increases the efficiency of laboratory processing through timesaving, resource maximization, automated procedures, and electronic transmission of critical data. BRASSTRAX accomplishes this by eliminating the mass transmittal of physical evidence and by repositioning certain time-consuming activities, such as case preparation and image acquisition outside the lab. This can actually save time for both the submitters of evidence and the analyzers, by minimizing paperwork and simplifying evidence handling, transportation, inventory management, and chain-of-custody procedures.

Some research suggests that certain investigative practices are linked with higher homicide solvability rates¹¹. Among the 37 police practices that were statistically significant and positively associated with homicide clearances were the collection and preservation of evidence, as well as the conducting of computer checks on guns, suspects, and victims. Therefore a reasonable argument can certainly be made that more evidence is a good thing, and so are certain computer checks. Taking this conclusion one step further, we can assume that with BRASSTRAX and IBIS, the sustainable collection and storage of more computerized data from

11. "An Analysis of Variables Affecting the Clearance of Homicides: A Multi-state Study, Charles Wellford and James Cronin, Justice Research and Statistics Association, October 1999.

more evidence can be a driving force for success in the solving of shooting crimes.

The strength of the IBIS/BRASSTRAX technology is to compare all pieces of evidence in the system at speeds well beyond human capacity. This “see it all” concept is best summed up in the words of an experienced Firearms Laboratory Director:

A singular piece of ballistic evidence, no matter how seemingly insignificant, used to be discarded because the amount of work required to examine it was too great. However, with the Integrated Ballistic Identification System, a single spent bullet or cartridge casing can provide the key required to unlock the mystery of one or several unsolved cold cases.

—Eliot Springer, Chief Superintendent, National Police, Jerusalem, Israel

Barrier Three: Time and Distance

According to the Bureau of Justice Statistics, there are over 18,000 police agencies in the United States. Most of these agencies are relatively small and they may rely on forensic services assistance from other local, county, or state agencies. Such agencies represent elements of a very large criminal justice system in which the efficient and effective coordination of information is a continual challenge.

For example, in considering the processing of bullet and cartridge case evidence, the NIBIN program deploys technology and equipment to about 235 labs, which perform the bulk of the firearms evidence examinations conducted in the United States.

Consider all of the tasks to be performed and coordinated in the transmittal of evidence from one of the 18,000 agencies that do not have a ballistics lab to one of the 235 that do. Among the tasks are the preparation of transmittals, packing, transportation and shipping, receiving, chain-of-custody and inventory management, forensic analysis, preparation of lab reports, evidence storage, repacking and return transportation and shipping.

These problems are exacerbated when the evidence must be exchanged between multiple agencies and across state and international borders in order to facilitate a thorough investigative process.

Furthermore, time and distance have been identified as factors that affect the solvability rates of murder cases. Research has shown that in 66 percent of solved murder cases, a suspect is in custody within 24 hours and, if the murder is not solved within 48 hours, the chances of it ever being solved significantly decrease.^{12 13} One of the major limiting factors in meeting this 48-hour window is the distance that the evidence must travel from crime scene to forensic laboratory for examination. In an internal study, Forensic Technology has determined that there are approximately 40 police agencies with staff levels of 100 officers that are located 120 miles or more from a forensic firearms lab. Geographical distance can be an important barrier for law enforcement. Evidence will either have to be driven by law enforcement personnel or shipped by courier, and either way the result can be costly. For example, precious resources can be diverted from their primary task of protecting the public when police officers are required to transport evidence to the lab. Using technology to transmit a digital image of the evidence containing the critical data needed for analysis directly from the investigating department to an IBIS system miles and hours away could expedite the generation of investigative leads, conserve law enforcement resources, and fall within the 48-hour time frame identified by the research.

Even when distance is not a factor, time is always an issue. Even the heroic marshaling of resources can take time. Consider this excerpt from the study “Linking Crime Guns: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department’s Ballistics Unit:”¹⁴

Making cold hits was an ad hoc process that was limited by the ability of firearms examiners to compare selected casings to the larger inventory of crime scene casings in the property of the Ballistics Unit. In the pre-IBIS period a search for “cold hits” typically originated

12. Danto, B. L., J. Bruhns, and A. Kutcher, *The Human Side of Homicide*, Columbia University Press, New York, 1982.

13. Lunde, D., *Murder and Madness*. Norton, New York. 1975.

14. “Linking Crime Guns: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department’s Ballistics Unit,” by Dr. Anthony A. Braga, Harvard University, and Dr. Glen L. Pierce, Northeastern University.

from either a hunch that two crimes might be related and/or as a result of an extraordinary event. For example, in September 1993, Detective John Mulligan was shot execution style five times in the head with a .25-caliber firearm as he sat in his car while working a private security detail at a Walgreens pharmacy in the Roslindale neighborhood of Boston. [Dep. Supt. Casey reported that] in an attempt to develop more information on the case, the BPD selected fifty, .25-caliber cartridge casings from recent violent crimes in the surrounding neighborhood. The entire Ballistics Unit, comprised of five firearms examiners, spent twenty, 8-hour days comparing the selected casings to the recovered crime scene evidence. This intensive effort did not result in a match.

The Boston study also addressed the cost effectiveness of IBIS. In the example above, the researchers calculated that it cost the Boston Police about \$208 to compare two cartridge casings without using ballistics technology.

Breaking Barrier Three: Electronic Transmission

BRASSTRAX is fully compatible with IBIS technology. It can be deployed anywhere a network can be established. BRASSTRAX allows for evidence to be automatically imaged from a remote location and the data securely transferred to a centralized IBIS system in a laboratory. Once imaged, evidence in the form of digital information is transferred electronically, saving precious investigative time and resources.

BRASSTRAX is able to overcome most of the time, distance, and resource obstacles that the transmittal and exchange of actual physical evidence raises. Once the system identifies a high-probability match, only the selected physical evidence need be submitted for confirmation by the forensic examiner.

BRASSTRAX leverages IBIS technologies to assist police with the management of their most precious resource—time. Greater efficiencies provide police with the time needed to compare critical evidence to seemingly insignificant evidence. Computers efficiently conduct time-consuming work in the background, delivering information based on high probability. The rapid delivery of this high-probability information allows police to focus on the generation of more leads and information for investigators and prosecutors in a timely manner.

BRASSTRAX can be deployed in a police agency or close to the location where the evidence is stored. BRASSTRAX automatically images evidence and electronically transmits the critical data needed for analysis directly to a forensic laboratory's IBIS system for correlation. The use of BRASSTRAX can effectively reduce many of the traditional tasks involved with the transmittal and processing of bullet and cartridge case evidence.

Barrier Four: Subjective Information Sharing

Everyone understands how important it is in today's world that law enforcement agencies efficiently exchange critical information, but it is a very difficult task considering that there are more than 18,000 state and local police agencies in the United States alone.¹⁵ Most often the information that does get shared is subjective in nature rather than systematic. In unveiling the International Association of Chiefs of Police National Intelligence Plan, Chief Joseph Polisar of the Garden Grove, Calif. Police Department, said in 2003:

In my opinion, while we do a magnificent job collecting information, we do a poor job sharing it. [The plan] is only the first stage of this critical effort. We should be under no illusion. This is not an easy task.¹⁶

This problem is not new and it affects communication within agencies as well as between them. For example, consider the much-publicized Tate-LaBianca California murder cases involving cult leader Charles Manson in 1969.¹⁷ On September 1, 1969, about two weeks after the murders, a boy found a "Hi Standard" .22-caliber revolver in a field not far from the scene of one of the murders. The handgun had a broken trigger guard and was missing a grip. The boy's father turned the gun over to police, who logged it in as a matter of routine and stored it in the property room. It took more than three months before investigators determined that the gun they had been searching for had been sitting in their evidence vault.

15. U.S. Department of Justice, Bureau of Justice Statistics, Census of State and Local Law Enforcement Agencies, 1996.

16. "Police List Info-Sharing Suggestions," FCW.COM, FCW Media Group, by Dibya Sarkar, 10-27-2003

17. Helter Skelter: *The Manson Murders*, by Vincent Bugliosi, Norton Publishing.

Even today, many confiscated weapons get logged in as routine and remain in police property rooms without being processed at a forensic laboratory. This happens for a variety of reasons, including but not limited to a lack of resources, a lack of easy access to services, and a lack of information that the evidence is significantly relevant to a particular case. As in the Tate-LaBianca cases, firearms lawfully taken into police custody that seemingly bear no significance to crimes at the time have the capacity to provide critical information and generate valuable investigative leads.

The reality is that police must prioritize their work and operate within the constraints of their resources. They do not have the time or resources to correlate every piece of information against every other on the off-chance of generating a lead. However, this is precisely the strength of BRASSTRAX leveraged with IBIS technology—to allow police to compare all pieces of cartridge-case evidence in the system to all other similar pieces in the system in a way that is sustainable. When the Tate-LaBianca murders were committed, automated ballistics technology did not exist. However, if the crimes occurred today, two relatively simple but absolutely mandatory actions could have been taken on the part of the police to provide critical leads. First, the cartridge case evidence found at the murder scenes would have been imaged and entered into the system, and second, a test-fired cartridge case from the “Hi Standard” revolver in question would have been imaged and entered into the system. The good news is that once those two steps had been completed, the technology would have taken over the most time-consuming and challenging aspect of the work that remained—the correlation of the data. The system could have automatically correlated all of the exhibits in the database that could possibly be related and, at the very least, provided the police with a report of possible matches, which a firearms examiner could have confirmed, linking the found gun to the murders.

As hard as it may be for law enforcement agencies to share information with each other, the problem is intensified when crossing between the public and private domains. For example, some countries make use of private examiners in order to expedite casework. In essence, the private examiner competes with the public examiner. Although the practice has shown in some cases that private examiners are both more available and provide faster turnaround times than the public examiner, there is a major drawback to their use. Private examiners have little

incentive to share their information and evidence. Therefore cross-jurisdictional matches between evidence are next to impossible.

Breaking Barrier Four: Systematic Information-Sharing

The previously mentioned university study reported that IBIS has been shown to generate investigative actions that add value to ongoing firearm-related criminal investigations and to facilitate more systematic information sharing within and across law enforcement agencies.¹⁸

BRASSTRAX is fully compatible with IBIS technology. It can be deployed anywhere a network can be established. BRASSTRAX allows for remote evidence to be automatically imaged, transferred, and centralized in the IBIS system. Because only electronic data is exchanged, BRASSTRAX is able to overcome most of the obstacles of time, distance, and resources that the transmittal and exchange of actual physical evidence raise. Once in the IBIS system, the information is available to be shared, depending on the need.

Every day around the world, ballistics technology is facilitating better information-sharing within and among police agencies. Consider the following actual case example from Mexico City:

On March 10, 2001, a gunman armed with a .45-caliber semi-automatic pistol killed a taxi driver. A spent cartridge casing was recovered at the scene. Two weeks later, police arrested a man for the murder of a woman in Mexico City. The man had a .45-caliber automatic in his possession. Firearms technicians using IBIS linked a test-fired cartridge case from the seized .45-caliber pistol to the casing found at the scene of the taxi driver's murder.

18. "Linking Crime Guns: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department's Ballistics Unit," by Dr. Anthony A. Braga, Harvard University, and Dr. Glen L. Pierce, Northeastern University.

What Else Does the Immediate Future Hold?

Since the first ballistics imaging systems were fielded in early 1993, the complexity, speed, accuracy, and global performance of the correlation algorithms have been improved dramatically and will continue to do so. IBIS software has gone through a major rewrite and eleven significant software upgrades. With these upgrades, IBIS has been able to realize correlation speed increases of more than 1,000 times. In addition, correlation performance has been significantly improved through the expansion of the types of marks that can be correlated. This paper has addressed the latest technology release of BRASSTRAX, a significant enhancement to the two-dimensional imaging technology of IBIS. Following close behind BRASSTRAX are recent developments by Forensic Technology in the area of three-dimensional imaging and the demonstrated potential of “3-D” in taking data-search performance to levels never before achieved.

Conclusion

BRASSTRAX uses the latest technology available to conduct the more thorough processing of shooting crime evidence and overcome the barriers and restraining forces of: Resource Limitations and Backlogs, Selective Analysis, Time and Distance, and Subjective Information Sharing. Using BRASSTRAX will help law enforcement break through these barriers as automated collection systems and electronic data transmission speed the delivery of critical data to the lab, sustain the comprehensive analysis of large volumes of evidence, including seemingly insignificant evidence, and facilitate the systematic and collaborative sharing of information among forensic scientists and investigators.

Final Note

We at Forensic Technology are innovators who are proud of the partnerships we have forged with law enforcement around the world. We steadfastly believe that technology is critical to winning the war on crime and are committed to research and development that create new crime-fighting solutions. We also understand that technological solutions alone do not take armed criminals off our streets—police and forensic firearms examiners do.



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