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## **Report Advises Against New National Database of Ballistic Images**

WASHINGTON — A national database containing images of ballistic markings from all new and imported guns sold in the U.S. should not be created at this time, says a new report from the National Research Council. Such a database has been proposed to help investigators link ballistics evidence -- cartridge cases or bullets found at crime scenes -- to a firearm and the location where it was originally sold. But given the practical limitations of current technology for generating and comparing images of ballistic markings, searches of such an extensive database would likely produce too many candidate "matches" to be helpful, the report says.

The report notes that the fundamental assumption underlying forensic firearms identification – that every gun leaves microscopic marks on bullets and cartridge cases that are unique to that weapon and remain the same over repeated firings – has not yet been fully demonstrated scientifically. More research would be needed to prove that firearms identification rests on firmer scientific footing, said the committee that wrote the report.

Nevertheless, current ballistic imaging technology can be useful in generating leads for law enforcement investigation, said the committee. Its report recommends ways to improve the usefulness of an existing ballistic image database – limited to ballistics evidence associated with crimes – that is administered by the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) and used by more than 200 state and local law enforcement agencies. It also recommends further research on "microstamping," a technique that imprints unique marks on guns or ammunition. This promising method could be an alternate way to attain the same basic goal as the proposed database.

### **National Database Would Be of Limited Usefulness**

"Toolmarks" are created on cartridge cases and bullets when a gun is fired -- for example, when a bullet scrapes against grooves on the inside of the gun barrel, or when high gas pressure forces the walls of a cartridge case against the gun's firing chamber. These toolmarks have long been used to help solve crimes -- for example, a firearms examiner might compare a crime-scene bullet to one test-fired from a suspect's gun to determine whether the marks match. Since the 1980s, computerized imaging has allowed law enforcement agencies to input toolmark images in databases of crime-related ballistic evidence and search for images of bullets or cases with similar marks.

The National Institute of Justice of the U.S. Department of Justice asked the National Research Council to assess the feasibility of a national database that would contain images of toolmarks from all new and imported guns; about 4.5 million new guns are sold in the U.S. each year, including about 2 million handguns. With such a system, when a gun is sold, images of cartridge cases from a firing of that gun would be entered into the database, possibly with information on its original purchaser. Investigators around the country who collect ballistic evidence at crime scenes could search the database for possible matches. Maryland and New York already operate such databases for guns sold or manufactured in those states.

A number of problems would hinder the usefulness and accuracy of a national database, the report says. Ballistic images from millions of guns could be entered each year, and many of the images would depict toolmarks that are very similar in their gross characteristics. Research suggests that current technology for

collecting and comparing images may not reliably distinguish very fine differences in large volumes of similar images, the report says. Searches would likely turn up too many possible "matches" to be useful. Also, the type of ammunition actually used in a crime could differ from the type used when the gun was originally test-fired – a difference that could lead to significant error in suggesting possible matches.

The report does recommend 15 improvements to the ATF's National Integrated Ballistic Information Network (NIBIN), an existing database that contains ballistic images from crime scenes and suspects' weapons. Seven recommendations focus on improving the operation of the NIBIN program; for example, the program should consider protocols for entering multiple images from the same gun – ideally involving multiple ammunition types – rather than relying on a single "best" case. The report also recommends eight ways to improve the database's technical platform -- for instance, by simplifying routines for conducting searches across multiple regions of the country. The committee examined the possibility of using three-dimensional surface measurement techniques rather than two-dimensional photographic images, but suggests the need for further research and testing before such a change is made.

### **Claims of Certainty About 'Matches' Without Firm Grounding**

The report does not assess the admissibility of firearm toolmark evidence in legal proceedings, since making such a determination was not part of the committee's charge. However, it cautions that the statement commonly made by firearms examiners that "matches" of ballistic evidence identify a particular source gun "to the exclusion of all other firearms" should be avoided. There is currently no statistical justification for such a statement, and it is inconsistent with the element of subjectivity inherent in any firearms examiner's assessment of a match.

If firearms identification is to rest on firmer scientific ground, more research would need to assess the fundamental assumption that toolmarks are unique and remain recognizable over time, despite repeated firings. Such research should include a program of experiments covering a full range of factors that may degrade a gun's toolmarks, as well as factors that might cause different guns to generate similar toolmarks. Intensive work is also needed on the underlying physics, engineering, and metallurgy of firearms, in order to better understand the mechanisms that form toolmarks as a weapon is fired.

### **Microstamping Should Be Studied**

The report also recommends more research on a promising alternative approach to providing links between crime-scene evidence and the original weapon. "Microstamping" etches or engraves unique markings -- such as an alphanumeric code -- on gun parts, which in turn generate unique marks on spent cartridge cases; microstamped marks could also be applied to individual pieces of ammunition. These marks could be rapidly examined at crime scenes using equipment as simple as a magnifying glass. However, more in-depth studies are needed on the durability of microstamped marks under various firing conditions and their susceptibility to tampering, as well as on their cost impact for manufacturers and consumers. California recently passed a law to require microstamping on internal parts of new semiautomatic pistols sold in the state by 2010.

The study was sponsored by the U.S. Department of Justice's National Institute of Justice. The National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council make up the National Academies. They are private, nonprofit institutions that provide science, technology, and health policy advice under a congressional charter. The Research Council is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering. A committee roster follows.

Copies of *Ballistic Imaging* are available from the National Academies Press; tel. 202-334-3313 or 1-800-624-6242 or on the Internet at <http://www.nap.edu>. Reporters may obtain a copy from the Office of News and Public Information (contacts listed above).

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