PART VII:
Recommendations and Future Enhancements

National Tracing Program

The ATF National Tracing Center (NTC) has maintained its capacity to process an increased volume of recovered crime gun trace requests submitted by federal, state, local, territorial, tribal, and international law enforcement agencies (LEAs) and to provide timely gun trace results and crime gun intelligence analysis to these agencies. This information provides crucial tactical information used by criminal investigators to solve violent gun crimes as well as to apprehend traffickers who supply illegal guns to violent criminals, drug trafficking organizations, organized crime syndicates, and terrorist / extremist groups. ATF analyses of traced crime gun trends and patterns also yield important strategic intelligence for policy makers and law enforcement leaders considering new policies and programs to reduce gun violence. These vital contributions to public safety have been achieved despite decreased resources and in the absence of much-needed technological enhancements to NTC systems.

From 2000 through 2011 the NTC's annual budget allocations increased 139% in current dollars and 80% in constant dollars while at the same time crime gun trace requests received by the NTC increased 59%. By comparison, from 2011 through 2021 the NTC's annual budget allocations decreased 6% in current dollars and 22% in constant dollars while at the same time crime gun trace requests received by the NTC increased 64% (See Figure NTC-11 and Table NTC-21 in Part II – NTC Overview).

The NTC has been very effective in leveraging technological enhancements to address this increased workload in the face of diminishing resources and staffing. These innovations have allowed the NTC to meet an increased demand for crime gun tracing of 174% between 2000 and 2021 (See Table NTC-02a in Part II – NTC Overview) while improving the rate of completed[1] crime gun traces by 17 percentage points from nearly 67% (137,641of 206,117) in 2000 to 84% (475,627 of 564,229) in 2021 (See Table NTC-02 in Part II – NTC Overview). The NTC also improved the rate of traces to a purchaser among traces possible to complete by 14 percentage points from 71% (98,248 of 137,641) in 2000 to nearly 85% (403,246 of 475,627) in 2021 (See Table NTC-03 in Part II – NTC Overview). Unfortunately, these improvements based on technological innovations can no longer offset the ever-increasing workload faced by the NTC. It is now taking longer to process trace requests and provide LEAs with critical investigative leads. The research team suggests the following recommendations to remedy this concerning situation. These recommendations comply with current ATF appropriations riders, Tiahrt Amendment provisions, and Title 18 U.S.C. § 926(a).[2]

Recommendations

1. **Application Programming Interface (API)**: An API facilitates data sharing among two or more computer software programs that need to communicate with each other. In early FY-23, the NTC implemented a Firearm Tracing Web Service, which leverages a secure API component. The new API allows for the electronic exchange of firearm trace related data between LEAs and the NTC to occur in a more accurate and efficient manner. This technology allows LEAs to tailor their existing records/case management systems to connect

seamlessly with the Firearm Tracing System (FTS) for automated trace submission and retrieval of trace results. The API eliminates the redundant entry of trace requests and search/retrieval of trace results by LEAs. While other LEAs benefit from these automated processes, the NTC's firearms tracing process remains fundamentally manual.

Additional APIs could also be utilized to standardize and improve information sharing capabilities between the FTS and various other ATF systems, to include NIBIN-NESS, internal case management systems, and others.

2. **Standardization of Data Terminology and Data Management within ATF**: It is recommended that ATF convene a cross-directorate working group to standardize the terminology used to define and describe firearms, privately made firearms (PMFs), industry information, and other relevant data items. This same working group will also develop data management standards to ensure uniformity in data collection, reporting, storage, and transfer protocols among the Directorates and their various tracing, intelligence, and case management systems. For instance, firearm manufacturer identification terminology can vary across databases used by the FTS, National Firearms Act Division, Imports Branch, NIBIN-NESS, and other firearms data systems. Standardization will facilitate data sharing between ATF systems and enhance the completeness of data available for strategic and tactical intelligence analysis.

3. **Expand the Use of NTC Connect Program:** NTC Connect is a free service available to manufacturers, importers and wholesalers who maintain electronic Acquisition and Disposition (A&D) records. NTC Connect utilizes a secure web-based application through which authorized NTC personnel, when conducting a crime gun trace, can send a query, by serial number only, against an FFL's electronic firearm acquisition records and retrieve the corresponding disposition data if available. The data remains the property of the FFL and is not housed at ATF. Participation in the program is voluntary and can reduce FFL costs associated with maintaining personnel on staff to provide a response to NTC crime gun trace requests. At the same time, this program benefits the NTC by providing immediate access to a participant's firearms data on a 24/7 basis, thereby allowing for operations to continue outside of normal business hours and leading to improved response times in completing crime gun trace requests for LEAs engaged in active and urgent criminal investigations. NTC Connect seems to produce efficiencies in trace response and completion time as well as cost savings to the participating licensed firearms industry members, however it does introduce additional overhead and costs to the government, which limit the overall scalability of the program.

   In an effort to expand usage and further optimize the NTC Connect program, ATF should explore options to leverage an Application Programming Interface (API) to automate the process of contacting FFLs (currently done via phone, fax, email, or manual search via NTC Connect) to obtain firearm disposition information in furtherance of a trace request. FFLs that maintain electronic records could opt to receive electronic trace requests through a secure NTC Connect API. A standard trace inquiry file, to include a complete description of the specific firearm being traced could be electronically generated and transmitted via the NTC Connect API to the participating FFL, where it would be automatically compared to their electronic records. If a match was found, the disposition information for the traced firearm could be instantaneously transmitted back to the NTC through the API and loaded directly

into the Firearms Tracing System (FTS) with no manual intervention. The goal would be to leverage the NTC Connect API through each FFL in the chain of distribution as far as possible. In cases where an FFL is unable or chooses not to leverage the API service or where the response is incomplete, the trace could be automatically routed to the appropriate section for manual processing.

It is recommended that DOJ survey current firearms industry members along with product vendors who provide FFL recordkeeping software to further evaluate the feasibility of implementing API capabilities. These survey results can then serve as a basis for ATF to modernize and expand the availability of NTC Connect to additional firearms industry members (major manufacturers, importers, distributors, and retailers) who wish to participate.

4. **Use the Crime Gun Tracing Data Submission Process to Support NIBIN Data Acquisition and Dissemination:** Amend eTrace and ATF Form 3312.1, National Tracing Center Trace Request to include additional fields that ask law enforcement representatives whether the recovered crime gun has been test-fired and entered into NIBIN. In addition, reported NTC trace results should be revised to include any relevant NIBIN results information.

5. **Extend the Retention of Handgun Multiple Sales Purchaser Information:** Since 1975, FFLs have been required by regulation (27 C.F.R. §178.126a) and law (18 U.S.C. §923(g)(3)(A)) to report all transactions in which an unlicensed person has acquired two or more pistols and/or revolvers at one time or during any five consecutive business days. Multiple sales reporting was implemented to monitor and deter illegal interstate commerce in pistols and revolvers by unlicensed persons. In November 1995, ATF initiated a policy that digitized data contained in multiple sale reports, including firearms purchaser information, to be maintained at the NTC. This ATF policy was reviewed by the Government Accounting Office (GAO) in 1996 and was found to comply with all data restrictions and appropriations riders[3]. The 1995 ATF policy included a requirement to purge identifying information on multiple sales purchasers whose firearms had not been identified in a crime gun trace after two years from the original purchase date. ATF was not required by law to purge this information nor was this policy decision based on a scientific analysis of the data. This policy decision was only designed to minimize data volume. The analyses in this report found that nearly 9% (127,460) of the 1,482,861 crime guns traced to a purchaser were part of a multiple sales transaction during the five-year study period (See Figure OFT-20 in Part III – Crime Guns Recovered and Traced Within the United States and Its Territories). The median TTC for recovered crime guns associated with multiple sales transactions was 2.1 years reflecting that almost half were recovered after the current retention date. The statutes of limitation for charging most firearms violations are within five years of the date of the offense. For some firearm trafficking offenses, the date of offense is the date the firearm was purchased in a multiple sale. As such, it is recommended that multiple sales data should be maintained for five years to ensure that the associated purchaser data can be analyzed, and investigative leads provided to law enforcement agencies to assist in the apprehension of violent gun criminals and identifying gun traffickers responsible for arming them.

6. **Invest in eTrace to Improve Tracing and Generate Leads**: Inaccurate or incomplete crime gun trace submissions result in unsuccessful traces, squanders crucial time working through

problematic trace submissions, and undermines the development of strategic and actionable intelligence needed by crime gun investigators. Increased funding would enhance the capacity of eTrace to trace recovered crime guns to purchasers and generate investigative leads in the following two ways:

a. There have been no significant enhancements to the eTrace application since a Spanish language version was deployed in 2009. Modernization of the fields and prompts that guide the entry of recovered crime gun information is critical to the identification of purchasers and would further improve the validity and reliability of entered crime gun data. Potential enhancements could mandate the inclusion of a recovery date to yield more precise gun trafficking indicators based on time-to-crime measurement, support the validation of recovery address data to track intrastate and interstate crime gun movements more accurately, and the inclusion of photographs of both sides of recovered crime guns to improve trace results. Crime gun photographs allow ATF personnel to examine relevant markings, validate the submitted firearm description, and correct firearm descriptor errors and omissions prior to initiating the trace process.

b. The value of eTrace analytics could be improved by adding enhanced search and reporting features, interactive analytical dashboards, crime gun mapping capabilities, and establishing an enhanced information sharing platform to share leads and alerts with partnering LEAs. Participating LEAs would benefit from improved flexibility in managing and sharing trace data at various levels and across jurisdictions (local, state, multi-state, and national).

7. **Digitization of OOB Records:** Between 2000 and 2021, OOB records were used to complete 53% (4,041,799) of the 7,633,131 crime gun trace requests submitted to a purchaser (See Table NTC-04 in Part II – NTC Overview). The majority of OOB records are only available as paper records. The lack of digital records makes crime gun tracing a time-consuming effort and delays the generation of leads to investigators of violent gun crimes. ATF should explore digitizing the acquisition portion of FFL OOB Records. The OOB FFL acquisition records should be scanned and searchable by firearm description only. At no time would this include the cataloging of purchaser information. This should provide a significant improvement in the time required to complete a trace that requires the use of OOB records. This may require additional funding as well as the acquisition of software that can read handwriting and/or printed text and convert to a digitized format.

8. **Increased Focus on PMFs:** Some 37,980 PMF domestic trace requests were submitted to ATF between 2017 and 2021 (See Figure OFT-04 in Part III - Crime Guns Recovered and Traced Within the United States and Its Territories). As reflected in Table FER-01, the combined total of machinegun conversion and silencer and silencer parts recovered by ATF increased by almost 255% between the 2012 to 2016 period and the 2017 to 2021 period.

Table FER-01: Total Machine Gun Conversion Parts, Silencer and Silencer Parts Taken into ATF Custody, 2012 – 2021

Type	2012-2016	2017-2021	% Increase between 5 Year Periods
Machine-Gun Conversion Parts	814	5,454	570.0%
Silencer & Silencer Parts	3298	9,130	176.8%
Total	**4,112**	**14,584**	**254.7%**

a. ATF should expand training to federal, state, local, territorial, tribal, and international law enforcement partners in PMF recognition and processing (i.e., the proper submission of PMF trace requests to NTC). Due to ongoing importation of PMF parts into the U.S., ATF should enter into an intelligence partnership with U.S. Customs and Border Patrol (CBP) to better monitor the influx of PMFs. ATF should also provide training to CBP on all types of PMFs including illegal NFA items such as Glock machinegun conversion switches, drop in auto sear (DIAS), silencers portrayed as solvent traps and oil filters, receiver castings, and other items sourced from foreign countries and websites.

b. ATF should enhance eTrace and their internal case management systems (e.g., NForce, Spartan), to include a broader array of PMF characteristic descriptors that can be used to track various types of recovered PMFs and develop more detailed strategic and tactical intelligence. These improvements should be undertaken with all stakeholders across the various directorates in ATF so that any developed terms and descriptors are acceptable and compatible with all ATF systems and are used uniformly in policies and procedures as appropriate.

National Integrated Ballistic Information Network (NIBIN) Program - Modernization Efforts and Future Growth

During the study period there has been tremendous growth in the use of NIBIN and the ability of NIBIN to generate leads that are linked to crime gun trace data. The number of NIBIN cases increased 103% from 2017 (206,069) to 2021 (418,076) (See Figure NIB-01 in Part VI – NIBIN & Ballistic Evidence). The number of NIBIN acquisitions increased 99% from 2017 (290,507) to 2021 (576,930) (See Figure NIB-02 in Part VI – NIBIN & Ballistic Evidence). The number of NIBIN acquisitions with NIBIN leads increased 170% from 2017 (56,751) to 2021 (153,409) (See Figure NIB-04 in Part VI – NIBIN & Ballistic Evidence). The number of firearms entered into NIBIN increased 107% from 2017 (151,795) to 2021 (314,736) (See Figure NIB-06 in Part VI NIBIN & Ballistic Evidence). The number of firearms entered into NIBIN and submitted for tracing increased 109% from 2017 (94,249) to 2021 (196,633) (See Figure NIB-07 in Part VI – NIBIN & Ballistic Evidence). The number of Crime Gun IDs, based on the first lead date, increased 186% from 2017 (20,378) to 2021 (58,235) (See Figure NIB-10 in Part VI – NIBIN & Ballistic Evidence).

In order to expand the use of NIBIN and to continue to provide Crime Gun Intelligence (CGI) to LEAs the following recommendations are made:

1. **Funding for Continued Expansion of ATF's NIBIN Program**:

    a. *Funding for Correlation Personnel* - The NIBIN National Correlation and Training Center (NNCTC) has proven exceptionally effective and efficient at processing and correlating large amounts of ballistic evidence as a service to LEAs nationwide. Personnel at the NNCTC specialize exclusively in NIBIN correlation work and therefore become highly efficient at this process. Conducting correlations is one of the most time-consuming and labor-intensive aspects of the NIBIN process. Most LEAs do not have the resources to dedicate personnel exclusively to conducting correlations. LEAs could benefit from both costs savings as well as a more expeditious turn- around time on correlations with expanded access to NNCTC resources. It is therefore recommended that funding be provided to ATF for

additional correlation review and training specialists. These additional resources will primarily be located at the NNCTC II currently under construction in Wichita, Kansas.

b. *Funding for RMS Data Ingests in NESS* – NESS has driven innovation in ATF's NIBIN program by providing standardized and efficient mechanisms to organize NIBIN data. In addition to the nightly NIBIN data ingest, authorized NESS users also can overlay Record Management System (RMS) event data, including case narratives, people (suspects, victims, witnesses) and locations. This is an important aspect of NESS, allowing users to not only identify linked crime scenes through NIBIN data, but also identify patterns in the people and locations of each incident based on RMS data. With this combined NIBIN and RMS data in NESS, investigators and analysists can identify and target the key nodes in a violent criminal network. There are different methods to incorporate RMS data within NESS, including a process to automate entry for a given LEA. Automated entry relives the necessity to dedicate personnel and resources to manually upload RMS data.

2. **Engage in Research Regarding the Usefulness of Bullet Analysis:** Revolvers are routinely recovered in violent gun crimes. Revolvers accounted for 11% (211,590 of 1,922,577) of the crime guns recovered in the U.S. and its territories and submitted for tracing during the study period (See Table CCG-01 in Part III - Crime Guns Recovered and Traced Within the United States and Its Territories). In certain cities, revolvers accounted for larger shares of recovered crime guns, ranging from 14% to almost 19%, in New York, NY; Baltimore, MD; San Diego, CA; and Los Angeles, CA (See Table CCG-04a in Part III - Crime Guns Recovered and Traced Within the United States and Its Territories). Studies of fatal and nonfatal gunshot wounds find similar percentages of shootings involving popular revolver calibers such as .38 and .357.[4] Revolvers do not automatically eject cartridge casings when fired and, as result, generally do not leave casing evidence at shooting scenes. Bullets fired from crime guns can sometimes be recovered from victims and at shooting scenes and submitted for forensic examination. An evaluation of the use of 3-D ballistics imaging technology to collect and analyze bullets found the approach to be effective in generating investigative leads that would not otherwise be possible.[5] ATF should engage in research to determine the usefulness of projectile analysis technology in those situations where bullets are recovered from shooting victims and no casings are recovered. ATF should review existing studies in this area as well as conduct their own research into rates of revolver use in shooting crimes in various cities, rates of shooting crimes where no casings are recovered, rates of links between shooting crimes, and by speaking with law enforcement and medical examiner practitioners.

3. **Engage with Partners in Research on the Efficacy of Ballistic Forensics as well as "Match Error Rates":** Courts are currently considering defense challenges to the use of forensic ballistics evidence as well as the degree of certainty to which firearms experts may testify that a specific gun fired a specific bullet.[6] Forensic science research groups and university scholars are currently studying the validity of ballistic matches.[7] ATF should engage with organizations such as the National Institute of Standards and Technology (NIST) to assist in the ongoing research in this area and in the discussion on "match error rate" standards and their application.

Prevention of Firearm Theft from FFLs, Interstate Shipments, and Private Citizens

Between 2017-2021, there were 1,074,022 firearms reported stolen. About 3% (34,339) were stolen in 5,395 FFL thefts (burglary, robbery, larceny), 1% (13,145) were stolen or lost in 6,008 interstate shipments, and 96% (1,026,538) were stolen in thefts from private citizens (See Figure FT-01 in Part V – Firearm Thefts). Every stolen or lost firearm represents a financial loss for an FFL or private citizen and risks subsequent use in violent crime. ATF provides training to FFLs on best practices related to inventory management and loss prevention. Nevertheless, there are other preventive methods that could help reduce both firearms industry thefts and losses as well as thefts from private citizens.

Recommendations

1. **Use Unmarked Packages in Shipping:** Between 2017 and 2021 annual interstate shipment theft and loss incidents increased 351% (574 to 2,587) and the number of firearms involved in those incidents increased 192% (1,839 to 5,378) (See Figure IT-01 in Part V – Firearm Thefts). DOJ, in partnership with the firearm industry, should explore the feasibility of requirements to prohibit the appearance of firearm manufacturer names and logos on the exterior of boxes containing firearms that are being shipped in commerce as well as concealing firearms manufacturer names in return address labels. Currently these markings clearly indicate a firearm(s) is contained within the cardboard box and this makes firearm shipments more susceptible to deliberate pilferage and diversion.

2. **Limit Shipments to Common Carriers that Use End-to-End Tracking:** In partnership with the firearm industry, DOJ should explore the feasibility of requirements to limit the firearm industry to shipping firearms using common carriers that have end-to-end tracking capabilities. Interstate thefts can be more quickly identified when common carriers are able to determine where a package is at all times in transit and/or use overnight shipping with receipt confirmation notices.

3. **Explore the Use of Shipment Tracking Devices:** In partnership with the firearm industry, DOJ should explore the potential use of small, inexpensive "Bluetooth-type" tracking devices in certain high-risk shipments (by volume, high theft risk firearms type, or shipping locations relative to high crime areas) to help law enforcement locate packages in the event they are lost or stolen.

4. **Review Modus Operandi Tracking:** ATF should review how they track the modus operandi fields for FFL thefts to ensure they are collecting this data in the most effective and efficient manner for use in identifying trends and patterns. For example, it may be useful to have a primary modus operandi designation and then ancillary modus operandi to allow for distinguishing between major and minor modus operandi.

5. **Support Local Policing Efforts to Reduce Firearm Theft:** The number of firearms reported stolen from private citizens greatly exceeds the number of firearms reported stolen from FFLs and interstate shipments. DOJ should direct the National Institute of Justice and Bureau of Justice Assistance to support local police departments in forming partnerships with academic research institutions to implement problem-oriented policing projects to reduce gun theft. Problem-oriented policing has been effective in controlling residential, vehicle, and commercial thefts. Police and academic research partnerships can be productive in analyzing the nature of local theft

problems, designing innovative theft prevention strategies, and evaluating the impacts of those strategies on firearm thefts in specific jurisdictions.

6. **Explore ATF – FBI Partnerships to Enhance National Crime Information Center (NCIC) Stolen Firearm Data:** Firearm thefts from private citizens represent an important source of crime guns for criminals and other prohibited persons. The FBI NCIC Gun File was developed to assist LEAs in communicating private citizen reports of the theft, loss, and recoveries of firearms through a shared database and communications system. ATF has unique expertise in collecting, managing, and analyzing data on crime guns that could enhance the prospects of generating tactical and strategic intelligence from the NCIC Gun File data. It is recommended that DOJ support an ATF – FBI partnership to review NCIC Gun File data collection processes, assess the reliability and validity of its data elements, and determine the strategic and tactical value generated by deeper analyses of these data. DOJ should also consider the merits of a formal agreement between ATF and FBI to jointly manage the NCIC Gun File and additional funding to support enhanced data collection and analysis of this important source of data on firearm thefts from private citizens.

Research and Development

This report along with past studies have confirmed the importance of CGI and the role of ATFs NTC and NIBIN programs in developing CGI.[8] Ballistic imaging technology improves firearms enforcement operations by increasing investigative leads on violent firearm crimes, enhancing strategic intelligence on violent groups, and improving the apprehension and prosecution of armed violent criminals. NTC data as well as NIBIN leads/hits also guide violence prevention efforts by establishing patterns of armed violence in particular areas and among specific individuals as well as where those crime guns are sourced from. Current academic research supports the tactical and strategic potential of NIBIN, the NTC, and CGI. Moving forward, partnerships between academics and practitioners should be created to further advance policy-relevant research on firearm violence that leverages NIBIN and crime gun trace data. These research partnerships could delve more deeply into the data sets presented in this report or through past academic research as well as new research ideas not yet explored.

It is recommended that ATF partner with academia on future research projects that could help drive innovation, training, and priorities within ATF's NIBIN, NTC, and CGI programs.

1. **Evaluate the Effectiveness of ATF Enforcement and Regulatory Operations in Reducing Violent Gun Crime by Limiting Criminal Access to Firearms:** For decades ATF has employed strategies to reduce violent crime by targeting the traffickers responsible for making firearms available to those who use them to commit violent crimes. New CGI available through ATF Analytics and NESS facilitates the measurement of the impact of ATF enforcement and regulatory operations on the traffickers of crime guns that are being used in shootings. It is recommended that DOJ support rigorous academic evaluations of its efforts to reduce violent gun crime by identifying and apprehending gun traffickers and others who divert firearms to criminals and prohibited possessors. This may include interstate and intrastate firearms trafficking rings, internet traffickers, unlicensed PMF manufacturers, or smaller but numerous straw purchasers and unlicensed dealers. DOJ would need to ensure the U.S. Attorney Offices in selected cities will support these investigations with the issuance of subpoenas, search warrants and the use of grand juries where appropriate as well as the prosecution of any persons identified as having violated federal law.

2. **Assess and Improve the Comprehensiveness and Timeliness of Firearm Tracing and Imaging of Crime Gun Evidence:** The validity, reliability, and practical usefulness of firearms trace and ballistic

imaging data in supporting investigations, understanding gun violence problems, and evaluating gun violence reduction policies and programs are greatly enhanced when LEAs are timely submitting all recovered firearms and crime gun evidence for tracing and ballistic imaging. DOJ and ATF persistently educate LEAs on the importance of comprehensive and timely crime gun tracing and comprehensive and timely crime gun evidence ballistic imaging. However, prior DOJ and ATF assessments suggest mixed results with some LEAs embracing a comprehensive approach while other LEAs have struggled to do so.[9] It is recommended that DOJ supports a national assessment of firearm tracing and ballistic imaging of crime gun evidence that identifies the staffing, processes, and technology needed to ensure comprehensive and timely crime gun data collection and analysis in varied state, local, territorial, and tribal jurisdictional settings. This nationwide effort should be completed in collaboration with academic researchers and supported as appropriate by local research partners involved in the implementation of Crime Gun Intelligence Centers (CGICs).[10]

ENDNOTES

[1] A completed trace is when, at a minimum, the identity of the licensed manufacturer or importer is confirmed as the source of the firearm.

[2] Title 18 of U.S.C. § 926(a)(3) of the Firearm Owners Protection Act of 1986 states: *"No such rule or regulation prescribed after the date of the enactment of the Firearms Owners' Protection Act may require that records required to be maintained under this chapter or any portion of the contents of such records, be recorded at or transferred to a facility owned, managed, or controlled by the United States or any State or any political subdivision thereof, nor that any system of registration of firearms, firearms owners, or firearms transactions or dispositions be established. Nothing in this section expands or restricts the Secretary's authority to inquire into the disposition of any firearm in the course of a criminal investigation."*

[3] Government Accountability Office. September 1996. FEDERAL FIREARMS LICENSEE DATA: ATFs Compliance with Statutory Restrictions. (GAO Publication No. 96-174) Washington, DC: U.S. Government Printing Office. Retrieved at www.gao.gov/assets/ggd-96-174.pdf

[4] See, e.g., Braga, Anthony A. and Philip J. Cook. 2018. "The Association of Firearm Caliber with Likelihood of Death from Gunshot Injury in Criminal Assaults." *Journal of the American Medical Association, Network Open*, 1(3): e180833. doi:10.1001/jamanetworkopen.2018.0833.

[5] Braga, Anthony A. and Glenn L. Pierce. 2011. "Reconsidering the Ballistic Imaging of Crime Bullets in Gun Law Enforcement Operations." *Forensic Science Policy and Management*, 2 (3): 105 – 117.

[6] Mann, Alex. 2022. "Md. Court Weighs Limiting Ballistic Evidence Linking Guns in Shootings." *Baltimore Sun*, December 5. Retrieved at www.officer.com/investigations/forensics/firearms-identification/news/21289000/md-high-court-weighs-limiting-ballistic-evidence-linking-guns-in-shootings

[7] Murdock, John, Petraco, Nicholas, Thornton, John, Neel, Michael et al. 2017. "The Development and Application of Random Match Probabilities to Firearms and Toolmark Identification." *Journal of Forensic Sciences*, 62 (3): 619 – 625; doi: 10.1111/1556-4029.13386. www.jcweb.jjay.cuny.edu/npetraco/pubs/RMP_Paper.pdf ; See also National Institute of Standards and Technology at https://www.nist.gov/ballistics ; National Research Council. 2008. *Ballistic Imaging.* Committee on Law and Justice, Committee on National Statistics, and National Materials Advisory Board. Washington, DC: The National Academies Press; National Research Council. 2009. *Strengthening Forensic Science in the United States*. Committee on Science, Technology, and Law Policy and Global Affairs, Committee on Applied and Theoretical Statistics. Washington, DC: National Academies Press.

[8] Bureau of Alcohol, Tobacco, and Firearms. 2002. *Crime Gun Trace Analysis (2000): National Report*. Washington, DC: Bureau of Alcohol, Tobacco and Firearms; Bureau of Alcohol, Tobacco and Firearms. 2002. *Commerce in Firearms in the United States (2001/2002)*. Washington, DC: Bureau of Alcohol, Tobacco and Firearms; Bureau of Alcohol, Tobacco and Firearms. 2000. *Following the Gun: Enforcing Federal Laws Against Firearms Traffickers*. Washington, DC: Bureau of Alcohol, Tobacco and Firearms; Bureau of Alcohol, Tobacco and Firearms. 2000. *Crime Gun Trace Analysis (1999): National Report*. Washington, DC: Bureau of Alcohol, Tobacco and Firearms; Armstrong, Dale. 2018. *Firearms Trafficking: A Guide for Criminal Investigators.* Saco, ME: Prudens Group Consulting; King, William, William Wells, Charles Katz, Edward Maguire, and James Frank. 2013. *Opening the Black Box of NIBIN: A Descriptive Process and Outcome Evaluation of the Use of NIBIN and Its Effects on Criminal Investigations, Final Report.* Washington, DC: U.S. Department of Justice, National Institute of Justice; Hureau, David M. and Anthony A. Braga. 2018. "The Trade in Tools: The Market for Illicit Guns in High-Risk Networks." *Criminology*, 56 (3): 510 – 545; Braga, Anthony A. and Glenn L. Pierce. 2004. "Linking Gun Crimes: The Impact of Ballistics Imaging Technology on the Productivity of the Boston Police Department's Ballistics Unit." *Journal of Forensic Sciences*, 46 (4): 701 – 706

[9] https://oig.justice.gov/sites/default/files/reports/a20067.pdf ; Bureau of Alcohol, Tobacco and Firearms. 1999. *Youth Crime Gun Interdiction Initiative: Performance Report for the Senate and House Committees Pursuant to Conference Report 105-825, October 1998.* Washington, DC: Bureau of Alcohol, Tobacco and Firearms.

[10] https://www.atf.gov/resource-center/fact-sheet/fact-sheet-crime-gun-intelligence-centers-cgic ; https://bja.ojp.gov/program/cgic-initiative/overview ; https://crimegunintelcenters.org/