



Audit of the Bureau of Alcohol, Tobacco, Firearms
and Explosives' Monitoring of 3-D Firearm
Printing Technology



22-016

DECEMBER 2021



EXECUTIVE SUMMARY

Audit of the Bureau of Alcohol, Tobacco, Firearms and Explosives' Monitoring of 3-D Firearm Printing Technology

Objective

The objective of our audit was to evaluate the effectiveness of the Bureau of Alcohol, Tobacco, Firearms and Explosives' (ATF) policies and procedures regarding the regulation and monitoring of three-dimensional (3-D) printed firearms technology and trafficking.

Results in Brief

ATF reports that only a limited number of 3-D printed firearms have been used in crimes. Nevertheless, evolving 3-D printing technology may make these weapons, which present a unique combination of law enforcement challenges, even more accessible. 3-D printed firearms may be rendered undetectable by metal detectors. Fully and partly (i.e., hybrid) 3-D printed firearms typically lack serial numbers. Such privately made, un-serialized 3-D printed firearms represent a subset of "ghost guns" as they are effectively untraceable.

Although ATF lacks authority to regulate 3-D printing technology, it has evaluated and disseminated information on particular 3-D printed firearms seized or recovered during criminal investigations. We found 3-D printed firearms present unique challenges that merit further ATF assessment. If complemented by formal policies and procedures, such an assessment would help ATF better identify the threats posed by this technology.

ATF also does not have methods to identify data specific to suspected 3-D printed firearms or dedicated channels to communicate 3-D printed firearm information within ATF or externally. ATF instead has monitored 3-D printed firearms as a subset of privately made firearms, which increases the risk of ATF being unaware of increasingly improving and accessible 3-D printed firearm technology. While ATF has taken steps to stay abreast of emerging 3-D printed firearms and associated technologies, we believe it can readily take additional action to respond effectively to the challenges posed by capabilities of this advancing technology.

Recommendations

We identified four recommendations for ATF to improve its monitoring of 3-D printed firearms, which will enhance its effectiveness of ensuring that 3-D printed firearms are not trafficked, do not fall into the hands of prohibited persons, and comply with existing federal laws. We requested a response to our draft audit report from ATF and their response is appended to this audit report at Appendix 2. ATF concurred with all recommendations. Our analysis of its response can be found at Appendix 3.

Audit Results

ATF is responsible for enforcing and investigating violations of federal laws involving the use, manufacture, and possession of firearms and explosives. As one of its core functions, ATF seeks to target, investigate, and help prosecute criminals, persons prohibited from possessing firearms, and individuals who traffic in firearms, to reduce crime and enhance public safety. While ATF does not have statutory authority to regulate the methods used to manufacture firearms, either by individuals or by federally licensed manufacturers, it is responsible for enforcing federal laws addressing the illegal sale, possession, and use of firearms, including firearms produced using 3-D printing technology.

On May 7, 2021, DOJ issued a notice of proposed rulemaking derived from ATF's regulatory authority to enforce federal firearm laws and investigate federal firearm crimes. Relevant to 3-D printed firearms, the proposed rule provides new definitions of "firearm frame or receiver" and "frame or receiver" and clarifies when a firearm parts kit is considered a "firearm."

ATF Should Enhance Its Approach to Evaluating 3-D Printed Firearms to Address Their Increasing Quality and Decreasing Costs

In 2013, ATF tested the Liberator, a 3-D printed firearm, the design files of which were widely available online.

These tests indicated that the firearm could project sufficient deadly force to be a risk in certain circumstances, and that users could render the firearm undetectable. ATF disseminated its results to other law enforcement agencies and conducted presentations on 3-D printed firearms to other government and non-government entities.

While ATF has tested some fully 3-D printed firearms seized by other law enforcement agencies since its assessment of the Liberator, it has not proactively conducted tests of other 3-D printed firearms or hybrid 3-D printed firearms known to have been produced. ATF officials told us that they have not identified 3-D printing of firearms as a priority area to monitor. ATF officials have reported only 12 confirmed cases of 3-D printed firearms in the last 4 years. Identification challenges and resulting difficulties in tracing 3-D printed firearms increase the likelihood that this figure does not provide a complete picture of their use in crimes. After all, 3-D printed firearms are comprised almost entirely of polymer materials that are undetectable by metal detectors. Moreover, 3-D printing technology has seen advances in quality and decreases in cost and has become much more accessible to individuals, including prohibited persons.

ATF does not have standardized procedures to guide how it proactively identifies and evaluates 3-D printed firearms, and to ensure proactive monitoring of this evolving technology. Considering its important regulatory and enforcement mission, ATF should be positioned to assess technological advances that make 3-D printing more broadly accessible to print firearms likely to be used in a prohibited way, such as in the commission of crimes. While ATF took several actions regarding 3-D printed firearms in 2013, and has taken occasional actions since that time, it should establish standard procedures for determining which 3-D printed firearms to select for testing, how testing should be performed, and how results should be recorded.

ATF Should Engage in More Robust Outreach and Communication to Sustain 3-D Printed Firearm Technology Awareness

An important part of keeping pace with technology involves strengthening collaboration with law enforcement stakeholders as well as industry leaders that drive technological advances. While ATF tested the Liberator in 2013 and performed ad hoc collaboration in some cases, ATF needs to implement procedures to guide more regular communication and collaboration on 3-D printed firearm issues within ATF and externally with other government and non-government entities.

ATF Should Improve its Efforts to Collect 3-D Printed Firearm Information

ATF administers the Electronic Tracing System (eTrace), a web-based firearm trace submission system accessible to 8,177 law enforcement agencies throughout the United States and 46 other countries. ATF has also developed an informational dashboard to capture, catalog, and display information on privately made firearms recovered in criminal investigations and reported to it by other law enforcement agencies. However, ATF lacks a method to facilitate collecting 3-D printed firearms data, either in eTrace or outside of eTrace. Consequently, law enforcement cannot report and ATF cannot collect information regarding the material composition of a firearm or whether a firearm was possibly derived from 3-D printing. Without enhancements to its reporting capability and requirements, ATF cannot receive data or comprehensively analyze emerging trends involving 3-D printed firearms.

Table of Contents

Introduction	1
Background	1
ATF Regulatory Framework	1
Definition of a “Firearm”	2
Development of Functional 3-D Printed Firearms	3
3-D Printed Firearms Are a Type of Privately Made Firearm.....	5
Office of the Inspector General Audit Approach.....	7
Audit Results	8
ATF’s Regulatory Scope Covers 3-D Printed Firearms but not Manufacturing Technology or Designs	8
ATF has Examined 3-D Printed Firearms and Resulting Threats	10
The Liberator	10
ATF 3-D Printed Firearm Activity Since 2013.....	11
ATF Should Enhance Its Approach to Assessing Emerging 3-D Technologies and Threats	12
Decreasing Cost of 3-D Printers	13
Increasing Quality and Variety of Designs of 3-D Printed Firearms Require Procedures to Guide ATF Assessment.....	13
ATF Requires Robust Outreach and Communication to Sustain 3-D Printed Firearm Technology Awareness	15
ATF Should Improve Procedures for Receiving 3-D Printed Firearm Information	17
Conclusion and Recommendations	19
APPENDIX 1: Objective, Scope, and Methodology	20
Objective.....	20
Scope and Methodology.....	20
Statement on Compliance with Generally Accepted Government Auditing Standards	20
Internal Controls.....	20
APPENDIX 2: Bureau of Alcohol, Tobacco, Firearms and Explosives’ Response to the Draft Audit Report.....	22
APPENDIX 3: Office of the Inspector General Analysis and Summary of Action Necessary to Close the Report.....	25

Introduction

In 2013, computer-assisted firearm design specifications were first made available on the Internet, allowing individuals to use mass-market additive manufacturing printing machines, widely known as three dimensional (3-D) printers, to produce operational firearms either fully or partly made of polymer (plastic) material. Some of these firearms are undetectable by metal detectors and lack serial numbers required for conventionally made, commercial firearms.

The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) is responsible for enforcing and investigating violations of federal laws involving the use, manufacture, and possession of firearms and explosives. As one of its core functions, ATF seeks to target, investigate, and help prosecute criminals, persons prohibited from possessing firearms, and individuals who traffic in firearms, to reduce crime and enhance public safety.¹

Background

As part of its mission of enforcing federal firearms laws, ATF issues firearms licenses to both commercial dealers and manufacturers of firearms. ATF also conducts firearms licensee qualification and compliance inspections. However, some firearm manufacturing and sales occur outside of the Federal Firearm Licensee (FFL) framework. This section reviews the laws that charge ATF with regulating firearms and describes what legally constitutes a firearm.

ATF Regulatory Framework

Figure 1 outlines the three laws that define ATF's jurisdiction and enforcement powers over firearms.²

¹ A prohibited person is an individual who cannot legally possess, receive, ship, or transport firearms, to include felons, fugitives, and those convicted of domestic violence. 18 U.S.C. § 922(g).

² Although ATF is responsible for enforcing federal statutes, individual states may enact stricter firearm controls.

Figure 1

ATF Jurisdiction and Enforcement Power Summary

National Firearms Act (NFA), 26 U.S.C. ch. 53.	Imposes a tax on both the making and transfer of certain firearms and those whose business it is to import, manufacture, and deal in such firearms. The NFA covers shotguns and rifles with barrels less than 18-inches in length, certain firearms described as any other weapons, machine guns, and mufflers and silencers.
Gun Control Act of 1968 (GCA), 18 U.S.C. ch. 44.	Makes it unlawful for someone who is not licensed to: (1) be “engaged in the business” as a firearms importer, manufacturer, or dealer, or, in the course of business, ship, transport, or receive any firearm in foreign or interstate commerce, and (2) transport firearms interstate to someone not licensed to import, manufacture, or sell. Establishes new categories of firearm offenses and prohibits firearms sales to prohibited persons.
Undetectable Firearms Act of 1988 (UFA), 18 U.S.C. § 922(p)	Makes it unlawful to manufacture, import, sell, deliver, possess, transfer, or receive any firearm: (1) not as detectable as the Security Exemplar, and that contains less than 3.7 oz of stainless steel in a handgun shape, or otherwise not detectable by metal detectors; or (2) of which any major component, when subjected to x-ray inspection, does not generate an image accurately depicting the component’s shape.

Source: OIG analysis

Under the GCA and the NFA, commercially manufactured firearms require a unique serial number to be engraved on each firearm, or at least the frame or receiver onto which other unserialized firearm parts are attached.³

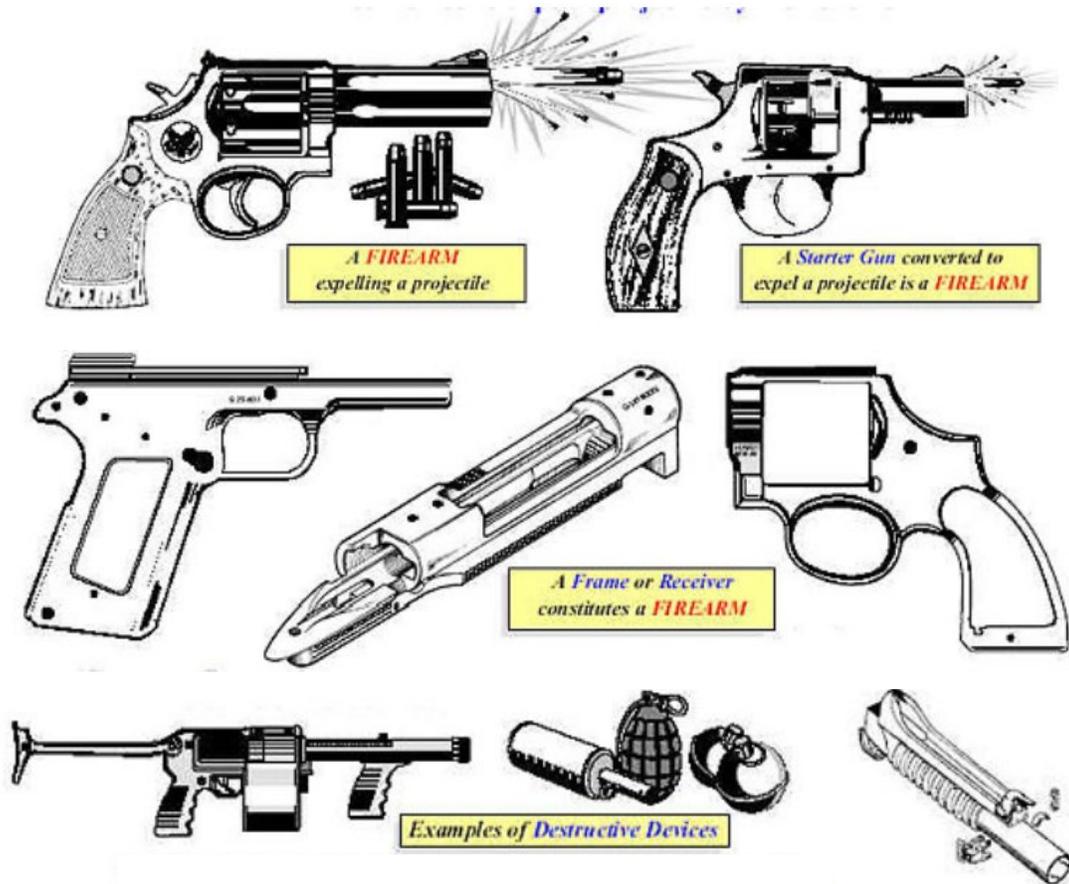
Definition of a “Firearm”

For the purposes of ATF monitoring and control, 18 U.S.C. § 921(a)(3) defines the term “firearm” as: (1) any weapon that will, is designed to, or may readily be converted to expel a projectile by the action of an explosive; (2) the frame or receiver of any such weapon; (3) any firearm muffler or firearm silencer; or (4) any destructive device, but not including antique firearms. See Figure 2 below for visual depictions of ATF-regulated firearms.

³ A firearm frame or receiver houses the hammer, bolt, or breechblock, as well as the firing mechanism, and is usually threaded at its forward portion to receive the firearm barrel. In accordance with the statutory definition of “firearm,” *see* 18 U.S.C. § 921(a)(3), ATF classifies and regulates frames and receivers as firearms. In May 2021 the Department issued a notice of proposed rulemaking in which it, among other things, proposed to update ATF’s regulatory definition of “frame or receiver” to include certain unfinished frames or receivers that could readily be completed or assembled to a functional state, and to include weapon parts kits containing such unfinished frames and receivers in ATF’s regulatory definition of “firearm.” The proposed rule is discussed in greater detail in the Audit Results section of this report.

Figure 2

ATF-Regulated Firearms



Source: ATF website

As federal law does not define what constitutes a “3-D printed firearm,” this report generally refers to a 3-D printed firearm as a weapon that will expel a projectile by the action of an explosive, or component that federal law otherwise defines as a firearm (such as a frame or receiver), which was generated via 3-D printers.⁴

Development of Functional 3-D Printed Firearms

While 3-D printing technology has been in existence since the 1980s, 3-D printed firearms did not gain prominence until 2013, when a private company publicly released its designs on the Internet for a functional, fully 3-D printed firearm called the Liberator. Federal law enforcement agencies grew concerned

⁴ As discussed throughout this report, the technology involving 3-D printed firearms has evolved so that only a part or parts of a firearm may be 3-D printed. In such cases, this report will differentiate between a fully 3-D printed firearm and a 3-D printed hybrid firearm that consists of a component that ATF defines as a firearm that is 3-D printed combined with conventional firearm parts.

about the publishing of the Liberator's design files in part because, as a fully polymer 3-D printed firearm, the possibility existed that such firearms would be undetectable by metal detectors.⁵ Figure 3 below depicts the Liberator.

Figure 3

Fully 3-D Printed Firearm, The Liberator



Source: ATF

The Liberator is an example of a privately made, fully 3-D printed firearm that could be easily rendered undetectable by metal detecting devices, as it lacks substantial metal components. The company publishing the Liberator files estimated that the files were downloaded 100,000 times in the few days in May 2013 that they were available online, before the U.S. Department of State, which was then responsible for regulating the international export of defense and destructive technical information under the International Traffic in Arms Regulations, ordered the information removed.⁶

Also in 2013, a custom manufacturing company publicized its use of a commercial, metal 3-D printer to produce an all-metal copy of a self-loading pistol, called the 1911 DMLS, a firearm that it offered for sale at \$11,900 per copy. However, as of April 2021 the commercial-grade 3-D printer capable of making the metal 1911 DMLS, and similar other printers, cost several hundred thousand dollars.

⁵ Made of polymer, except for a metal nail (which served as a firing pin), the Liberator could fire a single round of .38 or .22 caliber ammunition. To comply with the UFA, the design contained a space for an inert metal insert, but the firearm could still function without the insert installed.

⁶ Jurisdiction over the export of 3-D printed firearm design files has since changed from the U.S. Department of State to the U.S. Department of Commerce. ATF maintains authority over the unlawful use, manufacture, possession, and transfer of firearms.

Moreover, we noted extensive litigation related to the legality of making the Liberator files available online. *See Def. Distributed v. Grewal*, 971 F.3d 485 (5th Cir. 2020), *cert. denied*, 141 S.Ct. 1736 (2021).

3-D Printed Firearms Are a Type of Privately Made Firearm

Functional polymer 3-D printed firearms made using designs available on the Internet are effectively a subset of privately made firearms (PMFs)—firearms created by an individual without a licensed manufacturer serial number and not purchased through an FFL. An unlicensed individual, who is not a prohibited person and not “engaged in the business” of making firearms, may lawfully make a firearm via 3-D printing or otherwise provided that: (1) the firearm is for personal use, and (2) the firearm does not fall within the NFA and thus is not subject to registration and tax requirements.⁷ If these conditions are met, there is no accompanying requirement to engrave a serial number on the firearm, its frame, or lower receiver.⁸

Lacking serial numbers that can help ATF trace a firearm back to the first retail purchaser, PMFs are colloquially known as “ghost guns,” because they are “untraceable” if recovered at a crime scene. Further, although a prohibited person is not legally permitted to own a PMF, there is no background check to prevent it from happening. Recent ATF statistics show that untraceable firearms are increasingly being recovered from potential crime scenes, though ATF believes that 3-D printed firearms do not comprise a significant number of these.⁹ In such cases, law enforcement’s inability to investigate the firearm’s background hampers subsequent efforts to generate investigative leads.

Additionally, while the seller of a firearm “engaged in the business” of importing, manufacturing, or dealing firearms must be an FFL, an individual making a PMF may be able to sell such a firearm without a license in certain circumstances. Federal law provides that an individual who repetitively buys and sells firearms with the principal motive of making a profit requires a license, while an individual that makes only occasional sales of firearms from a personal collection need not be licensed. The relevant statute provides no clear or definitive numeric threshold for determining if a seller is “engaged in the business.” As such, ATF acknowledges that there are certain circumstances whereby it is possible, and legal, for an unlicensed individual to sell an unregistered PMF without a serial number to another user.

Whether made of 3-D printed or conventionally made materials, constructing a PMF does not require creating or printing all firearm parts from scratch or individually procuring every part. Gun kits advertised as containing an “80-percent” frame or receiver contain an unfinished frame or receiver that requires additional drilling or mill work by the user to make it functional. Gun kits are often marketed as very easy to use, with minimal drilling and mill work required to complete the frame or receiver and make them functional. Some gun kits even include the jigs, drill bits, and patterns needed to facilitate making these

⁷ Should an individual make the firearm in such a way that it constituted an NFA-controlled item, such as a handgun with a smooth-bore barrel, the person must register the firearm, pay the applicable tax, and receive approval from ATF before making the firearm.

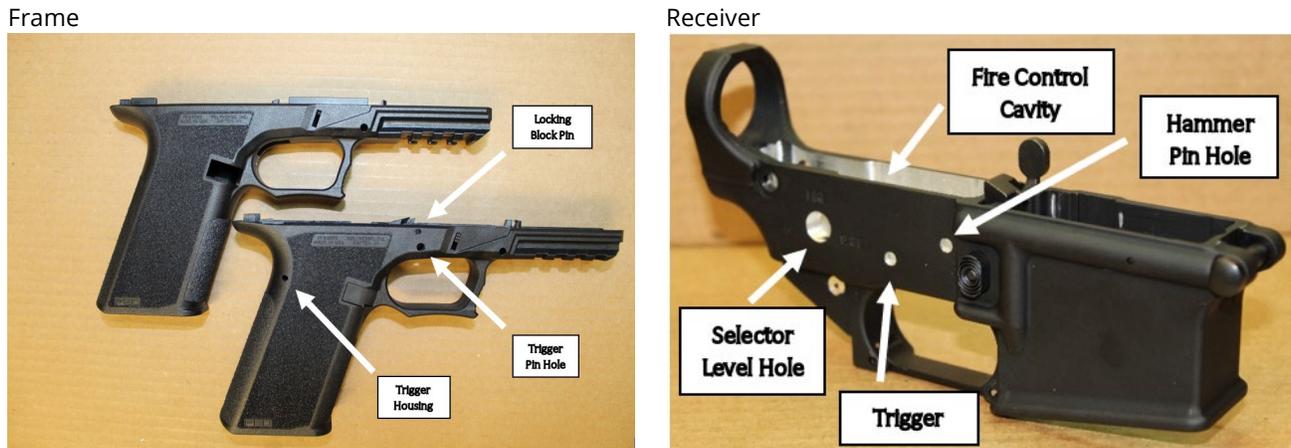
⁸ Moreover, when only a portion of a weapon is 3-D printed, ATF states that the firearm may not likely be classified as “undetectable” under federal law. Therefore, such firearms would be lawful to be printed and possessed by non-prohibited persons because they do not violate the UFA, 18 U.S.C. § 922(p).

⁹ ATF reported 1,750 suspected PMFs recovered by law enforcement from potential crime scenes in 2016. This number has increased every year since then, and in 2020, ATF reported 8,712.

further refinements.¹⁰ Figure 4 details examples of the drill and mill work required to finish an incomplete frame and a receiver.

Figure 4

Incomplete and Complete Frames and Receivers



Source: ATF

Once finished, the user can obtain (or, in some cases, print) and assemble the remaining parts of the firearm. Because unfinished frames and receivers were not yet operational, ATF did not consider these gun kits “firearms” that required serialization and registration. However, in April 2021, the White House announced several actions to address gun violence, including directing the Department of Justice to issue a proposed rule within 30 days to mitigate the proliferation of untraceable “ghost guns.” If the proposed rule is enacted as written, some gun kits would be classified as firearms and subject to serialization requirements and purchasers of these gun kits would be subject to background checks.¹¹

¹⁰ A “full-build” kit, which contains an unfinished “80 percent” frame and all the other necessary parts for completing the firearm provides another option to make a PMF. While full-build kits ameliorate an end-user’s need to print 3-D printed firearm parts, this option allows an individual to have an easy-to-assemble, “one-stop shop” kit from which to construct a firearm in a short amount of time. In December 2020 ATF executed a search warrant as a result of an investigation into whether some “full-build” kits sold meet the definition of a firearm, as these kits “may readily be converted” into a weapon that can expel a projectile by the action of an explosive, and therefore sellers of such kits would be subject to the laws and restrictions governing the sale of firearms.

¹¹ Attorney General Order 5051-2021, ATF Proposed Rule 2021R-05. In relevant part, the proposed rule: (1) requires companies that produce firearm parts kits (frame or receivers, or complete weapons) with partially complete frames or receivers that may readily be completed to be licensed and to serialize those frames and receivers; and (2) requires all PMFs accepted into a licensee’s business inventory to be marked with a serial number that begins with the licensee’s abbreviated license number, and recorded for crime gun tracing purposes.

Once designated as a “firearm,” any transfer of a firearm parts kit to a non-licensed individual must occur only after a background check.

Office of the Inspector General Audit Approach

The objective of our audit was to evaluate the effectiveness of ATF policies and procedures regarding the regulation and monitoring of three-dimensional (3-D) printed firearms technology and trafficking. The overall scope of our audit covered ATF policies, procedures, and actions since 2013, when the issue of 3-D printed firearms began to receive prominent public attention. To accomplish this objective, we assessed ATF decision-making concerning 3-D printed firearm testing, and the public safety threat 3-D printed firearms may or may not pose. We reviewed incidents that involved 3-D printed firearms within ATF's jurisdiction and ATF's testing and evaluation of 3-D printed firearms.

We interviewed ATF officials across several divisions responsible for the monitoring, testing, enforcement, and legal compliance of firearms. We also interviewed officials at the Drug Enforcement Administration (DEA), the Federal Bureau of Prisons (BOP), and the National Institute of Justice (NIJ), and requested information from the Federal Bureau of Investigation (FBI) and the U.S. Marshals Service (USMS) regarding their encounters with 3-D printed firearms. In addition, we interviewed others knowledgeable about additive manufacturing/3-D printing technologies including academic experts from universities with established 3-D printing programs and industry experts within the U.S. Department of Defense. Further, we interviewed U.S. Secret Service (USSS) officials and multiple components within the Transportation Security Administration (TSA) to understand the perception of threats and the response of relevant federal law enforcement entities outside of the Department of Justice regarding 3-D printed firearms.

Additional information on our objective, scope, and methodology can be found in Appendix 1.

Audit Results

ATF has perceived the risk of 3-D printed firearms as low based on the limited number of 3-D printed firearms reported to date as having been used in the commission of crimes. However, technological advances have decreased the cost of 3-D printers and increased the quality and variety of designs of 3-D printed firearms, which, when coupled with conventional firearm regulations, potentially increases the criminal appeal of 3-D printed firearms. ATF monitoring of 3-D printed firearm technology has been primarily based on those firearms seized or recovered during criminal investigations. As a result, ATF does not have standardized procedures to guide how it proactively identifies and evaluates 3-D printed firearms, and to ensure proactive monitoring of this evolving technology. Further, ATF does not have formalized methods for communicating and collaborating about 3-D printed firearms, either within ATF or externally, and ATF does not have standardized methods to capture and collect information on 3-D printed firearms, even as a subset of other types of seized or collected firearms.

ATF's Regulatory Scope Covers 3-D Printed Firearms but not Manufacturing Technology or Designs

We found that ATF has no policies or regulations dedicated specifically to 3-D printed firearm manufacturing technology because, according to ATF, its authorities do not extend to regulating how firearms can be made, including controlling the development or sale of 3-D printers. Further, ATF officials told us that the agency may not regulate the schematics or design files for 3-D printed firearms. However, ATF's firearm authorities, consisting mainly of the GCA, NFA, and UFA, allow it to regulate licensees, and to enforce the law against firearms criminals, including against those who unlawfully engage in the business of manufacturing firearms, and those who illegally possess, transfer, or use firearms in violation of law. A firearm, regardless of its composition, is defined by statute, and ATF's regulatory posture makes no distinction between manufacturing firearms by conventional means or by 3-D printing. Consequently, ATF is responsible for enforcing the laws on firearms trafficking and on prohibiting certain persons from possessing such firearms with regard to 3-D printed firearms.

For 3-D printed PMFs, individuals can either print an entirely polymer firearm or print a component that is defined as a firearm by law, such as a frame or receiver, and then complete the firearm using mostly conventionally made metal materials that are not regulated (such as a barrel, bolt, breechblock, etc.) to create what has been referred to as a hybrid 3-D printed firearm.¹² Federal law does not regulate most firearm parts or the manufacturing thereof, such as grips, barrels, and magazines, many of which also can be 3-D printed.

Should a licensed manufacturer produce 3-D printed firearms for commercial sale, that manufacturer would have to comply with all laws and ATF regulations applicable to conventional firearms, including engraving a

¹² If a non-prohibited person were to manufacture a 3-D printed firearm for personal use using one of these methods, and the firearm was not otherwise controlled by the NFA (by, for instance, being a handgun and having a smooth-bore barrel designed to fire a shotgun shell), the 3-D printed firearm would qualify as a PMF and would not be subject to the NFA's registration and serialization requirements. Subsequent transfers or sales of the 3-D printed firearm within the same state may also occur without the seller being licensed or conducting background checks on purchasers, provided that the seller is not "engaged in the business." Private firearms sales across state lines generally need to be conducted with an FFL. 18 U.S.C. § 922.

serial number on the frame or receiver of the 3-D printed firearm. Likewise, any non-prohibited person purchasing a legal 3-D printed firearm from an FFL would be subject to the same requirements and regulations as if purchasing a conventional firearm from a licensee, and the selling FFL would be required to adhere to the same regulations governing conventional firearms, including conducting background checks and keeping records of the transaction.¹³

For some, the appeal of 3-D printed firearms is the ability to create them independently without having to adhere to the same requirements for commercial firearms. While standing ATF regulations applicable to commercial firearms do not apply to PMFs, provided the number of firearms created and transferred doesn't fall within the definition of those "engaged in the business," this does not negate all legal requirements for PMFs, whether created on 3-D printers or made by conventional means. A PMF maker cannot be a prohibited person or transfer the firearm to such a person, nor can the maker produce certain firearms covered by the NFA without authorization. For polymer 3-D printed firearms, the UFA requires that there be a detectable metal part for it to be legal. In addition, under the NFA, some firearm components, such as silencers and auto-sears, are firearms themselves and thus these components must be registered, meaning that an individual who wanted to 3-D print a silencer lawfully would first have to receive ATF approval. Similarly, auto-sears, used to convert semi-automatic firearms into fully automatic weapons, are defined as machine guns under the NFA, and if an individual were to 3-D print an auto-sear, they would be in violation of federal law.¹⁴ Despite the ATF's lack of authority related to 3-D printed firearm technology, ATF has taken steps to evaluate particular 3-D printed firearms and disseminate general information on these 3-D printed firearms.

On April 7, 2021, the White House announced several actions to address gun violence, which included directing the Department of Justice (DOJ) to issue, within 30 days, a proposed rule to help stop the proliferation of "ghost guns." On May 7, 2021, DOJ issued a notice of proposed rulemaking that derives from its regulatory authority to enforce federal firearm laws and investigate federal firearm crimes.¹⁵ Relevant to 3-D printed firearms, the proposed rule would:

1. Revise the regulatory definition of firearm "frame or receiver," to specify the terms include "in the case of a frame or receiver that is partially complete, disassembled, or inoperable, a frame or receiver that has reached a stage in manufacture where it may readily be completed, assembled, converted, or restored to a functional state."
2. Require that manufacturers or importers of weapon parts kits mark the "frame or receiver" in such kits with a serial number and additional information.
3. Revise the regulatory definition of "firearm" to clarify when a weapon parts kit is considered a "firearm." The proposed rule explains that weapon parts kits with partially completed frames or

¹³ This example presumes that such a firearm is detectable by a metal detector, and therefore not in violation of the Undetectable Firearms Act.

¹⁴ Individuals may not possess auto-sears, nor any machine gun, if not lawfully possessed by May 19, 1986, under 18 U.S.C. § 922(o).

¹⁵ Definition of "Frame or Receiver" and Identification of Firearms 86 Fed. Reg. 27,720 (proposed May 21, 2021) (to be codified at 27 C.F.R. pt. 447, 478, 479).

receivers and containing the necessary parts, such that they may readily be completed, assembled, converted, or restored to expel a projectile by the action of an explosive are “firearms” for which each frame or receiver of the weapon would need to be marked and subject to a background check prior to transfer to a non-licensee.

4. Provide definitions for among other things, a “privately made firearm,” and “readily” for purposes of clarity given advancements in firearms technology. Under the proposed rule, a “privately made firearm (PMF)” is a “firearm, including a frame or receiver, assembled or otherwise produced by a person other than a licensed manufacturer, and without a serial number or other identifying markings placed by a licensed manufacturer at the time the firearm was produced.” The background section of the proposed rule makes clear that the term “privately made firearm” includes firearms made using 3-D printers.
5. When privately made firearms are brought into a federal firearm licensee’s business inventory, require the licensee to mark or supervise the marking of each PMF with the same serial number on the frame or receiver within a certain brief time period and to record PMFs in their acquisition and disposition records.

The period for notice and comment on the proposed rule remained open through August 19, 2021. ATF had not issued the final rule as of this report.¹⁶

ATF has Examined 3-D Printed Firearms and Resulting Threats

We found that after 3-D printed firearms captured wide public attention with the Liberator handgun in 2013, ATF promptly tested and evaluated multiple versions of the Liberator handgun and disseminated information about its results to other government and non-government entities. We also found evidence that ATF made assessments of two subsequently developed 3-D printed firearms—one received as criminal evidence and the other obtained by referral from another law enforcement entity.

The Liberator

When the Liberator files became widely available on the Internet in 2013, ATF conducted extensive evaluation and testing of this type of firearm. ATF found that the Liberator met the legal definition of a “firearm” under the GCA and performed a series of tests that evaluated both its functionality as a firearm and its detectability through x-ray and imaging machines. The tests were conducted by multi-agency technical groups that included personnel from the FBI, USSS, the Department of Homeland Security and its TSA. An ATF official informed us that ATF shared the test results with relevant parties, including local law enforcement.¹⁷

ATF’s tests confirmed that the Liberator posed a viable firearm risk for certain limited uses and could be made to avoid detection by metal detector or security personnel. The Liberator could successfully fire a single shot or a few shots before it was destroyed in the process. The testing also determined that the

¹⁶ The scope of this audit does not evaluate or otherwise review the subject proposed rulemaking.

¹⁷ TSA printed the Liberator firearms used for testing and attended the test firing.

Liberator could be rendered undetectable (by removal of the metal insert) and concealable from x-ray scanners if transported in pieces and reassembled (the pieces can be reassembled within minutes).

ATF, in conjunction with FBI, subsequently created and distributed a technical bulletin to law enforcement agencies, describing the background of 3-D printing, the background and legal issues of the Liberator, as well as the results from testing of the Liberator. In addition to the technical bulletin, an ATF official stated he gave some presentations to law enforcement agencies, government entities, and non-government entities on 3-D printed handguns. Also, ATF officials informed us that ATF provided technical assistance to Congress on whether to update the UFA in 2013 to include requiring the detectable metal firearm component to be affixed to the firearm and the metal component be marked with a serial number. Congress did not enact amendments to the UFA when it renewed its effective date for an additional 10 years.

ATF 3-D Printed Firearm Activity Since 2013

Since 2013, ATF has continued to make appraisals of the risks of 3-D printed firearms and has promoted collaboration on the issue. These efforts include both additional forensic testing of newly encountered 3-D printed firearms and information sharing activities to keep apprised on 3-D technology.

1. In August 2016 ATF received information from TSA that TSA had stopped an individual attempting to go through security with a 3-D printed firearm. ATF did a comparative analysis of the firearm and performed tests on the firearm's detectability and ability to fire.
2. In August 2018 ATF officials participated in a conference hosted by the Lawrence Livermore National Laboratory on additive manufacturing/3-D printing technology and discussed ways to strengthen collaboration with the Laboratory. ATF officials stated that they have an ongoing, informal relationship with the Laboratory to evaluate advances in 3-D printed firearm technology.
3. In August 2018 ATF gave a presentation on 3-D printed firearms to the Law Enforcement/Homeland Security Technology Exchange Working Group.
4. In 2019 ATF seized and analyzed another type of 3-D printed pistol. ATF found the firearm was in violation of the Undetectable Firearms Act.
5. In August 2020 ATF evaluated a 3-D printed auto-sear. ATF found the auto-sear was able to convert a semi-automatic firearm to shoot automatically, therefore making the auto-sear a "machine gun" as defined by statute and accordingly unlawful.
6. In 2020, ATF officials informed us that ATF purchased a 3-D printer for their new training area under construction, with a goal of printing 3-D printed firearms for testing. As of May 2021, an ATF official informed us that it had not been used yet because the training area is still under construction.

Additionally, in 2018, ATF's San Francisco Crime Gun Intelligence Center compiled a comprehensive report analyzing the then-state of 3-D printed guns.¹⁸ This report concluded that the quality and speed of 3-D printers was improving, advances in material filaments were making 3-D printed objects more durable, new exotic material filaments such as stainless steel fiber and composites were market-ready, and new designs for 3-D printed firearms continued to appear on the Internet. Although this report was not officially distributed by ATF, this report helped ATF monitor the state of 3-D printing technology and analyze and share forensic results on firearms.

ATF Should Enhance Its Approach to Assessing Emerging 3-D Technologies and Threats

ATF has not considered 3-D printed firearms a priority because few such firearms have been confirmed to have been used in crimes ATF has investigated. ATF officials also told us that they have encountered few partly or fully 3-D printed firearms in ATF operations to date—whether in ATF investigations, used in crimes reported by local law enforcement, or sold in the marketplace. ATF doesn't specifically track 3-D printed firearms, therefore when we requested this information, ATF had to canvass information across its field offices, and it reported to the OIG only 12 cases from August 2016 through June 2020 involving 3-D printed firearms or components.

ATF officials opined that 3-D printed firearms have not been more plentiful in criminal activity because many other, easier legal and illegal alternatives exist for criminals to obtain firearms. These options include buying through private sales, buying from traffickers, using a "straw purchaser," or making a conventional or hybrid firearm with an "80-percent" gun kit.¹⁹ Also, as stated above, ATF, through its testing, found the quality and durability of fully 3-D printed firearms to be questionable. ATF officials also believed that such technology would not be a realistic option for PMF production unless and until the prices for better printers and specialized printing materials reduced significantly. Finally, ATF officials maintained that manufacturing a firearm with 3-D printing, whether by printing the full firearm or by printing just the frame/receiver and finishing the rest with parts, currently requires a sophisticated level of technical knowledge that the average individual lacks.

Law enforcement officials at other federal agencies stated that they have encountered few 3-D printed firearms throughout the course of their investigations. For example, TSA identified six 3-D printed firearms incidents from January 2017 to July 2020 at its checkpoints. Furthermore, while "ghost guns" have been increasingly used in crime, ATF believes the majority of these have been conventional or hybrid firearms, where ATF reports the frames and lowers of the hybrid firearms are manufactured using injection molding and not 3-D printing, and a significant number of which may be constructed using "80-percent" gun kits.

¹⁸ ATF San Francisco Crime Gun Intelligence Center, *A Report on Three Dimensional (3D) Firearms Development in the last Eighty-four Months*, (2018).

¹⁹ Using a "straw purchaser" refers to when the actual buyer recruits a person with a "clean" background to complete the required paperwork, pass the background check, and purchase the firearm on their behalf, thereby concealing the actual buyer's identity.

However, these low figures might not present a complete picture, in part because 3-D printed firearms may be privately made and many polymer 3-D printed firearms are inherently undetectable by metal detectors.²⁰ With regard to the future prevalence of 3-D printed firearms, ATF stated that 3-D printing technology has seen advances that have both lowered the price and improved the quality of 3-D printers, materials, and their end products when used for firearms and firearm components. We found these developments have spurred creation of new fully and partly 3-D printed firearm designs published on the Internet.²¹

Decreasing Cost of 3-D Printers

Basic 3-D printers now cost as little as \$150 to \$200 and there is a wide range of more effective printers available for purchase at relatively affordable price points. Stronger polymer print materials have been developed, including polymers infused with metal for increased durability. Even 3-D printers that print metal-end products have realized a significant reduction in cost. Although metal 3-D printers remain significantly more expensive than polymer 3-D printers, and a 3-D printed metal firearm would be more detectable than a polymer-based one, a 3-D printing expert we spoke with said easily accessible metal 3-D printing would greatly increase the effectiveness and prevalence of 3-D printed firearms.²²

In light of these changes, the perception that costs for 3-D printed firearms are prohibitive may quickly change, especially regarding hybrid 3-D firearms. The costs for the 3-D printing method are competitive with the costs for using a kit, even including the upfront cost to buy the printer. Our research estimated the price to make a 9-millimeter handgun from a “full-build” kit (“80 percent” frame with all the parts necessary for completing the weapon) is about \$780. Making an AR-15-style semi-automatic rifle from a “full-build” gun kit (“80 percent” receiver with the parts necessary for completing the weapon) costs about \$840. In comparison, constructing a 9-millimeter handgun by purchasing a 3-D printer and printing a frame and buying the other necessary parts costs an estimated \$700, while constructing an AR-15 style rifle by the same method costs approximately the same as the full-build kit. These costs are also generally within the range of cost estimates for FFL sales of similar firearms.²³ Moreover, having a 3-D printer would allow the user to subsequently make additional firearms for only the cost of materials.

Increasing Quality and Variety of Designs of 3-D Printed Firearms Require Procedures to Guide ATF Assessment

While the quality of a 3-D printed firearm depends on several factors and thus may be inconsistent and not yet as reliable as those conventionally manufactured, 3-D printing technology has greatly progressed. While the average individual may be priced out of the most advanced, commercial-grade polymer 3-D printing processes, academic and industry experts stated that motivated individuals who use more affordable 3-D

²⁰ See section entitled “ATF Should Improve Procedures for Tracking 3-D Printed Firearm Statistics” regarding the need for ATF to collect and maintain consistent 3-D printed firearm statistics.

²¹ Fully 3-D printed polymer firearms designs included a .22 caliber long gun, a .22 caliber pistol, a .38 caliber handgun, a .22 caliber revolver, and a .22 caliber handgun. Hybrid or partly 3-D printed firearm designs included those for AR-15s and TEC9s made with printed receivers, as well as handguns made with printed frames.

²² As of the date of this report, the price for a 3-D metal printer is estimated at about \$100,000.

²³ As of the date of this report, the cost for a new 9-millimeter handgun purchased from an FFL is estimated from \$499 to \$726, while the cost for a new AR-15-style semi-automatic rifle ranges widely in price, from about \$500 to more than \$2,000.

printers and materials can still dedicate additional time and effort before and after printing to strengthen a firearm and improve both its quality and reliability.

Since 2013, 3-D printed firearm designs available on the internet have proliferated well beyond the Liberator. ATF and other government officials stated, and our review of related research supported, that design files for multiple types of fully or partly 3-D printed polymer firearms and parts are readily accessible on the Internet. However, ATF provided evidence that it had identified, evaluated, or tested only one of these 3-D printed firearms. Additionally, we found that other agencies tested new firearm designs. For example, in 2019 FBI tested another fully 3-D printed firearm design, concluding that the firearm was functional and lethal as designed, and warned other law enforcement agencies of a public safety threat.

PMFs derived from gun kits comprise the vast majority of ghost guns, which, as of the date of this report, do not rely on 3-D printed parts. Even so, research experts say the technological advances and accompanying price decreases of 3-D printers and materials have made 3-D printing technology more accessible to the general public. Although federal law permits non-prohibited persons to make their own firearms, we believe ATF, as a firearms regulatory body, should be aware of, and communicate with law enforcement agencies about, the capabilities, limitations, and advances of hybrid PMFs involving 3-D printed frames or receivers, and not just of fully 3-D printed firearms. With technological advancements, the process of 3-D printing a frame/receiver may require less technical knowledge than relying on a gun kit. Also, if ATF's proposed rules on serializing certain gun kits take effect, prohibited persons might be more likely to turn to alternatives to gun kits, to include 3-D printing a frame, receiver, or even a fully polymer firearm. Some states and jurisdictions have already passed laws restricting the sale and purchase of unfinished lower and upper parts of firearms.²⁴

As with any advancement in technology, there is potential for 3-D printing technology to develop quickly, causing the safety threat of 3-D printed firearms to increase suddenly.²⁵ Experts we spoke to stated that it will be "only a matter of time" before 3-D printing of firearms becomes more mainstream. Given the rising prominence of 3-D printing, advances in polymers and the increasing use of "ghost guns" in crime, a potential exists for an uptick in the creation and use of 3-D printed firearms. While ATF has taken some action to stay informed of emerging 3-D printed firearms and its associated technologies, we believe ATF can better position itself to inform federal, state, and local law enforcement of anticipated advances in 3-D printing technology and keep these parties abreast of the evolving capabilities of 3-D printed firearms.

Specifically, a standardized risk or threat assessment process would help ATF identify which 3-D printed firearms it should proactively test and evaluate. We recommend that ATF update its policies and

²⁴ In a pair of federal lawsuits, the City of Syracuse, NY and the State of California challenged ATF's determination that unfinished frames and receivers are not firearms subject to regulation under the GCA. *See City of Syracuse v. ATF*, No. 1:20-cv-06885 (S.D.N.Y.); *State of California v. ATF*, No. 3:20-cv-06761 (N.D. Cal.). After the May 7, 2021, issuance of the proposed rule, both suits were stayed by agreement of the parties, pending issuance of the final rule. *City of Syracuse*, No. 1:20-cv-06885 (S.D.N.Y.) (June 21, 2021); *State of California v. ATF*, No. 3:20-cv-06761 (N.D. Cal.) (May 21, 2021).

²⁵ In October 2021, a West Virginia man was sentenced to 60 months of incarceration for unlawfully possessing a firearm silencer. At the sentencing, the Department of Justice presented evidence that the man's conduct also involved the manufacture and transfer of hundreds of 3-D printed machinegun conversion devices for AR-15 style rifles, also known as "drop in auto sears," to hundreds of persons, including persons whom the man had reason to believe were adherents to the extremist "Boogaloo" movement.

procedures to include monitoring and evaluating 3-D printed firearms, and to include a preliminary risk assessment tool within its updated policies and procedures for its firearms technology division to properly weigh the potential threat posed by specific 3-D printed firearms. In implementing this recommendation, ATF should consider including in its assessment particular factors relevant to specific 3-D printed firearms concerns. These include firearm capabilities, detectability, and durability; the required expertise to make; the accessibility and costs of the printer and materials needed to print the firearm; the accessibility of the firearm's design file; and the capabilities, limitations, and advances of hybrid firearms involving 3-D printed frames or receivers, not just fully 3-D printed firearms.

ATF Requires Robust Outreach and Communication to Sustain 3-D Printed Firearm Technology Awareness

As discussed above, ATF has analyzed, tested, and reported the results of its examinations of a limited number of 3-D printed firearms. We found that these efforts resulted in ATF engaging in ad-hoc communication with other law enforcement agencies and a research entity when specific issues concerning 3-D printed firearms arose.²⁶ However, we did not find evidence of regular, formalized channels of communication and collaboration on 3-D printed firearms issues, either within ATF or externally with other government agencies or non-government entities. For example, ATF does not have a standard protocol for sharing or receiving information on 3-D printed firearms that potentially are in violation of the law or represent a notable technological advancement, and no relevant ATF working group exists that could readily collect, assess, and disseminate this information.

Representatives we contacted from ATF and other federal agencies with an interest in undetectable firearms said that they had informal, ad hoc processes for communicating if they encountered new developments in the areas of 3-D printed or undetectable firearms. For example, ATF Field Operations, DEA, and BOP personnel stated that, should they encounter a possible 3-D printed firearm that is new, notable, or in violation of the law, they would contact the ATF Firearms Technology Division Branch Chief or a similar ATF official.

Lacking a forum to facilitate open communication of 3-D printing developments increases the potential for ATF to be caught unaware of resulting public safety threats should a partner agency neglect to send a notice, or should an informal communication to ATF not be appropriately shared within the organization. For instance, ATF officials we spoke with were not aware of a new specific 3-D printed firearm design we found and had no information to provide on it, despite the FBI's 2019 testing of that design and their subsequent technical bulletin on it. We also observed that the ATF officials we spoke to were largely unaware of the latest technologies in 3-D printed firearm designs, including designs we discovered on the Internet, and thus could not opine on whether they would be violative of the law or present a realistic public safety threat. Further, we found that only one ATF official was considered the go-to technical expert on 3-D printed firearms, and this official was the only official who could fulfill many of our information requests.

Standardizing communication and collaboration on 3-D printed firearms issues would help ensure ATF is better positioned to accomplish its monitoring of this emerging public safety issue. This approach would

²⁶ For example, ATF participated in initial discussions with an external working group comprised of agencies focusing on K-9 detection and forensic analysis of 3-D printed firearms before the COVID pandemic made the group's work not feasible.

enable ATF to keep abreast of advances in commercial deployment of 3-D printing technology and its resulting impact on firearms and would promote greater inter-agency communication and coordination.²⁷ In addition, given rapidly advancing technology and increasing accessibility to that technology and materials, a forum for regular communication and collaboration would enhance ATF's awareness of developments as well as new and potential threats posed by 3-D printed firearms.

Some ATF officials told us that they see the value of hosting formal working groups regarding undetectable firearms and 3-D printing technology for firearms. One ATF official said there were already internal discussions to expand ATF's collaboration with other entities on these issues, to start after the COVID-19 pandemic. Such a forum would encourage communication and collaboration among federal partners on undetectable or untraceable firearms that are 3-D printed. Therefore, we recommend that ATF implement its planned internal and external communication and collaboration strategy regarding 3-D printed firearm issues, including convening a formal working group with relevant stakeholders. Other items that we believe should be considered include, but are not limited to, objectives on communicating 3-D printed firearm tests and evaluation results, legal discussions, communicating new developments within the 3-D printing realm, and exploring improvements and efficiencies in testing and evaluation methods.

In resolving this recommendation, ATF should consider how best to solicit the ongoing input of experts from other government agencies with a mission that involves undetectable firearms and 3-D printing technology, as well as non-government entities such as academic institutions that can provide information on areas of progress and new advancements. ATF may especially benefit from increasing formal engagements with research and academic entities, which are often at the forefront of technology and are well positioned to provide ATF valuable information on printing technology and how it relates to 3-D printed firearms.²⁸ This would include research institutions that receive grants or fellowships funded by the National Institute for Justice (NIJ), the research and development agency of the Department of Justice. For example, in 2017, NIJ awarded a research grant to the University of Mississippi that focused on forensic identification and cataloguing of ballistic evidence from 3-D printed firearms; the award did not involve ATF collaboration, but ATF may well benefit from learning about the research results.

Finally, it may benefit ATF's awareness and ability to advise and prepare other law enforcement entities if they have increased engagement with the firearms industry regarding 3-D printed firearm technology. Including industry experts regarding the use of 3-D printing technology for making firearms would improve situational awareness and could help ensure that any 3-D printed firearms advances or commercial developments conform to the existing firearm laws and regulatory framework. While firearm companies are certainly not obligated to communicate with ATF concerning 3-D printing, they may possess unique knowledge that would benefit ATF and its law enforcement partners. As such, we recommend that ATF build on its established lines of communication with the firearms industry to keep abreast of technological developments pertaining to 3-D printed firearm detectability and, as appropriate, operational functionality.

²⁷ A prior OIG audit underscored the need for communication between FBI and ATF regarding investigating firearm sales on the dark web. U.S. Department of Justice OIG, *Audit of the Federal Bureau of Investigation's Strategy and Efforts to Disrupt Illegal Dark Web Activities*, Audit Report 21-014 (Dec. 2020).

²⁸ During our research, we consulted with 3-D printing experts at two universities and found these consultations extremely informative.

ATF Should Improve Procedures for Receiving 3-D Printed Firearm Information

We found ATF lacks standardized requirements and procedures to obtain data specific to 3-D printed firearms, for example the number of such firearms seized at crime scenes. When we requested the number of ATF cases involving 3-D printed firearms, the data was not readily available, and ATF had to canvass its field offices to provide an answer. In addition, ATF officials we interviewed did not have specific 3-D printed firearm information readily available.

In comparison, ATF does capture statistics on PMFs in general, of which 3-D printed firearms are essentially a subset. ATF gathers firearms statistics from local and state law enforcement entities submitting electronic trace information through the Electronic Tracing System (eTrace) to the Firearms Tracing System (FTS) housed at ATF's National Tracing Center.²⁹ ATF provided us a walkthrough of eTrace and demonstrated an information dashboard that displays a broad array of information on PMFs seized by law enforcement entities. An ATF official stated that the dashboard's main objective is to assist with ATF and other law enforcement agency investigations, but the dashboard also allows federal, state, and local law enforcement officials to obtain meaningful statistics on the prevalence of PMFs nationally or in a particular region, state, county, or zip code. The dashboard can also be used to search and create reports based on captured data such as the possessor, caliber, recovering agency, recovery date, firearm model, firearm type, crime category, or the manufacturer, purchaser, and dealer, if such information is available.³⁰

However, despite the plethora of information eTrace captures on the PMF universe in general, we found it does not have an effective way for a submitting law enforcement agency to provide information on the material(s) that the firearm is composed of, or whether the firearm or frame is suspected of being made by a 3-D printer.³¹ Aside from eTrace, we did not identify another method by which ATF could collect referenceable information on firearms suspected of being 3-D printed. Without a standard process to capture this information, ATF cannot comprehensively track emerging trends or associated risks involving firearms that are 3-D printed. We therefore recommend that ATF establish expanded protocols to more effectively collect data on recovered firearms made entirely using 3-D printers and "hybrid" firearms made with a 3-D printed frame or receiver. This action may include modification of ATF's case management or firearm tracing systems to permit specific designation of such recovered firearms.

In implementing this recommendation, we suggest ATF consider improving its data collection related to 3-D printed firearms in various ways: (1) modifying eTrace and FTS, to include a dedicated and standardized query box for submitting officials to report on the material composition of a confiscated firearm, and to report this information on the PMF dashboard; (2) updating eTrace and FTS to include a checkbox to indicate whether a firearm is suspected of being fully or partially manufactured by a 3-D printer and permit reporting of this information on its PMF dashboard; (3) modifying eTrace and the dashboard to allow for a

²⁹ ATF administers eTrace, a web-based firearm trace submission system accessible to 8,177 law enforcement agencies throughout the United States and 46 other countries.

³⁰ ATF sent out a 2020 memo to encourage law enforcement agencies to submit trace requests for privately made firearms to assist in investigations and allow ATF to collect statistics.

³¹ A submitting law enforcement official does have a field in eTrace to submit free-text comments along with the trace, and this, in theory, provides a mechanism to report information concerning 3-D printed firearms. However, the audit team and ATF officials agree that this is not an effective way for eTrace to capture info on the firearm material(s) or whether the firearm is suspected of being 3-D printed.

photo of each firearm, particularly those suspected of being 3-D printed, to be attached with the submission; and/or (4) convening a standing 3-D printed firearms working group (see Recommendation 2) to collect and report referenceable information on 3-D printed firearms on a regular basis. These steps would better enable ATF to collect and track 3-D printed firearms information, assist with relevant investigations, or possibly identify firearms that warrant further examination. Other strategies not listed here might also serve these same ends.

Regardless of how ATF chooses to collect 3-D printed firearm information, we acknowledge that the comprehensiveness and accuracy of this new information will be heavily dependent on the submitting law enforcement agencies. If ATF chooses to modify eTrace, ATF may face complications from the fact that some agencies may need to modify their local databases as well to reflect any added fields where such information is automatically populated. Further, the submitting official might not possess the necessary expertise to identify the firearm material(s) and whether the firearm is 3-D printed. However, we believe that by obtaining some referenceable information, ATF would better position itself in the future to address emerging trends.

Conclusion and Recommendations

ATF officials stated that they have not encountered many 3-D printed firearms in their operations – whether used by the subject of an ATF investigation, recovered from a crime being investigated by state or local police, or being sold on the marketplace. However, some 3-D printed firearm designs can readily be made undetectable to metal detectors, and its technology is rapidly advancing both in terms of lower cost and improved quality of 3-D printers, materials, and end products. As such, the prevalence of 3-D printed firearms, and the unique combination of threats they pose, likely will increase substantially in the future. Coupled with conventional firearm regulations, the criminal appeal of 3-D printed firearms may potentially increase.

After the public became more aware of 3-D printed firearms with the publication of design files for the Liberator handgun in 2013, ATF took some important actions to evaluate the new technology, assess the risks it poses, communicate the information to other entities, and engage other entities on the issue. Yet, advancements in 3-D printing technology are poised to make 3-D printing far more accessible. This increased accessibility in turn increases the likelihood that the technology will be used to print firearms that may be used in a prohibited way, such as in the commission of crimes. While ATF has taken some steps to stay abreast of emerging 3-D printed firearms and associated technologies, we believe that ATF can readily take additional action to better position itself to respond to the challenges posed by quickly advancing 3-D printing technology capabilities. Currently, ATF 3-D printed firearms testing and information sharing occurs on an ad-hoc, “as needed” basis and is not formalized. We believe that standard, updated policies and procedures for monitoring and assessing 3-D printed firearms, formalized communication and collaboration with other 3-D printed firearm stakeholders, and standardized data collection on 3-D printed firearms would better position ATF to respond to new and developing risks and violations of law associated with 3-D printed firearms.

We recommend that ATF:

1. Update its policies and procedures to include monitoring and evaluating 3-D printed firearms, and to include a preliminary risk assessment tool within its updated policies and procedures for its firearms technology division to properly weigh the potential threat posed by specific 3-D printed firearms.
2. Implement its planned internal and external communication and collaboration strategy regarding 3-D printed firearm issues, including convening a formal working group with relevant stakeholders.
3. Build on its established lines of communication with the firearms industry to keep abreast of technological developments pertaining to 3-D printed firearm detectability and, as appropriate, operational functionality.
4. Establish expanded protocols to more effectively collect data on recovered firearms made entirely using 3-D printers and “hybrid” firearms made with a 3-D printed frame or receiver. This action may include modification of ATF’s case management or firearm tracing systems to permit specific designation of such recovered firearms.

APPENDIX 1: Objective, Scope, and Methodology

Objective

The objective of our audit was to evaluate the effectiveness of the Bureau of Alcohol, Tobacco, Firearms and Explosives' (ATF) policies and procedures regarding the regulation and monitoring of three-dimensional (3-D) printed firearms technology and trafficking.

Scope and Methodology

Our audit concentrated on, but was not limited to, ATF policies, procedures, and actions since 2013, when the issue of 3-D printed firearms began to be featured prominently in the public discourse, through April 2021, before the DOJ publicly announced proposed rulemaking regarding the definition of firearms. We assessed ATF's decision-making concerning 3-D printed firearm testing and monitoring, and tested adherence to policies and procedures regarding the assessment of 3-D printed firearms and the public safety threat they may or may not pose. We reviewed incidents that involved 3-D printed firearms within ATF's jurisdiction and ATF's testing and evaluation of 3-D printed firearms.

In May 2020, we initiated fieldwork with ATF. As a result of the COVID-19 pandemic response, we performed our audit fieldwork exclusively in a remote manner. We interviewed multiple ATF officials across several ATF divisions responsible for the monitoring, testing, enforcement, and legal compliance of firearms. We also interviewed officials at the Drug Enforcement Administration, the Bureau of Prisons, and the National Institute of Justice, and requested information from the Federal Bureau of Investigation and the U.S. Marshals Service. Outside of ATF and the Department, we interviewed parties knowledgeable about additive manufacturing/3-D printing technologies, including academic experts from universities with established 3-D printing programs, and industry experts within the U.S. Department of Defense. We also interviewed U.S. Secret Service officials and multiple components within the Transportation Security Administration to fully understand the perceived threats and the response of relevant law enforcement entities outside of the Department of Justice regarding 3-D printed firearms. We received a demonstration of ATF's Privately Made Firearm (PMF) dashboard, as well as the e-Trace system housed within ATF's National Tracing Center. We did not establish the reliability of the data contained within ATF systems. However, when viewed in context with other available evidence, we believe the opinions, conclusions, and recommendations included in this report are valid.

Statement on Compliance with Generally Accepted Government Auditing Standards

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

Internal Controls

In this audit, we performed testing of internal controls significant within the context of our audit objectives. We did not evaluate ATF internal controls to provide assurance on its internal control structure as a whole.

ATF management is responsible for the establishment and maintenance of internal controls in accordance with GAO-17-704G, *Standards for Internal Control in the Federal Government*. The Audit Results section of this report identifies any internal control deficiencies we identified. However, because our review was limited, it may not have disclosed all internal control deficiencies that may have existed at the time of this audit. Because we do not express an opinion on ATF's overall internal control structure, we offer this statement solely for the information and use of ATF.³²

³² This restriction is not intended to limit the distribution of this report, which is a matter of public record.

APPENDIX 2: Bureau of Alcohol, Tobacco, Firearms and Explosives' Response to the Draft Audit Report



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

[Assistant Director]

Washington, DC 20226

www.atf.gov

November 16, 2021

900000: WJR
8310

MEMORANDUM TO: Inspector General
U.S. Department of Justice

FROM: Assistant Director
Office of Enforcement Programs and Services
Bureau of Alcohol, Tobacco, Firearms and Explosives

SUBJECT: OIG Audit of ATF Monitoring of 3-D Firearm Printing
Technology

This memorandum responds to the recommendations contained in the Office of Inspector General's (OIG) report titled "Audit of the Bureau of Alcohol, Tobacco, Firearms and Explosives' Monitoring of 3-D Firearm Printing Technology." We welcome OIG's constructive comments and appreciate the opportunity to respond.

ATF has statutory authority to regulate the domestic production of "firearms", defined in Federal law as "any weapon [...] which will or is designed to or may readily be converted to expel a projectile by the action of an explosive," as well as "the frame or receiver of such weapon." As part of ATF's mission to reduce violent crime, ATF regulates those engaged in the business of manufacturing, importing, and dealing in firearms. However, Federal law permits individuals to make firearms for personal use. Federal law neither regulates firearms based on the method or means of production, nor requires that individuals serialize or maintain records on privately made firearms (PMFs). Therefore, unless otherwise prohibited, individuals may lawfully produce PMFs using traditional means and methods or by using developing technology, to include Computer Numerical Control (CNC) Machines and 3-D printing.

ATF has long recognized the potential public safety issues associated with PMFs and has actively monitored the most common means and methods of producing PMFs, as well as the less prevalent means of production, such as 3-D printing. Technological advances in additive manufacturing processes will likely decrease the cost and simultaneously increase

the quality of 3-D printed items, thereby increasing the demand for 3-D printed firearms. ATF therefore agrees that increased monitoring of 3-D printed firearms is appropriate. We are grateful for OIG's thorough and thoughtful review of this important topic, and as we further outline below, concur with each of the audit's recommendations.

Recommendation 1: Update its policies and procedures to include monitoring and evaluating 3-D printed firearms, and to include a preliminary risk assessment tool within its updated policies and procedures for its firearms technology division to properly weigh the potential threat posed by specific 3-D printed firearms.

ATF concurs with this recommendation and will update policies and procedures to include reference, monitoring and evaluation of 3-D printed firearms. ATF agrees that a preliminary risk assessment tool may be useful in helping to determine the allocation of law enforcement resources. Development of such assessment tool must consider the cost and availability of materials, the probability of use in violent crime, the potential negative impact on public safety, and other relevant factors as identified.

2. Implement its planned internal and external communication and collaboration strategy regarding 3-D printed firearm issues, including convening a formal working group with relevant stakeholders.

ATF concurs with this recommendation. Communicating and collaborating with other law enforcement agencies will positively impact public safety by helping law enforcement identify threats and trends related to 3-D printed firearms. ATF also concurs that a working group may be an effective means to address these issues with the relevant stakeholders and encourage two-way communication with partner agencies. Although ATF cannot mandate participation, ATF leadership sees value in convening a working group and inviting relevant stakeholders to receive and share information.

3. Build on its established lines of communication with the firearms industry to keep abreast of technological developments pertaining to 3-D printed firearm detectability and, as appropriate, operational functionality.

ATF concurs with this recommendation. As the Federal agency charged with regulating the firearms industry, ATF is in the best position to seek data from licensed firearm manufacturers, importers, and dealers, and develop useful information concerning the 3-D printing technology related to firearms. With that said, it is important to note that firearms industry members are not directly involved in the design or production of 3-D printers or 3-D printed firearms. Moreover, industry members do not typically utilize 3-D printers or materials and do not currently employ 3-D printing in large scale production of regulated items. To the extent that industry members use 3-D printing for prototyping, research and development, their experience may provide useful information on trends and potential future threats that ATF may leverage to ensure public safety.

Recommendation 4: Establish expanded protocols to more effectively collect data on recovered firearms made entirely using 3-D printers and "hybrid" firearms made with a 3-D printed frame or receiver. This action may include modification of ATF's case

management or firearm tracing systems to permit specific designation of such recovered firearms.

ATF concurs with this recommendation. The ATF National Tracing Center (NTC) will be taking steps to enhance the tracking of recovered PMFs and, more specifically, 3-D printed firearms. To achieve these ends, the NTC has requested funding in the Fiscal Year 2023 budget to modernize the eTrace application. As part of this modernization effort, functional enhancements will be made to eTrace which will allow ATF to more effectively collect data on recovered firearms made entirely using 3-D printers and “hybrid” firearms made with a 3-D printed frame or receiver. Dependent on availability of funding and the contracting, process these modifications could be completed in Fiscal Year 2024.

The meaningful implementation of these changes is dependent upon ability of trace requestors (primarily State and local police) to better identify a recovered firearm as a PMF including those that have been made entirely using 3-D printers and “hybrids” made with a 3-D printed frame or receiver. To enhance the capacity of local law enforcement to make these determinations, ATF is providing training nationally to local, state, and federal partners on how to better identify these types of firearms. As ATF emphasized during the audit, however, distinguishing whether a firearm component was produced using 3-D printing technology or through more traditional means such as injection molding may involve technical analysis of materials that may be beyond the capacity of many local police officers. Moreover, demands on local law enforcement, particularly with respect to firearm offenses, are ever increasing. ATF’s efforts to better collect data on recovery of PMF and firearms using 3-D technology will be contingent on the capacity and willingness of law recovering law enforcement agencies (even with enhanced training) to voluntarily report that information.

Please let me know if I can be of further assistance on this or any other matter.



Alphonso J. Hughes

APPENDIX 3: Office of the Inspector General Analysis and Summary of Action Necessary to Close the Report

The OIG provided a draft of this audit report to the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). ATF's response is incorporated in Appendix 2 of this audit report. In response to our draft audit report, ATF concurred with all four of our recommendations. As a result, the status of the audit report is resolved. The following provides the OIG analysis of the response and summary of actions necessary to close the report.

Recommendations for ATF:

- 1. ATF update its policies and procedures to include monitoring and evaluating 3-D printed firearms, and to include a preliminary risk assessment tool within its updated policies and procedures for its firearms technology division to properly weigh the potential threat posed by specific 3-D printed firearms.**

Resolved. ATF concurred with our recommendation. ATF stated in its response that it will update its policies and procedures to include monitoring and evaluation of 3-D printed firearms. ATF agreed that a preliminary risk assessment tool may be useful in helping to determine the allocation of law enforcement resources, and that the development of such assessment tool must consider the cost and availability of materials, the probability of use in violent crime, the potential negative impact on public safety, and other relevant factors as identified.

This recommendation can be closed when ATF provides evidence of updated policies and procedures that include: (1) monitoring and evaluating 3-D printed firearms; and (2) a preliminary risk assessment tool on 3-D printed firearms that assesses, among other factors, the cost and availability of materials, the probability of use in violent crime, and the potential negative impact on public safety. Additionally, ATF needs to provide evidence that these updates were distributed to relevant users.

- 2. ATF implement its planned internal and external communication and collaboration strategy regarding 3-D printed firearm issues, including convening a formal working group with relevant stakeholders.**

Resolved. ATF concurred with our recommendation. ATF stated in its response that communicating and collaborating with other law enforcement agencies will positively impact public safety. ATF also agreed that a working group may be an effective means to address these issues with relevant stakeholders and encourage two-way communication with partner agencies. ATF also stated that although it cannot mandate participation in a work group, ATF leadership sees value in convening a work group and inviting relevant stakeholders to receive and share information.

This recommendation can be closed when ATF can show us evidence that it: (1) implemented an internal and external communication and collaboration strategy regarding 3-D printed firearm issues; and (2) convened a formal working group on 3-D printed firearm issues and invited relevant stakeholders.

- 3. ATF build on its established lines of communication with the firearms industry to keep abreast of technological developments pertaining to 3-D printed firearm detectability and, as appropriate, operational functionality.**

Resolved. ATF concurred with our recommendation. ATF stated in its response that as the federal agency charged with regulating the firearms industry, it is in the best position to seek data from licensed firearm manufacturers, importers, and dealers, and develop useful information concerning 3-D printing technology as it relates to firearms. ATF also noted that firearm industry members are not directly involved in the design or production of 3-D printers or 3-D printed firearms and that industry members do not typically utilize 3-D printers or materials and do not use 3-D printing in the large scale production of regulated items. However, ATF said that to the extent that industry members use 3-D printing for prototyping and research and development, their experience may provide useful information on trends and potential future threats that ATF may leverage to ensure public safety.

This recommendation can be closed when ATF can show us evidence that it has built on existing communication with firearm industry members to seek information and/or data on 3-D printed firearms and developments in 3-D printing technology that would be pertinent to ATF's goal of ensuring public safety.

- 4. ATF establish expanded protocols to more effectively collect data on recovered firearms made entirely using 3-D printers and "hybrid" firearms made with a 3-D printed frame or receiver. This action may include modification of ATF's case management or firearm tracing systems to permit specific designation of such recovered firearms.**

Resolved. ATF concurred with our recommendation. ATF stated in its response that the ATF National Tracing Center (NTC) will be taking steps to enhance the tracking of recovered PMFs and, more specifically, 3-D printed firearms. ATF stated that to achieve these ends, the NTC has requested funding in the FY 2023 budget to modernize the eTrace application and that, as a part of this effort, functional enhancements will be made to eTrace, which will allow ATF to collect data more effectively on recovered firearms made entirely using 3-D printers and "hybrid" firearms made with a 3-D printed frame or receiver. ATF stated that dependent on availability of funding and the contracting process, these modifications could be completed in FY 2024.

ATF also added that meaningful implementation of these changes is dependent upon the ability of trace requestors (primarily state and local police) to identify a recovered firearm as a PMF, including those that were entirely 3-D printed or a "hybrid" made with a 3-D printed frame or receiver. To enhance this capacity, ATF stated that it is providing training to local, state, and federal partners on how to better identify these types of firearms. ATF stated that better collection of data on PMFs and firearms using 3-D printing technology will be dependent on the capacity and willingness of recovering law enforcement agencies to voluntarily report that information.

This recommendation can be closed when ATF can show us evidence that it has established expanded protocols to more effectively collect data on recovered firearms made entirely using 3-D printers and "hybrid" firearms made with a 3-D printed frame or receiver. While enhancing eTrace

could more effectively collect this data, in the interim ATF should also consider collecting data using other methods given it likely is years from making the stated enhancements to eTrace.