CRIME IN THE AGE OF PRINTABLE GUNS: METHODOLOGIES AND OBSTACLES TO PROSECUTING FEDERAL OFFENSES INVOLVING 3D-PRINTED FIREARMS

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INTRODUCTION

In May 2013, at an unidentified remote shooting range somewhere south of Austin, Texas, the world's first 3D-printed firearm was successfully test-

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fired for the first time.[1] Developed by Defense Distributed and dubbed "the Liberator," the weapon was composed almost entirely of plastic, with fifteen of the gun's sixteen functional pieces being printed inside the designer's "$8,000 second-hand Stratasys Dimension SST 3D printer, a machine that lays down threads of melted polymer that add up to precisely-shaped solid objects just as easily as a traditional printer lays ink on a page."[2] The sixteenth piece, the only non-printed component required to operate the firearm, was "a common hardware store nail used as its firing pin."[3] The firearm, being operated remotely for safety reasons, fired a single standard .380 caliber handgun round into the Texas landscape.[4] The propellant's explosion inside the firearm left the barrel and the body of the weapon entirely unscathed.[5]

This moment—the advent of 3D-printed, functional firearms—was undeniably historic, though it also exposed some serious shortcomings in the blooming technology. The firearm misfired a second .380 caliber round,[6] and when the designer replaced the barrel with "a higher-charge 5.7x28 rifle cartridge . . . the gun exploded, sending shards of white ABS plastic flying into the weeds and bringing the Liberator's first field trial to an abrupt end."[7] Regardless of these secondary technical failures, the single successful shot from the Liberator generated near-immediate consternation from various groups across the United States. Within days of the test, political opposition began calling for legal safeguards to prohibit such weaponry.[8] The controversy did nothing to deter the firearm's designer Cody Wilson,[9] who quickly returned to the same location to conduct another test—this time firing

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1. Andy Greenberg, *Meet the 'Liberator': Test-Firing The World's First Fully 3D-Printed Gun*, FORBES (May 5, 2013) [hereinafter Greenberg, *Meet the 'Liberator'*], https://www.forbes.com/sites/andygreenberg/2013/05/05/meet-the-liberator-test-firing-the-worlds-first-fully-3d-printed-gun/#76acbd3b52d7.

2. *Id.*

3. *Id.*

4. *Id.*

5. *Id.*

6. "[T]he firing pin failed to hit the primer cap in the loaded cartridge due [to] a misalignment in the hammer body, resulting in an anti-climactic thunk." *Id*.

7. *Id.*

8. *Id.*

9. Cody Wilson, the figurehead of the Liberator's design team, is himself a controversial figure. Wilson described his technology as "enabling individuals to create their own sovereign space" with the government "increasingly be[ing] on the sidelines . . . ." *Id.* Furthermore, "Wired [Magazine] included Wilson in its list of the 15 most dangerous people in the world. The Coalition To Stop Gun Violence calls him a 'hardcore insurrectionist' who advocates anti-government violence." *Id.* (citing *The 15 Most Dangerous People in the World*, WIRED (Dec. 19, 2012), https://www.wired.com/2012/12/most-dangerous-people/).

the Liberator by hand.[10] The second test was also a success, with the firearm operating more or less as intended with "no obvious signs of damage other than a cracked pin used to hold the barrel in place."[11]

In the years since the Liberator was first successfully discharged, the technology for 3D-printed firearms has improved as the controversies surrounding their existence have intensified.[12] Debate surrounding access to the blueprints necessary to create 3D-printed firearms, technically referred to as computer-aided design (CAD) files, has heatedly escalated across the political spectrum. Critics of the technology have labeled it a crisis affecting public safety and national security, often citing hypotheticals surrounding access to firearms by prohibited persons and the potentially untraceable nature of 3D-printed firearms, while proponents have argued that access to the technology is protected as a constitutional matter.[13] Even today, the accessibility of CAD file blueprints and the firearms they can produce is in a state of near-constant flux, with their legality still being a matter of intense debate between the Federal Government and multiple State Governments, and even between the branches of the Federal Government.[14]

While the argument over the general accessibility of 3D-printed firearms and their blueprints continues, there are still legal-enforcement mechanisms

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10. *Id.*

11. *Id.*

12. As of July 2018, at least 1,000 copies of the blueprints for an AR-15 style semiautomatic assault rifle were downloaded from Defense Distributed and Cody Wilson claimed that plans for the Liberator had already been downloaded "a million times." *See* Doug Criss & Kimberly Berryman, *More Than 1,000 People Have Already Downloaded Plans to 3-D Print an AR-15*, CNN (July 31, 2018), https://www.cnn.com/2018/07/30/us/pennsylvania-3d-guns-trnd/index.html (reporting that over 1,000 plans used to print an AR-15 style rifle have been downloaded in a matter of days); *see also* Kelly McLaughlin, *3-D Printed Guns Allow the Public Access to Real, Working Weapons That are Virtually Untraceable—Here's How They Work*, BUS. INSIDER (July 31, 2018), https://www.businessinsider.com/3d-printed-guns-how-they-work-2018-7 (explaining some of the advancements in 3D-printed firearms while comparing them to the hurdles of production); Gilman Louie, *I 3D-Printed An AR-15 Assault Rifle—And It Shoots Great!*, BUS. INSIDER (Dec. 4, 2013), https://www.businessinsider.com/i-3d-printed-an-ar-15-assault-rifle--and-it-shoots-great-2013-12 ("On a recent weekend, I printed the key part (called the lower receiver, shown in blue in the photo) of an AR-15 semi-automatic rifle on a consumer 3D printer made by Makerbot. The next weekend I took the assembled firearm and succeeded in firing more than 50 rounds into a target from 50 feet away.").

13. Criss & Berryman, *supra* note 12; *see also* Kyle Mizokami, *Those Controversial 3D-Printed Guns, Explained*, POPULAR MECH. (July 31, 2018), https://www.popularmechanics.com/military/weapons/a22604405/3d-printed-guns/ (discussing the constitutional dimensions of the argument for and against the availability of digital blueprints for 3D-printed firearms).

14. *See* Associated Press, *20 States Sue Over Rules Governing 3D-Printed Guns*, CBS NEWS (Jan. 24, 2020), https://www.cbsnews.com/news/20-states-sue-over-rules-governing-3d-printed-guns/ (describing a lawsuit 20 states brought against the Federal Government challenging a regulation that allows blueprints for 3D-printable guns to be posted on the internet).

under federal criminal law capable of ensuring that 3D-printed firearms meet certain criteria and do not fall into the hands of those who have already been categorically identified as dangerous or prohibited individuals. In 2018, then-Attorney General Jeff Sessions highlighted the importance of criminal enforcement actions as a counter to the possible dangers associated with the legalization and dissemination of 3D-printed firearm technology, stating that the Department of Justice would not "stand for the evasion, especially the flouting, of current law and will take action to ensure that individuals who violate the law by making plastic firearms and rendering them undetectable, will be prosecuted to the fullest extent."[15]

While 3D-printed firearms are not yet common and there are currently easier ways for criminals to acquire more reliable firearms, the technology has already made considerable strides since its introduction and will only improve in the coming years. Though "[s]tealing or assembling a gun would prove far easier for criminals than 3D printing one . . . that may not always be true: Like all technology, 3D printing will rapidly improve in quality and cost, likely letting it produce more affordable and reliable firearms in the future."[16] Given the complicated politics of the 3D-printed firearm debate, it is foreseeable that law enforcement may need to rely on existing law rather than waiting for reactive legislative action to address the technology when it has already become widespread.

Rather than focusing on the complicated and highly political debate over whether 3D-printed firearms should be made more accessible,[17] this Article instead addresses three more practical questions. First, if 3D-printed firearms are ultimately legalized and made more accessible, what mechanisms under existing federal criminal law allow the Federal Government to punish

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15. Press Release, Dep't of Just. Off. of Pub. Aff., Statement of Att'y Gen. Jeff Sessions on State of Washington v. U.S. State Dep't (Aug. 16, 2018), https://www.justice.gov/opa/pr/statement-attorney-general-jeff-sessions-state-washington-v-us-department-state.

16. Josh Hafner, *What is a 3D Printed Gun, and How is it Legal? Your Questions, Answered*, USA TODAY (Aug. 2, 2018), https://www.usatoday.com/story/tech/nation-now/2018/08/01/3-d-guns-how-3-d-printed-gun-parts-made-and-how-theyre-legal/879349002/.

17. Plenty of authors have already addressed the political debate surrounding 3D-printed firearms and the legal arguments for and against regulation. *See generally*, Josh Blackman, *The 1st Amendment, 2nd Amendment, and 3D Printed Guns*, 81 TENN. L. REV. 479, 496, 501 (2014) (discussing that the right to bear arms includes the right to create guns and that regulations on 3D-CAD files would be subject to strict scrutiny for regulating information); Jessica Berkowitz, *Computer-Aided Destruction: Regulating 3D-Printed Firearms Without Infringing on Individual Liberties*, 33 BERKELEY TECH. L.J. 51 (2018) (arguing for the regulation of ammunition and against the regulation of 3D-printing technology); Anthony M. Masero, *I Came, ITAR, I Conquered: The International Traffic in Arms Regulations, 3D-Printed Firearms, and the First Amendment*, 55 B.C. L. REV. 1291 (2014) (analyzing the constitutional implications of the International Traffic in Arms Regulations (ITAR) as applied to 3D-firearm CAD files). This author declines to opine on the merits of any side of the political debate.

dangerous persons for acquiring them? Second, in that legalization scenario, what inherent characteristics of 3D-printed firearms permit the Federal Government to enforce criminal liability to meet the ends of justice? Third, what are the biggest shortcomings of the existing federal criminal-enforcement framework?

This Article is composed of two primary Parts. Part I focuses on the existing framework for criminal enforcement surrounding 3D-printed firearms under current federal law. It explores some of the most practical federal prosecution mechanisms for enforcing criminal liability for those illicitly utilizing the technology, as well as some of the foreseeable limitations associated with different existing federal criminal statutes. It primarily focuses on possession offenses. Part II then considers the untraceable gun dilemma and explores how the current lack of tracing for 3D-printed firearms creates a substantial hurdle to effective criminal enforcement.

I. FEDERAL CHARGING STRATEGIES FOR OFFENSES INVOLVING 3D-PRINTED FIREARMS

While there has already been a considerable amount of debate and consternation surrounding 3D-printed firearms, 3D-printing is still a relatively young technology.[18] Consequently, federal legislative action has yet to fully anticipate or respond to some of the dangers associated with it. Despite that complication, law enforcement is still capable of ensuring accountability and liability under existing federal law for the majority of potential offenders, who seek to abuse the technology as its availability increases and its price decreases. This Part considers how 3D-printed firearm crimes can be prosecuted within the existing federal criminal framework, while also exploring some of the limitations of existing law in relation to the new technology.

A. Title 18, United States Code, § 922(g) and the Possession of 3D-Printed Firearms by Prohibited Persons

Before considering some of the substantive offenses available in Title 18, Chapter 44 of the United States Code, it is first important to clarify that the 3D-printed firearms that are currently in circulation fall within the scope

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18. *See* Luke Dormehl, *Layer by Layer: The Brief but Building History of 3D Printing*, DIGITAL TRENDS (Feb. 25, 2019) https://www.digitaltrends.com/cool-tech/history-of-3d-printing-milestones/ (retracing the history of 3D printing from its infancy in 1980 to now).

of "firearms" as defined therein. Under Title 18, United States Code, § 921(a)(3), the term "firearm" means: "(A) any weapon (including a starter gun) which will or is designed to or may readily be converted to expel a projectile by the action of an explosive; (B) the frame or receiver of any such weapon; (C) any firearm muffler or firearm silencer; or (D) any destructive device."[19] Because 3D-printed firearms are designed to expel a projectile by the action of an explosive (as demonstrated by the Liberator),[20] they fall within this definition and are therefore within the scope of most of the firearm crimes contained in Title 18, Chapter 44.[21] Additionally, even though the created firearms are sometimes a mixture of 3D-printed and traditional components,[22] so long as the frame or receiver of the firearm is intact, it would still fall within the definition's purview.[23]

Title 18, United States Code, § 922(g) prohibits various categories of individuals from possessing firearms. The subcategory of prohibited persons most commonly prosecuted for illegally possessing firearms is those have been convicted in any court of a crime punishable by imprisonment for a term exceeding one year—in other words, felons.[24] Section 922(g) charges are a vital instrument for federal prosecutors to punish dangerous individuals for possessing lethal weapons. Nearly ten percent of all criminal cases reported to the United States Sentencing Commission in Fiscal Year 2018 involved a

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19. 18 U.S.C. § 921(a)(3). This section is part of the Gun Control Act of 1968 (GCA), which is the basis for most of the currently used definitions under federal firearms law. *See* U.S. DEP'T OF JUST., CRIMINAL RESOURCE MANUAL 1117: RESTRICTIONS ON THE POSSESSION OF FIREARMS BY INDIVIDUALS CONVICTED OF A MISDEMEANOR CRIME OF DOMESTIC VIOLENCE (2013), https://www.justice.gov/archives/jm/criminal-resource-manual-1117-restrictions-possession-firearms-individuals-convicted (using the GCA definition of the term "misdemeanor crime of domestic violence" and extending a firearm ban to individuals convicted of the crime).

20. Greenberg, *Meet the 'Liberator'*, *supra* note 1.

21. Some of the firearms crimes in Title 18, Chapter 44 use a slightly different definition of firearm. *See, e.g.*, 18 U.S.C. § 922(p)(2)(A) (excluding frames and receivers from the definition of "firearm").

22. *See, e.g.*, Mizokami, *supra* note 13 ("Defense Distributed's controversial files are designed to 3D-print receivers. What comes out of the 3D printer isn't a working weapon, but something that still must be mated to bolts, barrels, trigger groups, stocks, and other necessary parts before it ever fires a bullet.").

23. For a discussion of the complications associated with the analysis of what constitutes a receiver for purposes of this law, see *infra* Part II.B.1. *But see* 18 U.S.C. § 922(p)(2)(A) (specifically excluding the frame and receiver from the definition of firearm).

24. *See* U.S. SENTENCING COMM'N, QUICK FACTS: FELONS IN POSSESSION OF A FIREARM 1, https://www.ussc.gov/sites/default/files/pdf/research-and-publications/quick-facts/Felon_In_Possession_FY18.pdf ("18 U.S.C. § 922(g) prohibits certain persons from shipping, transporting, possessing, or receiving a firearm or ammunition while subject to a prohibition from doing so, most commonly because of a prior conviction for a felony offense.").

conviction under this statutory provision.[25] Of those convicted, the majority of them fell into the highest Criminal History Category under the United States Sentencing Guidelines.[26] The maximum punishment for violating § 922(g), absent any enhancements such as under the Armed Career Criminal Act,[27] is ten years of confinement, a term of supervised release not to exceed three years, and a fine of up to $250,000.[28]

Every federal circuit's iteration of § 922(g)'s elements requires four critical components: (1) a status element (i.e., a prohibited person category in which a defendant falls); (2) a possession element (i.e., the defendant actually or constructively possessed the firearm); (3) a jurisdiction element (i.e., that the possession was "in or affecting commerce"); and (4) a firearm element (i.e., that the thing possessed was either a firearm or ammunition, as defined under federal law).[29] Moreover, as recently clarified by the Supreme Court in *Rehaif v. United States*, Title 18, United States Code, § 924(a)(2) imposes two knowledge requirements on § 922(g)'s elements: the defendant must know their status (i.e., know he or she is a felon) as well as knowingly possess the firearm.[30] As a result, the elements for § 922(g) will almost universally appear as some variation of the following:

> *First*: That the defendant knowingly possessed a firearm [ammunition] as charged;
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> *Second*: That before the defendant possessed the firearm [ammunition], the defendant [was in a prohibited category, e.g., a felon];
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> *Third*: That the defendant knew he [or she] [was in that prohibited category, e.g., a felon]; and
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> *Fourth*: That the firearm [ammunition] possessed traveled in [affected] interstate [foreign] commerce; that is, before the

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25. *See id*. (reporting a total of 69,425 convictions in Fiscal Year 2018, with 6,719 of these convictions coming under 18 U.S.C § 922(g)).

26 25.6% of offenders convicted under this statute fell into Criminal History Category VI (the highest category), while over 60% of the offenders fell into the three highest categories. *Id*.

27. *See* 18 U.S.C. § 924(e)(1) (providing enhanced penalties for a § 922(g) violation, when the defendant already has at least three prior convictions under the statute related to a violent felony, drug offense or both).

28. See 18 U.S.C. § 924(a)(2) for the term of imprisonment, § 3571(b)(3) for fines, and § 3583(b)(2) for terms of supervised release.

29. Rehaif v. United States, 139 S. Ct. 2191, 2195–96 (2019).

30. *Id.* at 2196.

> defendant possessed the firearm, it had traveled at some time from one state to another [between any part of the United States and any other country].[31]

At first glance, the prosecution of prohibited possessors of 3D-printed firearms under § 922(g) appears to be the most straightforward mechanism to account for the most dangerous individuals that might come into possession of such technology. It is easy to envision the facts of such a case: a prohibited person is found actually or constructively possessing a fully or partially 3D-printed firearm and the Government uses one of its most commonplace charges to meet the ends of justice. Beyond the fact that the firearm itself is unusual, there is nothing atypical about the fact pattern and the prosecution would seemingly progress in the same manner as pretty much any other prosecution under § 922(g). However, a basic understanding of 3D-printing technology presents a "burden of production" complication that is easy to overlook but nonetheless potentially case-defeating: the crime's jurisdictional element. The jurisdictional element, here tied to the Congress's Article I, § 8 powers under the Commerce Clause, is a core part of what allows the prosecution of felon-in-possession as a federal offense. Without it, the Federal Government lacks the constitutional authority to regulate the defendant's conduct, and the case cannot be brought federally.[32]

In cases involving traditional firearms, the jurisdictional element is usually proven by means of expert testimony showing that the firearm possessed by the defendant traveled across either state or international boundaries.[33] For example, if a previously convicted felon is arrested in

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31. This is a modified version of the Fifth Circuit's Pattern Jury Instruction (2019) for felon-in-possession. See COMM. ON PATTERN JURY INSTRUCTIONS DIST. JUDGES ASS'N FIFTH CIR., *2.43D Possession of a Firearm by a Convicted Felon 18 U.S.C. §§ 922(g)(1), 924(a)(2)*, *in* PATTERN JURY INSTRUCTIONS (CRIMINAL CASES) 215 (2019), https://www.lb5.uscourts.gov/juryinstructions/fifth/crim2019.pdf, for the version used by the Fifth Circuit.

32. *See Rehaif*, 139 S. Ct. at 2196 ("Jurisdictional elements do not describe the 'evil Congress seeks to prevent,' but instead simply ensure that the Federal Government has the constitutional authority to regulate the defendant's conduct (normally, as here, through its Commerce Clause power)." (citing Torres v. Lynch, 136 S. Ct. 1619, 1630 (2016))).

33. *See, e.g.*, United States v. Folk, 754 F.3d 905, 917 (11th Cir. 2014) ("The interstate nexus element of 18 U.S.C. § 922(g) can be established by showing that the firearm was manufactured in a different state from the one in which it was ultimately possessed by the defendant. . . . Such a showing can come from the testimony of an expert witness." (internal citations omitted) (first citing United States v. Clay, 355 F.3d 1281, 1287 (11th Cir. 2004); then citing United State v. Scott, 263 F.3d 1270, 1274 (11th Cir. 2001))); United States v. Luna, 649 F.3d 91, 105 (1st Cir. 2011) ("The government can establish the interstate nexus element required under 18 U.S.C. § 922(g)(1) by showing that a defendant 'possessed

Mississippi while in possession of a firearm that was manufactured in Massachusetts, the jurisdictional element is satisfied because the firearm could not possibly be in Mississippi without having moved in at least interstate commerce. To determine the jurisdictional nexus of the firearm, "[e]xperts may rely on 'technical manuals, conversations with manufacturers, and [their] prior experience' in forming their opinions without running afoul of Federal Rule of Evidence 703."[34] Though it is not a substitute for expert testimony at trial, the firearm's location of manufacture or importation is oftentimes stamped directly on to its frame or receiver.[35] It is not necessary to prove that the defendant personally moved the firearm across interstate or international lines, nor is it required to show that the defendant knew that the firearm had in fact crossed such boundaries.[36]

Even though the jurisdictional element is normally a straightforward and easily proved element at trial, by showing that that the firearm traveled in interstate or foreign commerce, the potential jurisdictional issues associated with 3D-printed guns are complicated and potentially capable of derailing federal prosecution efforts. Obviously, 3D-printed firearms can be made anywhere the appropriate 3D-printing technology exists, which is a substantial deviation from name-brand firearm manufacturers with known manufacturing plants. As a result, it is entirely possible that, for example, a felon in Mississippi could possess a 3D-printed firearm made from parts produced in a 3D-printer in Mississippi, and subsequently assembled in someone's house in Mississippi. As a result, the entire "manufacturing line" was entirely intrastate, thereby complicating the jurisdictional element of the federal charge. This problem is exacerbated by the fact that existing "laws do

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the [ammunition] in a state other than the one in which it was manufactured.' Expert testimony is appropriate to prove the interstate nexus element." (internal citations omitted) (first quoting United States v. Corey, 207 F.3d 84, 88 (1st Cir. 2000); then quoting United States v. Cormier, 468 F.3d 63, 72 (1st Cir. 2006))); *see also* United States v. Walker, 734 F.3d 451, 455 (2013) (describing how a nexus expert was used during trial to prove that ammunition possessed by a defendant in Ohio had shell casings that had been made in Russia, thereby satisfying the jurisdictional element).

34. *Luna*, 649 F.3d at 105 (quoting United States v. Cormier, 468 F.3d 63, 72 (1st Cir. 2006)).

35. *See*, U.S. DEP'T OF JUST. BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES [ATF], *Firearms Verification*, *in* ATF GUIDEBOOK– IMPORTATION & VERIFICATION OF FIREARMS, AMMUNITION, AND IMPLEMENTS OF WAR, https://www.atf.gov/firearms/docs/guide/atf-guidebook-importation-verification-firearms-ammunition-and-implements-war/download (last visited Dec. 9, 2020) (requiring that the name of the manufacturer be recorded on the firearm's frame, receiver, barrel, or slide).

36. *See Rehaif*, 139 S. Ct. at 2196 ("No one here claims that the word 'knowingly' modifies the statute's jurisdictional element. . . . Because jurisdictional elements normally have nothing to do with the wrongfulness of the defendant's conduct, such elements are not subject to the presumption in favor of scienter." (citing Torres v. Lynch, 136 S. Ct. 1619, 1631 (2016))).

not limit the technology or processes that may be used to produce firearms,"[37] so there are currently limited mechanisms to enforce location stamping or other movement-tracking identifiers on 3D-printed firearms. Even if the 3D-printed firearm was in fact manufactured in a different state, proving it would be extremely difficult. Absent an admission by either the possessor of the firearm or its manufacturer, it would be virtually impossible to elicit competent expert testimony that could prove beyond a reasonable doubt that the firearm had traveled across interstate or international boundaries, especially given the fact that an expert would be unable to consult a name-brand manufacturer's standardized manufacturing processes as a frame of reference.[38]

While these issues could realistically defeat the traditional methods of proving the jurisdictional element at trial, a broader reading of the statute may still permit some opportunity for successful prosecution under § 922(g). Per the statutory language, prohibited persons may not "possess in or affecting commerce[] any firearm or ammunition . . . ."[39] Title 18, United States Code, § 921(a)(2) defines "interstate or foreign commerce" as:

> [I]nclud[ing] commerce between any place in a State and any place outside of that State, or within any possession of the United States (not including the Canal Zone) or the District of Columbia, but such term does not include commerce between places within the same State but through any place outside of that State.[40]

As the Supreme Court has explained, by using the phrase "in . . . or affecting commerce," Congress "invoked the full breadth of its Commerce Clause authority" to achieve the end objective of keeping firearms out of the hands of prohibited persons.[41] In other words, as written in Title 18, Chapter 44, the Commerce Clause should be interpreted as being extended to its maximum scope.

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37. *What Say Does ATF Have in the Technology Used to Produce Firearms?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/firearms/qa/what-say-does-atf-have-technology-used-produce-firearms (last reviewed Sept. 23, 2016).

38. There is some evidence to support the fact that 3D-printers each have an individual "fingerprint" that could be used to track the origins of 3D-printed items, but this would require a database of 3D-printers and their catalogued unique characteristics that does not exist. Tess Owen, *Researchers Say They've Found a Way to Track Untraceable 3D Guns*, VICE (Oct. 15, 2018) [hereinafter Owen, *Track Untraceable 3D Guns*], https://www.vice.com/en_us/article/pa98pb/researchers-say-theyve-found-a-way-to-track-untraceable-3d-guns.

39. 18 U.S.C. § 922(g).

40. 18 U.S.C. § 921(a)(2).

41. Carr v. United States, 560 U.S. 438, 454 (2010).

The Supreme Court has already interpreted Congress's intent in drafting the jurisdictional element of § 922(g) to carry the full breadth and reach of the Commerce Clause.[42] It is reasonable to infer that the near-inescapable necessity of utilizing the Internet to manufacture 3D-printed firearms could sufficiently satisfy the commerce nexus requirement, even if the entire process was otherwise conducted intrastate. Courts have universally agreed that the Internet is an instrumentality and channel of interstate commerce.[43] The easiest means of obtaining the blueprint for a 3D-printed firearm is by downloading the firearm's computer-aided design (CAD) software file over the Internet from one of the distributors in the growing network of companies publishing 3D-printed firearm CAD files.[44] However, even if an end user of 3D-printer technology was sophisticated enough to create their own CAD file and bypass the need to download an existing blueprint over the Internet, the process will still inevitably involve a computer that is capable of connecting to the Internet.[45] Though the first scenario has a more direct nexus to interstate commerce, either scenario could arguably satisfy the broad definition of being in, or affecting, interstate commerce and thereby satisfy the jurisdictional element.

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42. *Id.*

43. *See, e.g.*, United States v. Morgan, 748 F.3d 1024, 1033 (10th Cir. 2014) ("We have decided the Internet is an instrumentality of interstate commerce." (citing Utah Lighthouse Ministry v. Found. for Apologetic Info. & Research, 527 F.3d 1045, 1054 (10th Cir. 2008))); United States v. MacEwan, 445 F.3d 237, 245 (3rd Cir. 2006) ("Having concluded that the Internet is an instrumentality and channel of interstate commerce, it therefore does not matter whether MacEwan downloaded the images from a server located within Pennsylvania or whether those images were transmitted across state lines. It is sufficient that MacEwan downloaded those images from the Internet, a system that is inexorably intertwined with interstate commerce." (citing United States v. Lopez 514 U.S. 549, 558 (1995))); United States v. Hornaday, 392 F.3d 1306, 1311 (11th Cir. 2004) ("The internet is an instrumentality of interstate commerce." (citing United States v. Pipkins, 378 F.3d 1281, 1295 (11th Cir. 2004))); United States v. Panfil, 338 F.3d 1299, 1300 (11th Cir. 2003); United States v. Trotter, 478 F.3d 918, 921 (8th Cir. 2007) ("[T]he Internet is an instrumentality and channel of interstate commerce." (quoting *MacEwan*, 445 F.3d at 245)); United States v. Sutcliffe, 505 F.3d 944, 953 (9th Cir. 2007) ("[T]he Internet is an instrumentality and channel of interstate commerce." (quoting *Trotter*, 478 F.3d at 921)).

44. *See* Jake Hanrahan, *3D-Printed Guns Are Back, and This Time They Are Unstoppable*, WIRED (May 20, 2019), https://www.wired.co.uk/article/3d-printed-guns-blueprints (discussing several different 3D-printed firearm CAD publishers); Adi Robertson, *Defense Distributed's 3D-Printed Gun Files Are Back Online*, THE VERGE (Mar. 30, 2020), https://www.theverge.com/2020/3/30/21199519/defense-distributed-defcad-3d-printed-gun-library-launch-vetting (discussing the renewed availability of Defense Distributed/DEFCAD's gun-making blueprints).

45. *See* Andrew Walker, *3D Printing for Dummies: How Do 3D Printers Work?*, INDEPENDENT (June 21, 2013), https://www.independent.co.uk/life-style/gadgets-and-tech/features/3d-printing-for-dummies-how-do-3d-printers-work-8668937.html (showing how use of a 3D-printer usually requires a computer, like an "ordinary home PC").

While such an expansive application of the jurisdictional element has not yet been applied to § 922(g), similar uses of the Internet have satisfied the jurisdictional element in other Title 18 crimes.[46] Its application to § 922(g) would be logically consistent with the broader application of the Commerce Clause. As a point of comparison, when prosecuting fraud and related activity in connection with computers in violation of Title 18, United States Code, § 1030, certain criminal provisions within that statute require the prosecution to show that the affected computer is a "protected computer."[47] This term is defined as a computer "which is used in or affecting interstate or foreign commerce or communication . . . ."[48] Analyzing this definition in light of the considerable breadth of the Commerce Clause, courts have interpreted a "protected computer" as being essentially any computer that can connect to the Internet:

> As the Supreme Court has recognized, the phrase "affecting interstate or foreign commerce" is a term of art used by Congress to signal that it is exercising its full power under the Commerce Clause. The Commerce Clause allows Congress to regulate instrumentalities of interstate commerce. The internet is an instrumentality of interstate commerce. Any computer that is connected to the internet is thus "part of 'a system that is inexorably intertwined with interstate commerce' and thus properly within the realm of Congress's Commerce Clause Power." Much as Commerce Clause authority permits Congress to regulate the intrastate activities of railroad cars, it now permits Congress to regulate computers connected to the internet, even in the unlikely event that those computers made only intrastate communications.[49]

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46. For example, in crimes involving intentional damage to protected computers in violation of 18 U.S.C. § 1030(a)(5)(A), the jurisdictional nexus for "protected computers" can be satisfied simply by showing that the computer "is used in or affecting interstate or foreign commerce or communication." 18 U.S.C. § 1030(e)(2)(B).

47. *See, e.g.*, 18 U.S.C. § 1030(a)(5)(A) (allowing criminal prosecution only if the computer is considered "protected" under the statute).

48. 18 U.S.C. § 1030(e)(2)(B).

49. United States v. Yücel, 97 F. Supp. 3d 413, 418 (S.D.N.Y. 2015) (internal citations omitted); *see also* United States v. Fowler, Case No. 8:10-cr-65-T-24 AEP, 2010 U.S. Dist. LEXIS 118260, at *5 (M.D. Fl. Oct. 25, 2010) ("There was evidence during the trial that Suncoast's computer system was connected to the internet and that Suncoast used its computers to send emails as part of its business. Such evidence is sufficient to show that Suncoast's computers were used in interstate commerce, and as such, they were protected computers." (citation omitted)).

While § 1030 offenses certainly have a more direct nexus to the Internet than § 922(g) offenses given § 1030's specific focus on computer systems, the logic surrounding the Internet as a mechanism to satisfy the jurisdictional element can reasonably be extended to the analysis of jurisdiction as it applies to 3D-printed firearms prosecutions under § 922(g).

The jurisdictional element presents a unique challenge to successful § 922(g) prosecutions involving 3D-printed firearms. However, the central role of the Internet in the technology still provides prosecutors reasonable and statutorily consistent avenues for arguing that the interstate commerce nexus is provable. If this tactic is pursued, prosecutors must ensure that their nexus expert is fully competent to qualify as an expert in the field of 3D-printed technology, in order to offer the necessary testimony to successfully establish the jurisdictional element. Prosecutors considering charging a prohibited person possessing a 3D-printed firearm with violating § 922(g) should explore these alternative jurisdictional arguments at their earliest identification of the issue, and work with their experts accordingly to ensure maximum preparedness.

Additionally, given the appropriate set of circumstances, prosecutors may be able to entirely circumvent the issue regarding the 3D-printed firearm's jurisdictional nexus—by instead charging the prohibited person with unlawful possession of any ammunition recovered with the 3D-printed firearm. Section 922(g) imposes criminal liability for prohibited persons who possess either firearms or ammunition.[50] Early tests of the Liberator used standard, commercially available ammunition: specifically, .380 caliber pistol ammunition and 5.7x28 caliber rifle ammunition.[51] If the facts of a case involve a loaded 3D-printed firearm, it is a logical starting place to assume that the ammunition involved is commercially available.

Moreover, like firearms, ammunition can be broken down into its individual components to meet the jurisdictional element. Title 18, United States Code, § 921(a)(17)(A) defines "ammunition" as "ammunition or cartridge cases, primers, bullets, or propellent[52] powder designed for use in any firearm."[53] Therefore, rather than struggling with the components of a

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50. 18 U.S.C. § 922(g) ("It shall be unlawful for any person [in an enumerated prohibited category] to . . . possess in or affecting commerce, any firearm or ammunition; or to receive any firearm or ammunition which has been shipped or transported in interstate or foreign commerce.").

51. Greenberg, *Meet the 'Liberator'*, *supra* note 1.

52. The term is spelled "propellent" in the United States Code, though its more common spelling is propellant. Technically, either spelling is correct, though "propellent" is a less commonly used variant. *Propellant*, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/propellant (last visited Dec. 9, 2020).

53. 18 U.S.C. § 921(a)(17)(A).

3D-printed firearm, a more effective solution may be to simply determine where the cartridge casing of the bullet was produced to determine whether it satisfies an interstate or foreign commerce nexus. Rather than trying to overcome some of the difficult questions regarding the 3D-printed firearm itself, turning to the ammunition possessed by the prohibited person in association with that firearm could be a workable alternative that will yield the same result, consistent with the ends of justice.

While this may be a workable solution in many cases, it is also important to be aware that some 3D-printed firearm users are sophisticated enough that they have already started self-manufacturing ammunition that functions more effectively with their plastic 3D-printed weapons.[54] This ammunition is less expensive to produce for the end user and is also designed to maintain the integrity of otherwise flimsy plastic 3D-printed firearms.[55] That said, the bullets still function by means of gunpowder as a propellant[56] and, if a nexus expert is capable of tracking the source of that gunpowder, a jurisdictional nexus can still be met.[57] While 3D-printed ammunition is certainly less frequently discussed technology than 3D-printed firearms, prosecutors should be aware that it exists, and prepare for the possibility that a prohibited person using a 3D-printed firearm may very well be using 3D-printed ammunition as well.

B. Prosecutions Based on the Unique Characteristics of 3D-Printed Firearms

In a criminal matter involving a 3D-printed firearm that is either not within the scope of Title 18, United States Code, § 922(g), or involving facts

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54. *See* Ian Urbina, *Inside the World of D.I.Y. Ammunition*, N.Y. TIMES (Oct. 5, 2018), https://www.nytimes.com/2018/10/05/us/3d-printed-guns-homemade-ammunition.html (reporting how a 29-year-old gunsmith crafted his own bullets that do not ruin 3D-printed plastic firearms); Lance Ulanoff, *Now There Are Bullets That Won't Break Your 3D-Printed Gun*, MASHABLE (Nov. 6, 2014), https://mashable.com/2014/11/06/bullets-3d-printed-gun/ (chronicling how a machinist made bullets for 3D-printed firearms by designing shells that suppress gunpowder explosions).

55. *See* Urbina, *supra* note 54 (reporting these new homemade bullets may be more compatible with the design of 3D-printed firearms).

56. *Id.*

57. *See, e.g.*, United States v. Hansen, No. 4:18-CR-3140, 2020 WL 1991059, 2020 U.S. Dist. LEXIS 74437, at *10–11 (D. Neb. Mar. 30, 2020) ("Additionally, the ATF established an interstate nexus for multiple rounds of ammunition, and established that, although certain rounds were manufactured in Nebraska, those rounds used powder/propellant powder and/or cartridge casings manufactured outside of Nebraska.").

that would suggest prosecution under that statute would be impractical,[58] there are still other mechanisms for criminal accountability based on the unique characteristics of 3D-printed firearms. This Subpart explores two statutes that may provide alternative charging solutions for people possessing 3D-printed firearms for an illicit purpose, specifically: Title 18, United States Code, § 922(p) and Title 26, United States Code, § 5861.

1. Title 18, United States Code, § 922(p) and the Undetectable Firearms Act

In 1988, Congress enacted the Undetectable Firearms Act[59] in response to a technological development allowing some firearms to be manufactured using plastic composite components, generating concerns over the prospect of an at-the-time theoretical plastic firearm capable of bypassing metal detectors and modern security measures.[60] The legislation, designed to curtail so-called "undetectable firearms,"[61] was codified as Title 18, United States Code, § 922(p), which states in relevant part:

> It shall be unlawful for any person to manufacture, import, sell, ship, deliver, possess, transfer, or receive any firearm—
>
> (A) that, after removal of grips, stocks, and magazines, is not detectable as the Security Exemplar, by walk-through metal detectors calibrated and operated to detect the Security Exemplar; or

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58. Prosecution may be impractical under § 922(g) if, for example, the prosecution would have to rely on circumstantial or indirect evidence showing that the defendant had knowledge of his status as being part of a prohibited class.

59. *Summary of Undetectable Firearms Act of 1988*, LIBRARY OF CONG., https://www.congress.gov/bill/100th-congress/house-bill/4445.

60. "When the Undetectable Firearms Act was passed in 1988, it was in response to the creation of the Glock 17, a weapon made with plastic composite components . . . .The idea that a weapon could be constructed entirely of plastic—thereby evading metal detectors—meant a requirement that every weapon contain at least enough metal to show up in detection devices." Philip Bump, *Undetectable Guns May Soon Be Legal—But Caveats Apply*, ATLANTIC (Nov. 14, 2013), https://www.theatlantic.com/politics/archive/2013/11/undetectable-guns-may-soon-be-legal-caveats-apply/355019/.

61. There is a distinct different between "untraceable" firearms and "undetectable" firearms. The former category typically denotes firearms that do not have serial numbers (sometimes called "ghost guns"), while the latter denotes firearms that may be concealed from traditional detection devices such as metal detectors or x-rays. See *infra* Part II for discussion of this distinction.

> (B) any major component of which, when subjected to inspection by the types of x-ray machines commonly used at airports, does not generate an image that accurately depicts the shape of the component. Barium sulfate or other compounds may be used in the fabrication of the component.[62]

The term "major component," as used in § 922(p)(2)(B), "means, with respect to a firearm, the barrel, the slide or cylinder, or the frame or receiver of the firearm . . . ."[63] The law, which has a sunset provision, has been extended multiple times over its history, but to date its scope has never been expanded.[64] The maximum punishment for violating § 922(p) is five years of confinement, a term of supervised release not to exceed three years, and a fine of up to $250,000.[65]

While § 922(p) could potentially be used to meet the ends of justice in future prosecutions involving firearms that are entirely plastic, it would likely have limited application with today's 3D-printed firearms. Modern plastic 3D-printed firearms are certainly closer to the futuristic plastic firearm feared by Congress in the late 1980s, but they are still not designed to entirely evade detection. Early 3D-printed guns designed by Defense Distributed stayed within the legal limits of the Undetectable Firearms Act by including various metal pieces designed to be detected, such as the Liberator's metal "firing pin and a six-ounce piece of steel to trigger metal detectors . . . ."[66] Therefore,

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62. 18 U.S.C. § 922(p)(1)(A)–(B).

63. 18 U.S.C. § 922(p)(2)(B). Note that the term "firearm" under this provision does not include the receiver or frame, as it does in other Title 18, Chapter 44 offenses. *See* 18 U.S.C. § 922(p)(2)(A) (excluding the frame or receiver of a weapon from the definition of "firearm").

64. *See* Kasie Hunt & Carrie Dann, *Senate Extends Ban on Undetectable Guns But Nixes Tighter Restrictions*, NBC NEWS (Dec. 9, 2013), https://www.nbcnews.com/politics/politics-news/senate-extends-ban-undetectable-guns-nixes-tighter-restrictions-flna2D11717122 ("[T]he Senate extended a ban on undetectable firearms but declined to tighten any of the law's restrictions.").

65. *See* 18 U.S.C. § 924(f) (stating term of imprisonment); 18 U.S.C. § 3571(b)(3) (stating amount of fine); 18 U.S.C. § 3583(b)(2) (stating term of supervised release).

66. Marrian Zhou, *3D-Printed Gun Controversy: Everything You Need to Know*, CNET (Sept. 25, 2018), https://www.cnet.com/news/the-3d-printed-gun-controversy-everything-you-need-to-know/; *see also* Andy Greenberg, *The Last-Ditch Legal Fight to Stop 3-D Printed Guns*, WIRED (July 31, 2018) [hereinafter Greenberg, *Last-Ditch Legal Fight*], https://www.wired.com/story/legal-fight-stop-3d-printed-guns-defense-distributed/ ("Earlier 3-D printed guns like the Liberator, to meet the requirements of the Undetectable Firearms Bill, sometimes contained a removeable chunk of metal designed to make them detectable."); Gina Martinez, *3D-Printed Guns Are Unchecked and Untraceable. And a Judge Blocked Them at the Last Minute*, TIME (July 31, 2018), https://time.com/5344265/3d-printed-guns-legal/ ("Wilson's 'Liberator' is a single-shot pistol made of ABS plastic, the material used for Legos. It includes a metal firing pin and a piece of metal to ensure it doesn't run afoul of the Undetectable Firearms Act.").

without a user modifying the design to remove these parts, these 3D-printed firearms will fall outside the scope of the weapons prohibited under § 922(p).

Moreover, the successful concealment of these plastic weapons does not appear to require removal of their metal components, giving little reason for dangerous persons to go through the extra effort of trying to convert the few remaining metal components into plastic ones. Journalists have successfully bypassed security with plastic firearms—specifically, versions of Defense Distributed's Liberator—on at least two notable occasions. In May 2013, British journalists from the United Kingdom's *Daily Mail* smuggled a dissembled Liberator onto a Eurostar train without the firing pin, "pass[ing] completely unchallenged through strict airport-style security to carry the gun on to a London to Paris service in the weekend rush-hour, alongside hundreds of unsuspecting travellers."[67] Subsequently, in July 2013, Israeli journalists managed to successfully bring the fully assembled Liberator into Israel's national legislature, the Knesset, during an address by the Prime Minister:

> [I]nvestigative journalists from Channel 10 TV tested government security by slipping a functioning 3-D-printed gun into the Israeli Parliament, the Knesset, and into an address by the Prime Minister Benjamin Netanyahu. (In fact, the journalists got past Knesset security twice.) The Channel 10 journalists printed the gun based on designs from U.S. nonprofit Defense Distributed, and although it contains one metal part, a nail that serves as a firing pin, the gun even made it past a metal detector. The incident shows that even the Israelis, who have developed sophisticated security procedures due to terrorism threats, might not be prepared for plastic, 3-D-printed weapons, as Israeli Brigadier General Yossi Griff conceded.[68]

If it is possible to bypass security without removing the metal components, criminals have reduced incentive to modify the firearms, thereby effectively keeping the firearms outside the prohibitions covered in § 922(p).

It is also possible that, as 3D-printed technology progresses, federal prosecutors may be more likely to encounter detectable metal 3D-printed

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67. Simon Murphy & Russell Myers, *How Mail on Sunday 'Printed' First Plastic Gun in UK Using a 3D Printer—and Then Took It on Board Eurostar Without Being Stopped in Security Scandal*, DAILY MAIL (May 11, 2013), https://www.dailymail.co.uk/news/article-2323158/How-Mail-On-Sunday-printed-plastic-gun-UK--took-board-Eurostar-stopped-security-scandal.html.

68. Sean Captain, *Journalists Smuggle 3-D Printed Gun into Israeli Parliament*, NBC NEWS (July 8, 2013), https://www.nbcnews.com/technology/journalists-smuggle-3-d-printed-gun-israeli-parliament-6C10570532.

firearms that fall entirely outside the scope of § 922(p), as opposed to their mostly plastic counterparts like the Liberator. Presently, metal 3D-printed firearms are more durable than their plastic counterparts, but they are also much more expensive to produce.[69] Currently, an industrial metal 3D-printer costs approximately $30,000 to upwards of $1,000,000,[70] though some non-industrial models are available for less.[71]

Though the cost differential is extreme, the price correlates with a substantially more effective firearm. The first metal 3D-printed firearm, produced by engineering company Solid Concepts, demonstrated the exponential increase in the durability of metal over plastic by successfully firing over 5,000 rounds before its retirement.[72] The company produced one hundred of the firearms at a price point of $11,900.[73] Even compared to other metal firearms, this price is exorbitant, costing several times as much as even the most high-end model 1911 pistols.[74] Of course, as metal 3D-printing technology improves, the costs of using a metal 3D-printer will inevitably decline.[75] Logically, as the price of metal 3D-printed firearms decreases, their accessibility to the broader criminal population will increase.

Compared to their plastic counterparts, metal 3D-printed firearms would also likely have a greater value in the firearms black market due to their

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69. *See* Dan Tynan, *'I Wouldn't Waste My Time': Firearms Experts Dismiss Flimsy 3D-Printed Guns*, GUARDIAN (July 31, 2018), https://www.theguardian.com/us-news/2018/jul/31/3d-printed-guns-danger-problems-plastic (discussing, in part, the prohibitive expense of 3D-printed weapons, especially in relation to other means of obtaining weapons); Jochan Embley, *First Ever Metal 3D Printed Gun Manufactured in the US*, INDEPENDENT (Nov. 11, 2013), https://www.independent.co.uk/life-style/gadgets-and-tech/news/first-ever-metal-3d-printed-gun-manufactured-in-the-us-8932953.html (stating that 3D-printers capable of printing 3D-metal guns "cost in excess of one million dollars").

70. Ludivine Cherdo, *Metal 3D Printers in 2020: A Comprehensive Guide*, ANIWAA, https://www.aniwaa.com/buyers-guide/3d-printers/best-metal-3d-printer/ (last updated July 13, 2020).

71. The company iro3d created a metal 3D-printer that was available for $5000, but it appears that model has since been discontinued. *IRO3D PRINTER*, ANIWAA, https://www.aniwaa.com/product/3d-printers/iro3d-printer/ (last visited Dec. 9, 2020). The company now appears to have a $7,000 model available ("Model C"), though there is less information available about this newer alternative. *3D Printer That Prints Solid, 100% Dense, Precise, and Strong Metal Objects*, IRO3D, http://iro3d.com/ (last visited Dec. 9, 2020).

72. Brittney Sevenson, *Solid Concepts 3DPrints Another Metal Gun, 'Reason', a 10mm Auto 1911*, 3DPRINT.COM (Oct. 26, 2014), https://3dprint.com/21109/3d-print-metal-gun-reason/.

73. *Id.*

74. *1911 Pistols for Every Budget*, GUNS.COM (Nov. 29, 2019), https://www.guns.com/news/2019/11/29/1911-pistols-for-every-budget.

75. *See Metal 3D Printing: 7 Common Misconceptions Debunked*, AUTONOMOUS MANUFACTURING BLOG (Mar. 3, 2020), https://amfg.ai/2020/03/03/metal-3d-printing-7-common-misconceptions-debunked/?cn-reloaded=1 (showing that some companies have already started using cost-efficient components to reduce the cost of 3D-printers).

relative reliability and durability.[76] Because plastic 3D-printed firearms have a comparably reduced durability, those types of firearms will presumptively be more commonplace in single-target assassination attempts, as opposed to normal firearms trafficking or street-level use, where single-shot firearms have limited value.[77] As the cost of the technology decreases to a more reasonable level and the price disparity between metal and plastic 3D-printed firearms narrows, prosecutors should logically expect more cases involving metal 3D-printed firearms. Consequently, § 922(p) would provide limited relief because it simply will not apply to those types of cases.

While prosecutors will likely find an overall limited application of § 922(p) in 3D-printed firearms cases, it may still be a viable charge for cases involving plastic 3D-printed firearms in the future. Even though it seems largely unnecessary, designs like the Liberator can nonetheless be modified to make them even harder to trace: "[i]f the metal parts, such as the firing pin, are removed, you could probably put a Liberator in your carry-on luggage and walk through airport security checkpoints."[78] One of the two metal pieces inside the Liberator is not even mechanically necessary to discharge the firearm: the steel plate is "not essential, and the gun can still be fired without it."[79] In the event that an offender possesses a modified plastic 3D-printed firearm with all metal parts removed, § 922(p) may be an appropriate charge. However, if a § 922(p) charge is pursued, prosecutors must be careful to prove that the firearm either "will or is designed to or may readily be converted to expel a projectile by the action of an explosive,"[80] or that the recovered component falls within the statute's defined parameters.

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76. It is unclear what is definitively the most commonly trafficked firearm, but there are multiple references showing models recovered, types of ammunition, and similar types of data. Pistols are the most commonly recovered type of firearm, which is likely connected to their concealability and portability. For an overview of the firearms data collected by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) in 2018, see *Firearms Trace Data–2018*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/resource-center/firearms-trace-data-2018 (last reviewed Aug. 26, 2019).

77. For a discussion of how street level guns can be used in gang activities, such as the use of "community guns" to protect drugs or to commit crimes of violence, see generally Frank Miniter, *Inside the Black Market for Guns*, FORBES (Aug. 12, 2014), https://www.forbes.com/sites/frankminiter/2014/08/12/inside-the-black-market-for-guns/#31c1a7e6181e (discussing the use of street-level guns in gang activities, such as protecting drugs or committing crimes of violence).

78. Zhou, *supra* note 66. While some legislative efforts have tried to modify the law so that a "core, unremovable component of the gun would have to be made of detectable metal," those efforts have not yet proved successful. Greenberg, *Last-Ditch Legal Fight*, *supra* note 66.

79. Murphy & Myers, *supra* note 67.

80. 18 U.S.C. § 921(a)(3)(A).

Future developments in the technology could also result in a growth in the production of plastic 3D-printed firearms. For example, future technological developments could allow the metal firing pin to be entirely replaced with a plastic component, or engineers may discover ways to increase the durability of plastic 3D-printed firearms. Either advancement could allow for a highly functional, entirely plastic 3D-printed firearm capable of completely avoiding detection.[81] Such a weapon would almost certainly fall within the scope of § 922(p). Additionally, it seems likely that metal 3D-printed firearms will prove the most valuable to the criminal population in the long term. However, the considerable price differential between plastic and metal 3D-printed firearms may result in a timeframe where plastic 3D-printed firearms are more common simply due to their lower cost. In such a scenario, modified versions of the plastic firearms designed to avoid detection may become more prominent. In either instance, § 922(p) may be appropriate.

2. 26 U.S.C. § 5861 and the National Firearms Act

Unlike the other provisions of law discussed previously in this Article, the National Firearms Act (NFA)[82] was originally established in 1934 as an extension of Congress's Article I, § 8 taxing power.[83]

> Similar to the current NFA, the original Act imposed a tax on the making and transfer of firearms defined by the Act, as well as a special (occupational) tax on persons and entities engaged in the business of importing, manufacturing, and dealing in NFA firearms. The law also required the registration of all NFA firearms with the Secretary of the Treasury.[84]

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81. *See* Bump, *supra* note 60 ("The challenge that Israel and the ATF note is that 3D printers, 3D printing, and 3D-printing materials are all fairly young technologies. They will evolve.").

82. BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, ATF NATIONAL FIREARMS ACT HANDBOOK § 1.1.1 (2009) [hereinafter ATF NATIONAL FIREARMS ACT HANDBOOK], https://www.atf.gov/firearms/docs/guide/atf-national-firearms-act-handbook-atf-p-53208/download.

83. *National Firearms Act*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/rules-and-regulations/national-firearms-act (last reviewed Apr. 7, 2020); Sarah Herman Peck & Michael A. Foster, CONG. RSCH. SERV., R45629, FEDERAL FIREARMS LAWS: OVERVIEW AND SELECTED LEGAL ISSUES FOR THE 116TH CONGRESS (2019), https://fas.org/sgp/crs/misc/R45629.pdf.

84. ATF NATIONAL FIREARMS ACT HANDBOOK, *supra* note 82, at 1.

Despite a constitutionally rocky history,[85] subsequent legislation amended and supplemented the NFA to create a powerful mechanism for regulating certain categories of firearms and ensuring accountability for those that receive, possess, transfer, and make such weapons without following the proper channels of authority.[86]

When dealing with an NFA case, the first question a prosecutor must ask is whether the firearm at issue is, in fact, an NFA firearm. Under the NFA:

> The term "firearm" means (1) a shotgun having a barrel or barrels of less than 18 inches in length; (2) a weapon made from a shotgun if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 18 inches in length; (3) a rifle having a barrel or barrels of less than 16 inches in length; (4) a weapon made from a rifle if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 16 inches in length; (5) any other weapon, as defined in subsection (e); (6) a machinegun; (7) any silencer (as defined in section 921 of title 18, United States Code); and (8) a destructive device.[87]

The fifth category, "any other weapon," encompasses a broad array of firearms, including "any weapon or device capable of being concealed on the person from which a shot can be discharged through the energy of an explosive . . . ."[88] The statute expressly clarifies that "[s]uch term shall not include a pistol or a revolver having a rifled bore, or rifled bores, or weapons designed, made, or intended to be fired from the shoulder and not capable of firing fixed ammunition."[89] A firearm is not *per se* illegal because it falls into one of the categories covered by the NFA—it simply requires the manufacturing or transferring party to pay a tax so that the firearm may be

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85. *See id.* (showing that the original NFA violated the privilege from self-incrimination under the Fifth Amendment by requiring the registration of any unregistered firearms with the Secretary of the Treasury).

86. *See* United States v. Freed, 401 U.S. 601, 605 (1971) (concluding that the amended Act cured the previous violation of the self-incrimination clause of the Fifth Amendment); 26 U.S.C. § 5861(b)–(f) (explaining that receiving, possessing, transferring, or making a firearm in violation of § 5861(g)–(l) is unlawful).

87. 26 U.S.C. § 5845(a).

88. 26 U.S.C. § 5845(e).

89. 26 U.S.C. § 5845(e).

possessed legally.[90] To the extent a 3D-printed firearm is considered an NFA firearm, the law provides methods of ensuring accountability for both the end possessors as well as those who make or transfer the firearm.[91]

At least some 3D-printed firearms fall within the "any other weapon" category of the NFA. Defense Distributed's Liberator, for example, is capable of being concealed, discharged by the energy of an explosion, and does not have a rifled bore barrel.[92] However, while the Liberator may fall under NFA regulations, some of its variants are not. Within the same month of the Liberator's unveiling and the release of its CAD file blueprint on to the Internet, a Wisconsin engineer working under a pseudonym modified the Liberator's design to include a rifled bore barrel, effectively sidestepping the registration requirements of the NFA.[93] The modified Liberator, dubbed the Lulz Liberator by its anonymous creator, was printed using a $1,725 Lulzbot A0-101 consumer-grade 3D-printer and only $25 of plastic material.[94] Unlike the original Liberator, after test-firing the Lulz Liberator nine times—eight times with a single rifled barrel—"the weapon's main components remained intact—even the spiraled rifling inside of the barrel's bore."[95]

The creation of the Lulz Liberator demonstrates a considerable shortcoming in the ability of federal prosecutors to consistently rely on the applicability of the NFA. Just as Cody Wilson was able to decipher a workaround to ensure that his Liberator did not fall within the scope of the Undetectable Firearms Act, it comes as no surprise that a sophisticated manufacturer capable of understanding and utilizing 3D-printer technology would be competent enough to modify the Liberator's CAD file to better skirt the edge of other federal firearms laws.

As 3D-printing technology improves and becomes more widely available, prosecutors should anticipate that the designs for 3D-printed

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90. *How Can a Person Legally Obtain NFA Firearms?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, (citing 26 U.S.C §§ 5812, 5822 and 27 C.F.R. §§ 479.62, 479.84 (2019)), https://www.atf.gov/firearms/qa/how-can-person-legally-obtain-nfa-firearms (last reviewed Feb. 6, 2020).

91. *See, e.g.*, 26 U.S.C. § 5861(b)–(f) (making it unlawful to receive, possess, transfer, or make a firearm in violation of § 5861(g)–(l)).

92. According to the DEFCAD blueprint notes, the firearm has a threaded .380 barrel, but not a rifled bore. *Defense Distributed Liberator V1.1*, DEFCAD, https://defcad.com/library/e8e76982-30c4-46e9-ae5b-22dd5b97763e/ (last visited Dec. 9, 2020).

93. Andy Greenberg, *$25 Gun Created with Cheap 3D Printer Fires Nine Shots (Video)*, FORBES (May 20, 2013), https://www.forbes.com/sites/andygreenberg/2013/05/20/25-gun-created-with-cheap-3d-printer-fires-nine-shots-video/#23c66ead6a72 ("The rifling that Joe added to the barrel is designed to skirt the National Firearms Act, which regulates improvised weapons and those with smooth-bored barrels.").

94. *Id.*

95. *Id.*

firearms will become increasingly sophisticated and potentially difficult to classify. Prosecutors should also anticipate that the manufacturers of 3D-printed weaponry are themselves often sophisticated enough to ensure that their blueprints meet requirements to minimize additional government regulation. In light of these considerations, while the NFA is an excellent tool that prosecutors should consider, they should be prepared to explore alternative charging mechanisms in the event that the 3D-printed firearm does not clearly fall into any of the NFA's listed categories.

II. 3D-PRINTED FIREARMS AND THE UNTRACEABLE GUN CRISIS

As demonstrated in Part I, current federal laws provide mechanisms for ensuring accountability for those that abuse 3D-printed firearm technology, even if the 3D-printed guns themselves are made legal. It is also apparent that there are some shortcomings in the current law that will make traditional firearms-prosecution mechanisms more difficult to utilize. Absent developed case law surrounding the jurisdictional element of 3D-printed firearms or more proactive legislative change that better defines the legal boundaries of 3D-printed firearm technology, the existing laws will remain imperfect solutions to a quickly evolving problem.

While the statutes in Part I do offer some means of ensuring accountability for perpetrators using 3D-printed firearms, arguably the most effective strategy for widespread deterrence and reduction of the illicit distribution of these firearms to dangerous persons is to mandate some method of firearms tracing. Firearms tracing is a tremendously important aspect of modern law enforcement, helping investigators track gun-trafficking patterns, generate leads, and find connections between crime scenes.[96] By being able to trace the origin of a 3D-printed firearm, federal law enforcement may be able to proactively cut off the source of supply for a criminal element rather than reactively responding to multiple cases that may result from a single dealer.

The negative impact that 3D-printing may have on firearms tracing is a more immediate and pressing concern than the potential shortcomings of the law discussed in Part I. Presently, there are no mechanisms in place to enforce the requirements of traditional tracing identifiers on 3D-printed firearms. The

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96. *See* CHELSEA PARSONS ET AL., RETHINKING ATF'S BUDGET TO PRIORITIZE EFFECTIVE GUN VIOLENCE PREVENTION 1, 2 (Ctr. For Am. Progress 2020), https://www.americanprogress.org/issues/guns-crime/reports/2020/09/17/490494/rethinking-atfs-budget-prioritize-effective-gun-violence-prevention/ (noting that firearm tracing is a unique resource that is integral to the criminal justice process).

result is a great opportunity for criminals to create untraceable "ghost guns."[97] This problem is multifaceted and complex, with regulatory failures occurring at multiple levels.[98]

This Part explores the relationship between 3D-printing and the ghost gun crisis. First, it discusses the recent history of traditional firearms tracing and its overall importance in investigations. Then, it explores how 3D-printed firearms contribute to the ghost gun crisis, and the resulting negative consequences for law enforcement. Finally, it considers an alternative regulatory scheme focused around 3D-printers (as opposed to the firearms they produce) as a means of improving tracing capabilities.

A. Firearms Tracing: A Modern Solution (in Development) for Deterring Gun Violence

Firearms tracing is broadly defined as "the systematic tracking of the movement of . . . firearms recovered by law enforcement officials from [their] first sale by the manufacturer or importer through the distribution chain (wholesaler/retailer) to the first retail purchaser."[99] The benefit of comprehensive firearms tracing is that it permits the "routine tracing of every crime gun recovered within a geographic area or specific law enforcement jurisdiction," thereby "provid[ing] investigative leads in the fight against violent crime and terrorism" with the overall intent of improving public safety.[100]

While firearms tracing has developed considerably in recent years, the seminal legislative effort for tracing dates back to the Gun Control Act of 1968 (GCA), which "requires licensed importers and licensed manufacturers to identify, by means of a serial number, each firearm imported or

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97. "Ghost guns are self-assembled firearms that are built from unregulated kits or 3D printers." Josiah Bates, *The Saugus High School Shooter Used an Illegal 'Ghost Gun.' Authorities Warn More Criminals Are Using Untraceable Weapons to Get Around Gun Laws*, TIME (Nov. 23, 2019) [hereinafter Bates, *The Saugus Shooter Used a Ghost Gun*], https://time.com/5737227/saugus-shooter-ghost-gun/.

98. *See* Adi Robertson, *State Officials Ask Trump Administration to Pull 3D-Printed Gun Files Offline*, THE VERGE (Apr. 14, 2020), https://www.theverge.com/2020/4/14/21220765/defense-distributed-defcad-relaunch-attorney-general-trump-administration-letter-legal-violations (describing how the federal government has declined to take action against Defense Distributed for selling blueprints for 3D-printed guns resulting in two dozen state attorneys seeking alternative means of prosecuting these manufactures).

99. *Tools & Services for Law Enforcement,* BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/firearms/tools-services-law-enforcement (last visited Dec. 10, 2020).

100. *Id*.; BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, ATF PUB. 3312.7, INFORMATION FOR LAW ENFORCEMENT AGENCIES (2005).

manufactured."[101] Manufacturers and importers must "legibly identify each firearm by engraving, casting, stamping (impressing), or otherwise conspicuously placing on the frame or receiver an individual serial number . . . [which] must be placed in a manner not susceptible of being readily obliterated, altered, or removed."[102] In association with the serial number requirement, "[t]he GCA requires Federal firearms licensees (FFLs) to maintain records of their acquisitions and dispositions of firearms, including complete and accurate descriptions of the firearms."[103] Maintaining information about the serial number, in addition to other characteristics of a firearm, "make[s] any given firearm uniquely identifiable and traceable."[104]

The investigative opportunities provided by firearms tracing are manifold. At its simplest level, if a firearm is stolen, the victim of that crime files a police report detailing the firearm's make, model, and serial number; and when that firearm reappears at a later crime scene, investigators will be able to quickly and accurately determine at least some of the firearm's history.[105] From a federal prosecution standpoint, being able to identify that a firearm is stolen, coupled with the opportunity to potentially interview the firearm's owner, yields at least two additional considerations. First, it suggests the possibility of a new charge: possession of a stolen firearm in violation of 18 U.S.C. § 922(j).[106] Second, in accordance with U.S. Sentencing Guideline § 2K2.1(b)(4)(A), almost all federal firearm offenses falling within the scope of § 2K2.1 are given a two offense level enhancement simply because the firearm is stolen.[107] This section "applies

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101. Identification Markings Placed on Firearms, 66 Fed. Reg. 40,596, 40,597 (Aug. 3, 2001) (codified at 27 C.F.R. pt. 178.92), https://www.govinfo.gov/content/pkg/FR-2001-08-03/pdf/01-19418.pdf; *see also* 18 U.S.C. § 923(i) (codifying the serial-number requirement).

102. Identification Markings Placed on Firearms, 66 Fed. Reg. at 40,597; *see also* 27 C.F.R. § 478.92 (2019) (adopting language of. 27 C.F.R. § 178.92 during reorganization of Title 27).

103. Identification Markings Placed on Firearms, 66 Fed. Reg. at 40,597; *see also* Gun Control Act of 1968, § 101, Pub.L. No. 90–618, 82 Stat. 1223 (codified as amended at 18 U.S.C. § 923(i)) (adding a recordkeeping requirement to existing regulatory scheme).

104. Identification Markings Placed on Firearms, 66 Fed. Reg. at 40,597.

105. Philip J. Cook, *Gun Theft and Crime*, 95 J. URB. HEALTH 305, 306 (2018).

106. Generally speaking, the elements of this crime are as follows: (1) the defendant knowingly possessed the firearm, (2) the firearm was stolen, (3) the defendant knew or had reasonable cause to believe the firearm was stolen, and (4) the firearm was shipped or transported in commerce either before or after it was stolen. *See, e.g.*, United States v. Provost, 237 F.3d 934, 938 (8th Cir. 2001) (listing elements); United States v. White, 816 F.3d 976, 985 (8th Cir. 2016) (listing elements).

107. *See* U.S. SENT'G COMM'N, 2018 GUIDELINES MANUAL ANNOTATED § 2K2.1, at 252 (2018), https://www.ussc.gov/sites/default/files/pdf/guidelines-manual/2018/GLMFull.pdf (detailing offense level enhancements for stolen firearms). But see *id.* § 2K2.1, Application Note 8(A), at 254–55, "[i]f the

regardless of whether the defendant knew or had reason to believe that the firearm was stolen . . . ."[108]

Beyond these fundamental uses, recent advancements in technology provide substantially more sophisticated tracing capabilities for law enforcement, enhancing the effectiveness of investigations. For example, the Integrated Ballistic Identification System (IBIS) operated by the National Integrated Ballistic Information Network (NIBIN) allows law-enforcement agencies to connect crime scenes through automated ballistic imaging, "allow[ing] for the capture and comparison of ballistic evidence to aid in solving and preventing violent crimes involving firearms."[109] The technology provides investigators the opportunity to cross-reference firearms-related evidence across multiple investigations to determine, among other things, whether a single firearm was used in a series of crimes.[110] While the NIBIN technology does not trace firearms from their initial lawful manufacture and sale,[111] combining information obtained through a firearm's serial number with its forensic NIBIN data can help investigators better discern the firearm's history and provide additional investigative leads.

The obvious importance and effect of tracing can be seen in the exponential increase in investigative trace requests over the past three decades. According to the Bureau of Alcohol, Tobacco, Firearms and Explosives' National Tracing Center, the number of trace requests skyrocketed from 48 requests in Fiscal Year 1988 to nearly 450,000 requests in Fiscal Year 2019.[112] The dramatic rise of the tracing program has allowed law enforcement to develop investigative leads and identify trafficking

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only offense to which § 2K2.1 applies [are] . . . []offenses involving a stolen firearm or stolen ammunition [as an element of the crime] [] and the base offense level is determined under subsection (a)(7)," then the enhancement for a stolen firearm does not apply because it is intrinsic to the offense. However, if the firearm has an altered or obliterated serial number, the four-level enhancement from § 2K2.1(b)(4)(B) still applies, even if one of these offenses is the single applicable offense of conviction for § 2K2.1 purposes.

108. *Id.* § 2K2.1, Application Note 8(B), at 255.

109. *Fact Sheet-National Integrated Ballistic Information Network*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES (June 2020) [hereinafter ATF, *NIBIN Fact Sheet*], https://www.atf.gov/resource-center/docs/undefined/nibin-fact-sheet-june-2020/download.

110. *See, e.g.*, Justin Rohrlich, *The Tool Revolutionizing the Tracing of Guns in the US Has a Blindspot*, QUARTZ (Oct. 20, 2018), https://qz.com/1430637/the-tool-revolutionizing-the-tracing-of-guns-in-the-us-has-one-big-blindspot/ (describing how NIBIN tracing can be used to connect multiple crimes).

111. "Only crime gun evidence and fired ammunition components pursuant to a criminal investigation are entered into NIBIN. Therefore, NIBIN cannot capture or store ballistic information collected at the point of manufacture, importation, or sale; nor purchaser or date of manufacture or sale information." Pete Gagliardi, THE 13 CRITICAL TASKS: AN INSIDE-OUT APPROACH TO SOLVING MORE GUN CRIME 46 (3rd ed. 2019).

112. *Fact Sheet—National Tracing Center*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES (June 2019), https://www.atf.gov/file/11046/download.

patterns in a way that was previously impossible.[113] Looking at these statistics, it becomes obviously apparent how critical firearms tracing is for criminal investigations and why preserving that system is essential to both law enforcement functionality and public safety.

B. Untraceable: 3D-Printing and the Rise of the "Ghost Gun"

As demonstrated above in Part II.A, firearms tracing is an important tool for modern firearms investigations and prosecutions. However, the advent of 3D-printed firearms has created an opportunity for an unregulated and untraceable gun-manufacturing market, which provides anarchists, criminals, and anti-government end users the opportunity to completely bypass the established firearms-tracing system.[114]

The availability of so-called "ghost guns"—firearms that are functionally untraceable and often lacking a serial number—threatens to undermine federal tracing efforts. Ghost guns are:

> [W]eapons [that] can easily be made from a do-it-yourself gun kit. A variety are sold online, including kits to build handguns and rifles. The parts are packaged up and can be shipped to anyone's home. With a drill and basic skills, virtually anyone can build a gun today in the comfort of their own home legally . . . .[115]

Moreover, so long as the creator of the firearm declares an intent to make the firearm only for personal use (as opposed to sale or distribution), the

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113. *See id.* ("[Tracing] information can identify possible suspects or traffickers and link them to specific firearms found in criminal investigations. Tracing can also help detect domestic and international trafficking patterns, and identify local trends in the sources and types of crime guns."); ATF, *NIBIN Fact Sheet*, *supra* note 109 ("Before NIBIN was created, law enforcement agencies did not have access to technology that allowed them to research, identify and cross-reference firearms ballistic data in one online system. Since its launch, the technology behind NIBIN has provided participating law enforcement agencies with an automated method to share, research, identify and cross-reference firearms ballistic data across a nationwide network. ATF maintains and operates NIBIN's infrastructure at no charge to law enforcement partners.").

114. *See* Zhou, *supra* note 66 (noting the potential for untraceable guns to seep into the hands of the public).

115. Brandi Hitt, *'Ghost Guns' Investigation: Law Enforcement Seeing Unserialized Firearms on Daily Basis in SoCal*, ABC 7 (Jan. 30, 2020), https://abc7.com/ghost-guns-california-gun-laws-kits/5893043/.

creator of the ghost gun has no federal licensure requirement, further deregulating their creation.[116]

Though 3D-printing technology is not required to create a ghost gun, the ability to manufacture unregulated firearms parts in a commercial 3D-printer considerably expands the opportunity for the development and dissemination of such firearms.[117] The public safety concern over these ghost guns is justifiable: they have already been used in several mass shootings where the perpetrators would not have otherwise been able to acquire firearms.[118] Moreover, the number of ghost guns recovered by law enforcement is increasing at an alarming rate, especially in California.[119]

This Subpart considers how 3D-printing technology can be used to create ghost guns and place them in the hands of dangerous and prohibited persons. Part II.B.1 considers the legal loopholes surrounding firearm receivers and how 3D-printing technology enhances the opportunity to avoid otherwise mandatory tracing mechanisms. Part II.B.2 considers the current lack of oversight for 3D-printers themselves and explores how regulation of the technology may provide an alternative method of allowing law enforcement to trace 3D-printed firearms.

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116. *See Does an Individual Need a License to Make a Firearm for Personal Use?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/firearms/qa/does-individual-need-license-make-firearm-personal-use (last reviewed Mar. 17, 2020) ("a license is not required to make a firearm solely for personal use. However, a license is required to manufacture firearms for sale or distribution.").

117. *See* Bates, *The Saugus Shooter Used a Ghost Gun*, *supra* note 97 ("Ghost guns are self-assembled firearms that are built from unregulated kits or 3D printers.").

118. *See id*. ("Authorities don't know how Berhow was able to get the gun, as he was too young to purchase one legally."); Susan Scutti, *Ex-Convict Used an Untraceable 'Ghost Gun' in Deadly Shootout with Police in Riverside*, CNN (Aug. 15, 2019), https://www.cnn.com/2019/08/15/us/riverside-shootout-ghost-gun/index.html ("The firearm used in the deadly Riverside, California, shootout was an untraceable AR-15-type weapon assembled from separately acquired parts, commonly known as a 'ghost gun,' a law enforcement source told CNN on Thursday.").

119. *See* Bates, *The Saugus Shooter Used a Ghost Gun*, *supra* note 97 ("According to experts and law enforcement officials, ghost guns are becoming a more common—and increasingly concerning—way for criminals to bypass gun laws and get their hands on firearms."); Richard Winton, *Santa Clarita Shooting: Weapon Used in Saugus High Attack a 'Ghost Gun,' Sheriff Says*, L.A. TIMES (Nov. 21, 2019), https://www.latimes.com/california/story/2019-11-21/santa-clarita-shooting-45-caliber-gun-saugus-high-attack-a-ghost-gun-sheriff-says ("'About a third of all firearms seized in Southern California now are unserialized, and that is expected to grow,' Ginger Colbrun, a spokeswoman for the Los Angeles region's ATF office, told The Times in August."); Dakin Andone, *The Gunman in the Saugus High School Shooting Used a 'Ghost Gun,' Sheriff Says*, CNN (Nov. 21, 2019), https://www.cnn.com/2019/11/21/us/saugus-shooting-ghost-gun/index.html ("[O]ne regional ATF office in California obtained 250 ghost guns in 2017 alone . . . .").

1. The Multifaceted "Receiver" Problem

The receiver is the main firearm component at the heart of the ghost gun dilemma. This Subpart explores two facets of how the receiver creates legal loopholes permitting the creation of ghost guns. First, in the scenario of a firearm that has two receivers (such as an AR-15), it explores a definitional debate that is developing between firearm regulators and the courts that could potentially disqualify certain receivers from being considered "firearms" under federal law.[120] This ambiguity creates a loophole that potentially allows prohibited persons to obtain the components that will ultimately allow them to construct their own firearms. This issue exists whether the firearm is 3D-printed or traditional. Second, this Subpart explores the legality of "receiver blanks," or unfinished receivers, which are not defined as "firearms" under the law. As discussed earlier in this Article, the definition of a "firearm" includes "the frame or receiver of any such weapon . . . ."[121] The anatomy of a firearm is as follows:

> [While] a firearm includes the frame or receiver of any such weapon[, a] "receiver" is the basic component of a rifle to which the barrel and stock are attached. It generally houses the breechblock, bolt, hammer, and trigger. In pistols, revolvers, and break-open firearms, it is called a "frame." The "receiver" or "frame" is generally the "controlled part" of a firearm.[122]

With respect to both of the issues mentioned above, it is important to remember that so long as a component does not fully meet the definition of a "firearm" under the United States Code, there is no federal requirement to affix a serial number.[123] By collecting enough unregulated, unregistered firearm components, a person can then construct a complete, functional firearm that has no markings or engravings—in other words, a ghost gun.

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120. Seth Okin, *A New Design Feature of the AR-15 Challenges the Definition of a Firearm,* NEWS LAW (June 15, 2020), https://news.law/a-new-design-feature-of-the-ar-15-challenges-the-definition-of-a-firearm/.

121. 18 U.S.C. § 921(a)(3).

122. WILLIAM J. KROUSE, CONG. RESEARCH SERV., GUN CONTROL: 3D PRINTED AR 15 LOWER RECEIVERS 2 (2018), https://crsreports.congress.gov/product/pdf/IN/IN10957; *see also* United States v. Rowold, 429 F. Supp.3d 469, 471 (N.D. Ohio 2019) ("The 'receiver,' in lay terms, is the part of a firearm that provides housing for the components that enable a gun to shoot bullets.").

123. *See When Does a Receiver Need to Have Markings and/or Serial Numbers?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES (citing 27 C.F.R. § 478.92), https://www.atf.gov/firearms/qa/when-does-receiver-need-have-markings-andor-serial-numbers (last reviewed Feb. 6, 2020) ("Receivers that meet the definition of a 'firearm' must have markings, including a serial number.").

While a "receiver" counts as a "firearm" under federal law, the scope of what constitutes a "receiver" is legally problematic. This becomes immediately apparent when a firearm has two receivers, such as with AR-15-style firearms.[124] The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) has interpreted the lower receiver as the "controlled part" of the AR-15;[125] however, some courts have disagreed, finding the definition of a receiver under the law to be too ambiguous to strictly apply to the lower receiver.[126] As one judge wrote in his decision holding that the lower receiver of an AR-15-style firearm did not meet the federal definition of a "firearm":

> This decision should not come as a total surprise to the agency. The Internal Revenue Service, the precursor firearms regulatory agency before the ATF acquired that responsibility, had been aware of the problem that two-part receivers pose for regulators for nearly as long as the GCA has been in effect . . . .[127]

Luckily, the disparity between what the ATF classifies as a "receiver" and what some courts regard as a "receiver" is not unfixable. As the same judge noted: "the ATF retains the authority—and has the duty—to fix the regulatory scheme and to regulate AR-15 lower receivers as firearms within the GCA."[128] In other words, any adverse results from the courts under the current regulations "only prevent[] the agency from using an unreasonable and legally unacceptable application of its current regulation to accomplish that worthwhile objective."[129] Such a regulation update is not

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124. *See* KROUSE, *supra* note 122 ("Some firearms like the AR-15, however, were designed with a lower and upper receiver.").

125. *See id.* (citing *ATF Rul. 2015-1*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES (Jan. 2, 2015), https://www.atf.gov/file/11711/download) ("ATF ruled that the lower receiver is the 'controlled part' of an AR-15.").

126. *See, e.g.*, *Rowold*, 429 F. Supp.3d at 473 (discussing how a receiver qualifies as a firearm under the Gun Control Act, but finding that the AM-15 lower receiver possessed by defendant did not qualify as a firearm within the definition established under 27 C.F.R. § 478.11); *see also* Scott Glover, *He Sold Illegal AR-15s. Feds Agreed to Let Him Go Free to Avoid Hurting Gun Control Efforts*, CNN (Oct. 11, 2019), https://www.cnn.com/2019/10/11/us/ar-15-guns-law-atf-invs/index.html (discussing multiple cases where federal prosecutors abandoned a prosecution under concern that an adverse ruling could create harmful precedent where an AR-15's lower receiver does not meet the federal definition of a "firearm").

127. *Rowold*, 429 F. Supp.3d. at 476.

128. *Id.*

129. *Id.*

unprecedented—a recent example is the clarification that bump stocks fall within the federal definition of a "machinegun."[130]

While the definitional two-receiver issue relates to situations involving two complete receivers, a more complicated and pervasive threat is an increase in the availability of single, partially completed lower receivers, sometimes called "receiver blanks."[131] As defined by the ATF, receiver blanks, also known as:

> "80% receiver[s]," "80% finished," "80% complete" and "unfinished receiver[s]" are . . . item[s] that some may believe ha[ve] not yet reached a stage of manufacture that meets the definition of "firearm frame" or "receiver" according to the Gun Control Act (GCA). These are not statutory terms and ATF does not use or endorse them.[132]

In order to complete these receivers, "one must drill out certain holes and hollow (mill) out the fire control cavity."[133] While the ATF has not flatly concluded that all receiver blanks uniformly fall outside the federal definition of a firearm, it has conceded that:

> Receiver blanks that do not meet the definition of a "firearm" are not subject to regulation under the Gun Control Act (GCA). ATF has long held that items such as receiver blanks, "castings" or "machined bodies" in which the fire-control cavity area is completely solid and un-machined have not reached the "stage of manufacture" which would result in the classification of a firearm according to the GCA.[134]

While a completed receiver meeting the definition of a "firearm" under federal law requires an affixed serial number, receiver blanks fall outside

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130. *See* Bump-Stock-Type Devices, 83 Fed. Reg. 66,514, 66,514 (Dec. 26, 2018) (codified at 27 C.F.R. pts. 447, 478, 479), https://www.govinfo.gov/content/pkg/FR-2018-12-26/pdf/2018-27763.pdf (making clear that the term "machinegun" includes all bump-stock-type devices) (on file with author).

131. *What is an "80%" or "Unfinished" Receiver?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/firearms/qa/what-"80"-or-"unfinished-receiver (last reviewed Feb. 6, 2020) (explaining what is commonly known as a "receiver blank").

132. *Id.*

133. KROUSE, *supra* note 122.

134. *Are "80%" or "Unfinished" Receivers Illegal?*, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, https://www.atf.gov/firearms/qa/are-"80"-or-"unfinished"-receivers-illegal (last reviewed Sept. 14, 2020); *see also* Glover, *supra* note 126 ("Roh sent the ATF a sample of one of his unfinished lower receivers seeking a determination as to whether it constituted a firearm. He was advised that it did not.").

those requirements and can be distributed anonymously to individuals, irrespective of whether those individuals fall into a prohibited category.[135]

The danger of these receiver blanks is that converting them into complete, functional lower receivers—still lacking a serial number, no less—is simply a matter of having the correct tools or machinery to finish the job.[136] Such machinery is not cost prohibitive to acquire and has been championed by some of the most significant players in the field of 3D-printed firearms.[137] Defense Distributed, the same company that developed the 3D-printed Liberator handgun, created a $1,200 machine dubbed the "Ghost Gunner" capable of completing the lower receiver in approximately one hour.[138] Operating entirely outside established regulatory channels and without the need to submit to the government oversight levied upon traditional firearms sellers, a finalized lower receiver can then be combined with the other uncontrolled parts of a firearm. The result is the construction of a complete and functional firearm—without any mechanism for tracing and without the end user submitting to an otherwise federally mandated background check.[139]

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135. *See* Winton, *supra* note 119 ("The finished gun has no serial number and therefore avoids background checks and waiting periods.")

136. *See* Bates, *The Saugus Shooter Used a Ghost Gun*, *supra* note 97 ("'Ghost gun' sellers, however, avoid breaking federal law by selling almost completed receivers—known as '80% receivers'—to buyers who can complete the piece on their own with tools or machinery.").

137. *See* Andy Greenberg, *The $1,200 Machine That Lets Anyone Make a Metal Gun at Home*, WIRED (Oct. 1, 2014) [hereinafter Greenberg, *The $1,200 Machine*], https://www.wired.com/2014/10/cody-wilson-ghost-gunner/ ("We developed something that's very cheap, that makes traditional gunsmithing affordable. You can do it at home.").

138. *See id*. ("Defense Distributed's machine can't carve pieces as large as its competitors, but its small size makes it more rigid and precise, allowing it to cut an aluminum lower receiver from an 80 percent lower in around an hour.").

139. *See* KROUSE, *supra* note 122 ("In short, unfinished receivers and the components needed to build fully functional AR-15s and other firearms are legally available on the U.S. civilian gun market and can be purchased without a background check under federal law."); *see also* Tess Owen, *People Are Panic-Buying Untraceable 'Ghost Guns' Online in the Coronavirus Pandemic*, VICE (Mar. 27, 2020), https://www.vice.com/en_us/article/g5x9q3/people-are-panic-buying-untraceable-ghost-guns-online-in-the-coronavirus-pandemic ("Ghost guns also appeal to those who distrust government authorities. 'Anti-government sentiment is a marketing tool for those manufacturers all the time,' said Nick Suplina from Everytown for Gun Safety. 'They market the unserialized nature of the gun. They market the fact there will be no record of the sale anywhere.'"); Bates, *The Saugus Shooter Used a Ghost Gun*, *supra* note 97 ("Since ghost guns are put together outside of licensed gun manufacturing systems and don't have serial numbers, they are almost impossible for law enforcement to trace."); Holmes Lybrand, *Fact Check: Can You Make an AR-15 With a 3D Printer?*, WASH. EXAMINER (July 31, 2018), https://www.washingtonexaminer.com/weekly-standard/fact-check-can-you-make-an-ar-15-with-a-3d-printer ("If an individual makes an 80 percent lower into a completed lower receiver and does not sell or gift the component, no serial number or registration is needed (except in California). All of the other parts of the AR-15 can be purchased online without the need for a background check because they are not what the ATF considers as the firearm.").

3D-printing has also provided end users with the opportunity to simply print their own lower receiver. In 2013, Defense Distributed 3D-printed an AR-15 lower receiver that, once installed, created a firearm that successfully discharged over 660 bullets without failure.[140] The CAD file blueprint for that lower receiver was downloaded over ten thousand times.[141] While the process itself stays within the bounds of what is legal, there is obvious risk that the technology will fall into the hands of those who should not have it. In the Northern District of Texas, the Department of Justice has already federally prosecuted a person prohibited from owning a gun, who 3D-printed a lower receiver and combined it with other components to create a functional firearm.[142]

Moreover, as access to 3D-printing technology expands, the ability for criminals to construct their own ghost guns will only increase. Because these firearms are untraceable, they present a considerable danger to public safety and national security. There has already been a heavy human cost associated with effectively allowing unregulated firearms to flood the market. A tragic example came out of California in 2013:

> [P]olice believe that an AR-15 built from an 80-percent lower [receiver] was used by 23-year-old John Zawahri . . . to kill five people in a rampage through Santa Monica before he was himself killed by police. Zawahri had a history of mental illness and had previously been denied a license to buy guns[.] The semi-automatic weapon he assembled from the bootleg lower receiver and parts ordered online was also illegal in California.[143]

As demonstrated by this example, it would have otherwise been illegal for the assailant to possess the firearm.[144] His rampage was made possible by the availability of untraceable lower receivers and the ability to circumvent

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140. Cyrus Farivar, *"Download This Gun": 3D-Printed Semi-Automatic Fires Over 600 Rounds*, ARS TECHNICA (Mar. 1, 2013), https://arstechnica.com/tech-policy/2013/03/download-this-gun-3d-printed-semi-automatic-fires-over-600-rounds/.

141. *Id.*

142. *See Man Carrying Prohibited 3D-Printed Gun Found with List of Lawmakers' Addresses*, U.S. DEP'T. OF JUST. (Feb. 13, 2019), https://www.justice.gov/usao-ndtx/pr/man-carrying-prohibited-3d-printed-gun-found-list-lawmakers-addresses ("In a jailhouse phone call to a family member, Mr. McGinnis admitted he'd 'printed' part of the gun. 'I didn't buy a gun, I built the gun,' he said in the recorded phone call. 'The upper, I printed a lower, and I built it—installed the trigger and did all that stuff. I built it.'"). It should be noted that, the Defendant was charged with and convicted of unlawfully possessing both an unregistered short barrel rifle and ammunition while under an active protective order. *Id.*

143. Greenberg, *The $1,200 Machine*, *supra* note 137.

144. *Id.*

background checks by operating outside the realm of traditional regulations.[145]

Whether converting a receiver blank into a functional lower receiver or simply manufacturing a lower receiver, the availability of 3D-printing technology has provided a new avenue for the construction and proliferation of ghost guns.[146] 3D-printed firearms can be fully legalized under federal law while still implementing common-sense restrictions on the ability to create ghost guns. Not every 3D-printed firearm is, by nature or necessity, a ghost gun. Just as discussed above in relation to the two-receiver issue, federal regulations can be updated and clarified to restrict the production of receiver blanks by placing them within the definition of a "firearm" under federal law. Alternatively, the Federal Government can codify additional rules to enforce the use of serial numbers at earlier stages of firearm construction, irrespective of whether the component is 3D-printed or traditionally manufactured. Without some sort of change, the ability to 3D-print unregulated firearm components seriously threatens to undermine firearms tracing and background-check initiatives.

2. Regulating 3D-Printers as a Mechanism for Firearms Tracing

While certain types of 3D-printed goods are regulated,[147] there is currently no overarching federal regulation system for 3D-printers themselves. While it would be initially difficult to establish the framework for such a system, shifting the regulatory focus from 3D-printed firearms to the 3D-printers themselves could prove a more effective means of implementing and enforcing firearms-tracing requirements.

For a traditional firearm, its serial number is the only unique identifier that allows you to trace the firearm.[148] While serial numbers would seemingly

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145. *See* Pamela Engel, *Here's the Legal Loophole that Allowed the Santa Monica Shooter to Own a Gun,* BUS. INSIDER, https://www.businessinsider.com/legal-loophole-allowed-john-zawahri-to-obtain-a-gun-2013-6 (explaining how 23-year-old John Zawahri used an 80 percent complete receiver to create the gun he used for the tragic massacre).

146. *Id.*

147. *See, e.g.*, *FDA's Role in 3D Printing*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/medical-devices/3d-printing-medical-devices/fdas-role-3d-printing (last visited Dec. 10, 2020) (regulating 3D-printed medical devices through the FDA's Center for Devices and Radiological Health).

148. *See* BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, FIREARMS TRACING GUIDE: TRACING FIREARMS TO REDUCE VIOLENT CRIMES 9 (ATF Publication 3312.13, 2011), https://www.atf.gov/file/58631/download ("The combinations of markings on firearms are integral in uniquely identifying a single firearm from hundreds of millions of other firearms. . . . A firearm cannot be traced without a serial number.").

play an equally significant role for 3D-printed firearms, early studies about 3D-printers suggest that items produced in a 3D-printer have a separate, equally unique "fingerprint" that could take the place of a serial number.[149] In response to Defense Distributed's early legal battles with the U.S. State Department over the availability of 3D-printed firearm CAD files, researchers at the University at Buffalo began to explore whether 3D-printers have unique characteristics that allow otherwise identical 3D-printed firearms to be distinguished from each other.[150] The researchers determined that, while "3D-printers are built to be the same, . . . there are slight variations in their hardware created during the manufacturing process that lead to unique, inevitable, and unchangeable patterns in every object they print."[151]

Using a proprietary tracking system dubbed the "PrinTracker," the university researchers discovered that:

> 3D printers discharge material, usually plastic, in layers until they form an object. According to researchers, each layer has tiny wrinkles, which are supposed to be uniform. But each printer, together with its nozzle size and the type of plastic used, causes miniscule imperfections. Researchers refer to that as its "fingerprint," which can be as tiny as a half millimeter.[152]

Based on this data, the researchers created an experiment where they printed "five door keys each from 14 different commercially available 3D printers. After creating digital images of each key, they developed an algorithm to calculate variations of the imprints on the key down to the millimeter."[153] Using the algorithm and cross-referencing information about the keys in the PrinTracker, "the researchers were able to match the key to

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149. Zhengxiong Li et al., *PrinTracker: Fingerprinting 3D Printers using Commodity Scanners*, (Jan. 2018) [hereinafter Li, *PrinTracker*], https://cse.buffalo.edu/~wenyaoxu/papers/conference/xu-ccs2018.pdf; Mustafa Dogan et. al., *G-ID: Identifying 3D Prints Using Slicing Parameters*, (Apr. 2020), http://groups.csail.mit.edu/hcie/files/research-projects/G-ID/2020-CHI-GID-paper.pdf; Yuki Kubo et al., *FabAuth: Printed Objects Identification Using Resonant Properties of Their Inner Structures*, CHI EA '19: EXTENDED ABSTRACTS OF THE 2019 CHI CONFERENCE ON HUMAN FACTORS IN COMPUTING SYSTEMS, May 2019, at 1, 1.

150. *See* Owen, *Track Untraceable 3D Guns*, *supra* note 38 (explaining that each 3D-printer has unique imperfections in its hardware that create unchangeable patterns in the objects it prints); *see generally* Li, *PrinTracker*, *supra* note 149 (stating that every 3D-printer has unique characteristics based on its corresponding mechatronic structure).

151. Owen, *Track Untraceable 3D Guns*, *supra* note 38 (internal quotation marks omitted).

152. *Id.*

153. *Id.*

its printer 99.8 percent of the time."[154] The experiment was duplicated ten months later to determine if additional use of the printers affected PrinTracker's ability to match objects to their originating 3D-printer, but the results were identical.[155]

This research suggests that there is a realistic opportunity to identify the origin of a 3D-printed firearm without resorting to a serial number system. A regulatory scheme that focuses on 3D-printers could be easier to enforce than one that tries to regulate the firearms they produce. Rather than trying to quibble over legal definitions of what constitutes a "receiver" or force compliance with serial number requirements among end users that seem determined to shirk government oversight, the Federal Government could effectively regulate the source of the firearms by implementing an individual printer registration requirement for the companies that manufacture 3D-printers.

Even assuming the accuracy of these early studies, successful implementation of such a system would face a number of hurdles. First, 3D-printer manufacturing companies may push back against efforts to regulate their products, rightfully juxtaposing the illegal uses of their technology against the considerably larger number of innocuous or beneficial uses.[156] Second, however imminent the threat of unregulated 3D-printed weaponry may be, because it is not yet accepted as a nationwide public safety emergency, it may be difficult to motivate the legislature to recognize the risk and respond with a sweeping regulatory requirement on an otherwise unregulated industry. Finally, and perhaps most laboriously, the Federal Government would need to establish a database of every 3D-printer's unique signature in order to permit the tracing of 3D-printed firearms. Without this essential step, there would be no mechanism to determine the point of origin for the 3D-printed firearm or firearm component.

Despite these hurdles, lawmakers should consider all of the possible solutions at their disposal when determining how to effectively regulate 3D-printed firearms. Even if ultimately legalized, 3D-printed firearm technology presents a considerable public safety risk if it is not properly monitored and traced. An important part of that effort requires assurances that background checks are still enforced and that 3D-printed firearms have

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154. *Id.*

155. *Id.*

156. *See generally* Linda Yeuh, *The Good, the Bad and the Ugly of 3D Printing Technology*, FINANCIAL TIMES (Aug. 16, 2018), https://www.ft.com/content/782461c8-9fe1-11e8-b196-da9d6c239ca8 (explaining the current use of 3D-printing technology in manufacturing and industrial production).

at least one unique, catalogued identifier that allows them to be traced for investigative purposes.

CONCLUSION

Irrespective of whether one is for or against them, it is undeniable that the future of 3D-printed firearms is going to be tumultuous and controversial. As 3D-printed technology becomes more commonplace, it will only continue generating heated legislative and public debate over how (and from some perspectives, whether) 3D-printed firearms should be regulated.[157]

While there are some mechanisms under current federal criminal law that can help keep 3D-printed firearms out of the hands of dangerous and prohibited persons, it is apparent that the law will need to be updated to reflect some of the new challenges presented by the technology. Laws that were originally designed to counter perceived threats to public safety may need to be adapted in light of the new technology. Additionally, aggressive measures must be taken to ensure effective firearms-tracing systems, especially given how easy ghost guns are to produce using 3D-printing technology.

Though this Article has focused on the federal aspect of criminal prosecution, deterring criminals from abusing 3D-printing technology will likely require a coordinated effort between federal and state law enforcement partners.[158] As society moves into the brave new world of 3D-printed firearms, law enforcement agencies and prosecutors at both federal and state levels should coordinate to analyze all of the charging options available to them and determine whether federal or state prosecution best meets the ends of justice in light of the facts and circumstances of each individual case.

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157. *See* German Lopez, *The Battle to Stop 3D Printing Guns, Explained*, VOX (Aug. 29, 2018) https://www.vox.com/2018/7/31/17634558/3d-printed-guns-trump-cody-wilson-defcad (showing that as 3D printing becomes more relevant in society there will be a larger debate on regulations).

158. Some states have already taken additional steps to limit the production, distribution, and possession of 3D-printed firearms. For example, California has already outlawed ghost guns, indirectly but effectively barring most (if not all) 3D-printed firearms. Andy Greenberg, *This "Ghost Gun" Machine Now Makes Untraceable Metal Handguns*, WIRED (Oct. 1, 2017), https://www.wired.com/story/ghost-gun-machine-makes-untraceable-handguns/.