
PACKING PLASTIC: HOW A FEDERAL BAN ON 3D PRINTED FIREARMS
MAY PROTECT THE PUBLIC WHILE RETAINING CONSTITUTIONALITY

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I. Introduction

“No online database will replace your daily newspaper, no CD-ROM can take the place of a competent teacher and no computer network will change the way the government works” exclaimed Clifford Stoll in a 1995 editorial belittling a newfangled device called the internet.¹ Today, more than twenty years removed from Stoll’s ill-fated prophecy where the internet permeates seemingly every aspect of daily life, it is easy to scoff at the idea of the internet’s subjugation, labelling the oracle hailing from that seemingly primitive age of 1995 as ill-informed or even crazy.² Another

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¹ See Martin Snapp, *How a Berkeley Eccentric Beat the Russians—and Then Made Useless, Wondrous Objects*, CAL ALUMNI ASSOCIATION (Spring 2016), archived at <https://perma.cc/SH75-JGVZ> (introducing Clifford Stoll as a former astronomer turned computer systems manager who became disenchanted with the “false religion” of the internet); Clifford Stoll, *Why The Web Won’t Be Nirvana*, NEWSWEEK (Feb. 26, 1995), archived at <https://perma.cc/WC5L-KFT5> (categorizing the internet as a fad that will not result in major changes to education, business, or recreation).

² See Jamie Condliffe, *The Average American Spends 24 Hours a Week Online*, MIT TECHNOLOGY REVIEW (Jan. 23, 2018), archived at <https://perma.cc/7UK6-HWLQ> (showcasing the vast use of the internet in America); Chris Dunne, *Amazon Has 1,029,528 New Sellers This Year (Plus Other Stats)*, FEEDBACKEXPRESS (Feb. 29, 2020), archived at <https://perma.cc/P48U-ZSJZ> (stating that Amazon, a solely online retailer, amassed over 232 billion dollars in sales in 2018); Carol Harris, A

frontier technological development susceptible to doubt, reminiscent of that which fueled the critique of the internet in its infancy, is the proliferation of 3D printing technology.³ This innovation may sound alien, and indeed evokes imagery of the Star Trek replicator, which was able to create a seemingly unlimited myriad of tangible objects from digital patterns for the officers of Starfleet Command.⁴

Look at the Federal Government's Aging Computer Systems, U.S. GOVERNMENT ACCOUNTABILITY OFFICE WATCHBLOG (Aug. 6, 2019), *archived at* <https://perma.cc/EWH2-969K> (noting that the federal government is planning to spend \$90 billion on information technology in 2019, including modernization of computer systems); Kate Rooney, *Online Shopping Overtakes a Major Part of Retail for the First Time Ever*, CNBC (Apr. 3, 2019), *archived at* <https://perma.cc/URQ2-WCN9> (explaining that revenue from general merchandise sales conducted online have surpassed their traditional brick and mortar equivalents for the first time ever). *See also* Taylor Soper, *Valve reveals Steam's monthly active user count and game sales by region*, GEEKWIRE (Aug. 3, 2017), *archived at* <https://perma.cc/9FJ4-TEKE> (outlining that the number of monthly players using Valve's video game distribution platform, Steam, exceeds 65 million). Steam is a personal computer game distribution platform that allows users to download a plethora of computer games from the internet. *Id.* *See also* Amy Watson, *Netflix – Statistics & Facts*, STATISTA (Feb. 6, 2020), *archived at* <https://perma.cc/6XA9-BXJV> (reporting that since its inception as a video on demand service in 2007, Netflix's revenue has grown from 1.36 to 20.15 billion dollars per year).

³ *See* Nick Allen, *Why 3D Printing is Overhyped (I Should Know, I Do It For a Living)*, GIZMODO (May 17, 2013), *archived at* <https://perma.cc/5EFX-7UTY> (outlining 3D printing as overrated in the aspects of people's expectations of the technology, the strength of the printed product, cost of printers and materials, and the ultimate functionality of the product); Martina Märki & Nicole Kasielke, *Innovation is a balancing act*, ETH ZÜRICH (Jan. 12, 2017), *archived at* <https://perma.cc/R7FD-F6EM> (downplaying affordable 3D printers as an underwhelming technology, currently only fit for children's playthings); Christina Warren, *3D Printers are Never Going to be a Thing*, MASHABLE (July 23, 2016), *archived at* <https://perma.cc/H2NP-9A6F> (explaining many practical issues with 3D printing that will hinder its prominence including the technical expertise needed to work such printers); *compare* Frank Wammes, *3D printing will disrupt more than just your supply chain*, CIO (Mar. 15, 2017), *archived at* <https://perma.cc/7AVK-72VV> (claiming that 3D printing technology will revolutionarily change the relationship between consumer and producer); *with* Mika Yeap, *The Future of 3D Printing: A Glimpse at the Next Generation*, ALL3DP (Mar. 1, 2019), *archived at* <https://perma.cc/6C6Y-DNQ7> (comparing the development of 3D printing to the rise of the internet in terms of societal impact).

⁴ *See* Peter Jensen-Haxel, *3D Printers, Obsolete Firearm Supply Controls, and the Right to Build Self-Defense Weapons Under Heller*, 42 GOLDEN GATE U. L. REV. 447, 447 (2012) (claiming that 3D printing or "additive manufacturing" may seem

However, this technology is not confined to the realm of fantasy interplanetary exploration and conquest, but may be purchased by citizens of earth for as little as three hundred dollars—or less than the price of a model U.S.S. Enterprise.⁵

3D printing is heralded for its ability to produce complex parts with less human supervision, less waste, and more efficiency than traditional manufacturing.⁶ While currently not far removed

otherworldly and too good to be true); Kyle Langvardt, *The Replicator and the First Amendment*, 25 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 59, 61 (2014) (suggesting the *Star Trek* replicator's abilities are analogous to those of 3D printing technology); *Replicator*, FANDOM (Oct. 17, 2019), archived at <https://perma.cc/T6BX-9WYP> (explaining that the replicator or “molecular synthesizer” was able to produce food, clothing, and even fully functional mechanical parts from digital patterns). See also *Replicator*, STAR TREK (Feb. 29, 2020), archived at <https://perma.cc/285V-SF4E> (explaining the replicator as a device that is able to “dematerialize matter and reconstitute it in another form”). Although the Replicator was mainly used to generate foodstuffs for the crews of intergalactic spaceships, it bears a resemblance to 3D printing as the food menu was only bound by the device's programming, and not available materials. *Id.* See also *Starfleet*, FANDOM (Oct. 17, 2019), archived at <https://perma.cc/2P5S-MDB8> (explaining that Starfleet was organized by the United Federation of Planets to explore and defend against threats, while using the most advanced science and technology).

⁵ See TJ McCue, *Significant 3D Printing Forecast Surges To \$35.6 Billion*, FORBES (Mar. 27, 2019), archived at <https://perma.cc/Z83P-FSM9> (concluding that the expected revenue in the 3D printing industry for 2020 is 15.8 billion dollars, and will climb to 35.6 billion in 2024); see TJ McCue, *Wohlers Report 2018: 3D Printer Industry Tops \$7 Billion*, FORBES (June 4, 2018), archived at <https://perma.cc/D8Z5-WMJA> (explaining the number of “desktop” 3D printers sold for home use has totaled 528,952 units in the span from 2016 to 2018). See also *U.S.S. Enterprise Star Trek Model*, AMAZON (Oct. 18, 2019), archived at <https://perma.cc/T3TH-7XCD> (showing results for models of the *Star Trek* flagship *U.S.S. Enterprise*, with many iterations costing upwards of 300 dollars); *3D printer*, AMAZON (Oct. 18, 2019), archived at <https://perma.cc/K99S-48XL> (setting forth 3D printers for purchase, many of which are under 300 dollars); *3D printing*, WALMART (Feb. 29, 2020), archived at <https://perma.cc/EKC2-6GJG> (providing inexpensive 3D printers for purchase).

⁶ See Jessica Berkowitz, *Computer-Aided Destruction: Regulating 3D-Printed Firearms Without Infringing on Individual Liberties*, 33 BERKELEY TECH. L.J. 53, 58 (2018) (stating that the process of 3D printing is likely cheaper than traditional manufacturing methods and allows for a far quicker production to market time). Further, 3D printing allows for the creation of highly complex designs that are able to be customized for any use, unlike traditional manufacturing processes. *Id.* See

from this technology's inception, the ability to create afforded by this innovation has shown that 3D printing technology has the potential to revolutionize personal manufacturing on a scale reminiscent of the internet's monumental impact on the spread of information.⁷ Nevertheless, the efficiency of this technology coupled with its widespread use makes it the perfect tool for those engaged in illegal activity and criminal enterprise.⁸ The regulation of 3D printed

also Caitlyn R. McCutcheon, *Deeper Than a Paper Cut: Is It Possible to Regulate Three-Dimensionally Printed Weapons or Will Federal Gun Laws be Obsolete Before the Ink has Dried?*, 14 U. ILL. J.L. TECH. & POL'Y 219, 222 (2014) (proffering that 3D printing is lauded for its efficiency, lack of human supervision, little waste produced, and may diminish the need for factories in order to produce complex parts); Allie Nawrat, *3D printing in the medical field: four major applications revolutionizing the industry*, VERDICT MEDICAL DEVICES (Aug. 7, 2018), archived at <https://perma.cc/Z3S3-VCRB> (claiming that one of the benefits 3D printing provides over traditional manufacturing is its ability to create cheaper products, especially in the realm of medical prosthetics).

⁷ See Berkowitz, *supra* note 6, at 55 (quoting President Barack Obama in highlighting the monumental impact of 3D printing in his 2013 State of the Union Address in which he states this technology has “the potential to revolutionize the way we make almost everything”); Jensen-Haxel, *supra* note 4, at 448 (discussing the radical nature of 3D printing that may enable this technology to “bring manufacturing back to America, create more complex and efficient designs, revolutionize distribution, and break down economies of scale”); Alexander J. Mendoza, *Legal and Social Implications of the 3D Printing Revolution*, CMC SENIOR THESES 1, 8 (2015) (comparing the development of 3D printing as an analogue to the development of the printing press). As the printing press led to such an explosion of the ability to share information, the 3D printing movement has the potential for the same magnitude of “exponential growth.” *Id.* See also 2019 *3D Printed Gun Digest: All You Need to Know*, ALL3DP (Oct. 14, 2019), archived at <https://perma.cc/L69X-C3ZV> (quoting Senator Chuck Schumer on his view that “3D printers are a miraculous technology that has the potential to revolutionize manufacturing”).

⁸ See Ruby Chase & Gerald LaPorte, *The Next Generation of Crime Tools and Challenges: 3D Printing*, NATIONAL INSTITUTE OF JUSTICE (Dec. 3, 2017), archived at <https://perma.cc/VK4L-HCN3> (evaluating why criminals are enticed to use 3D printing technology including: the customizable nature of the objects created; the low cost of these objects compared to acquiring them by traditional means; and the difficulty of detecting possession of these objects by law enforcement); John Hornick, *3D Printing New Kinds of Crime*, POLICE CHIEF MAGAZINE (Oct. 14, 2019), archived at <https://perma.cc/6G8K-GW8A> (outlining how criminals have used 3D printing technology to create firearms, keys and access cards, drugs, counterfeit money and even bombs); Ariel Watson, *How 3D Printing is Exploited by Criminals and Utilized by Law Enforcement*, CELLEBRITE

firearms is essential in impeding one of the largest aspects of this illegal activity.⁹

3D printed objects are not able to be formed from thin air of course, but require Computer Aided Design (“CAD”) files to instruct the printer how to proceed.¹⁰ Where anyone can convert a digital file into a functional firearm, or specialized firearm parts, the right to bear arms and freedom of speech enabling these individuals must be balanced against public safety and security threats.¹¹

(July 9, 2019), *archived at* <https://perma.cc/JGF6-DDDR> (stating that criminals utilize the “unprecedented manufacturing autonomy” afforded by 3D printing to bypass regulation and governmental oversight—especially in the realm of 3D printed firearms).

⁹ See Berkowitz, *supra* note 6, at 56 (claiming that the regulation of 3D printed guns is at the forefront of concern in stemming 3D printing illegal activity); Christine Fisher, *The legal battle over 3D-printed guns is far from over*, ENGADGET (Nov. 13, 2019), *archived at* <https://perma.cc/LB2W-AVXR> (articulating the State Department’s view that 3D printed firearms are an imminent threat requiring regulation). *Contra* Avi Reichental, *Why The Debate Around 3D-Printed Guns Needs To Change*, FORBES (Sept. 18, 2018), *archived at* <https://perma.cc/EYK8-TK9D> (stating that guns begotten from traditional means are easier to acquire than through 3D printing, and pose far greater risk).

¹⁰ See Berkowitz, *supra* note 6, at 57 (stating that computer aided design or CAD files are the “digital blueprints” for the object desired to be printed); Gary N. Stewart, *A Three-Dimensional World in a Two-Dimensional Patent System: 3D Printing and the Importance of Claiming CAD Files*, 118 W. VA. L. REV. 477, 480 (2015) (explaining that CAD files are the “digital blueprints that instruct 3D printers how to construct a tangible embodiment of the coded object” that they contain); Nathan Reitinger, *CAD’s Parallel to Technical Drawings: Copyright in the Fabricated World*, 97 J. PAT. & TRADEMARK OFF. SOC’Y 111, 118 (2015) (stating that the CAD file in the process of 3D printing instructs the printer on how to layer the desired material in order to accomplish the creation of the completed design).

¹¹ See 3D Printed Gun Safety Act of 2019, H.R. 3265, 116th Cong. § 2(10) (2019) (reiterating the massive threat of 3D printed guns to public safety and national security); 3D Printed Gun Safety Act of 2018, H.R. 6649, 115th Cong. § 2(10) (2018) (characterizing the “proliferation of 3D printed firearms” as a threat to the “entire Federal firearms regulatory scheme”, which endangers “public safety and national security”); Berkowitz, *supra* note 6, at 53 (stating that anyone with internet access and a 3D printer has the ability to produce 3D printed firearms and firearm parts). This ability renders the protections afforded by current firearm regulations useless. *Id.* See also Kyle Mizokami, *Those Controversial 3D Printed Guns, Explained*, POPULAR MECHANICS (July 31, 2018), *archived at* <https://perma.cc/CFF8-HUJL> (professing that the hosting of CAD files for guns

Contemporaneously, as with many new technological advancements, the muscles of the American regulatory scheme are underdeveloped in the fight against 3D printed firearms.¹² However, the government does not possess an unbridled ability to legislate in this area, as any regulation regarding the 3D printing of firearms implicates important constitutional safeguards namely the First Amendment's protection of free speech and the Second Amendment's guarantee of the right to

online allows anyone worldwide to download and print them); Jon Stokes, *3D printed guns are now legal...What's next?*, TECHCRUNCH (July 14, 2018), archived at <https://perma.cc/4NA5-5G9M> (stating that in addition to a 3D printer, all anyone needs is internet access and raw materials to make a 3D printed gun). See also *Skinner v. Ry. Lab. Exec. Ass'n*, 489 U.S. 602, 615 (1989) (holding the interest in public safety of travelling on safe railways a sufficient threat to mandate drug testing for railway employees). *Skinner* showcases the willingness of the Supreme Court to determine a safety issue as important enough to impose regulation where absent the safety issue regulation would be impermissible. *Id.* Thus, in crafting legislation, the gravity of a public safety issue must be considered in order to determine whether fundamental liberties have been impermissibly infringed. *Id.*

¹² See Berkowitz, *supra* note 6, at 53 (claiming that “very few laws . . . regulate the possession or manufacture of 3D printed firearms”); Katie Curtis, *A Wiki Weapon Solution: Firearm Regulation for the Management of 3D Printing in the American Household*, 41 RUTGERS COMPUTER & TECH. L.J. 74, 75–76 (2015) (explaining that the ability of 3D printed firearms to remain undetectable, coupled with the ability of anyone to obtain them without a background check, creates problems for lawmakers); Langvardt, *supra* note 4, at 66 (explaining that no “serious” attempts have been made to regulate the posting of CAD files online which contain the blueprints used to create 3D printed guns). See also *Copyright Timeline: A History of Copyright in the United States*, ASSOCIATION OF RESEARCH LIBRARIES (Jan. 31, 2020), archived at <https://perma.cc/9YR3-NU78> (explaining how at the time of the creation of the printing press there were no laws pertaining to the ownership of ideas, and delineating how the invention of the press led to the gradual formulation of copyright law in England). After the initial shock of such a new invention and institution of initial laws addressing the ramifications of such, the body of copyright law has been periodically reformed to keep up with the ever-increasing flow of technological advance. *Id.* This gradual advancement of the law in the face of new technology is applicable to all novel technological advances. *Id.* See also Vivek Wadhwa, *Laws and Ethics Can't Keep Pace with Technology*, MIT TECHNOLOGY REVIEW (Apr. 15, 2014), archived at <https://perma.cc/ZT75-3D42> (highlighting that the dilemma of implementing laws which regulate new technology is not limited to 3D printing, but occurs with all new technological innovations). According to Preeta Bansal, former White House General Counsel, legal frameworks lag behind technological advances because our laws are designed to model our ethics, and we as a society are slow to determine the permissible ethical bounds of new technology. *Id.*

bear arms.¹³ Consequentially, these fundamental rights impinge upon the government's regulatory powers, imposing indelible lines over which the government's reach may not extend.¹⁴ Thus, striking a balance between the liberties of those who post and download

¹³ See U.S. CONST. amend. I (stating that the government shall make no law abridging free speech of citizens); U.S. CONST. amend. II (guaranteeing the right to bear arms); *District of Columbia v. Heller*, 554 U.S. 570, 628–29 (2008) (impliedly asserting that a prohibition on handguns in any jurisdiction would fail even the most stringent standard of judicial review, heeding to the broad rights enshrined in the Second Amendment). See also *Reed v. Town of Gilbert*, 576 U.S. 155 S. Ct. 2218, 2224 (2015) (imposing the most demanding standard of judicial review when laws infringe upon an individual's free speech, strict scrutiny). In order to overcome this most demanding standard of review, the government must show that the regulation or law at issue serves a compelling governmental interest and is narrowly tailored to achieve this goal. *Id.* See also Josh Blackman, *The 1st Amendment, 2nd Amendment, and 3D Printed Guns*, 81 TENN. L. REV. 479, 481–82 (2014) (stating the Second Amendment's guarantee on the right of the people to keep, bear, acquire and manufacture arms); Adam Thierer & Adam Marcus, *Guns, Limbs, and Toys: What Future for 3D Printing?*, 17 MINN. J.L. SCI. & TECH. 805, 826–27 (2016) (arguing that the First Amendment protects the posting of 3D blueprints online). See also Jasper Tran, *The Law and 3D Printing*, 31 J. MARSHALL J. COMPUT. & INFO. L. 505, 509 (2015) (arguing that 3D printing objects falls under the "press clause" of the First Amendment). The author argues that "freedom of the press" applies not only to the press as an industry, but also printing technologies. *Id.*

¹⁴ See U.S. CONST. amend. I (stating that the government shall not infringe upon the exchange of ideas); U.S. CONST. amend. II (guaranteeing a seemingly plenary right to bear arms). See also *McDonald v. City of Chicago*, 561 U.S. 742, 768–69 (2010) (decreeing that the drafters of the Bill of Rights held the right to bear arms as "fundamental to the newly formed system of government"). Under Supreme Court precedent, the fundamental nature of the right to bear arms has withstood scrutiny. *Id.* at 784–85. Further, the determination that the right to bear arms is fundamental is binding on the states and greatly limits their ability to regulate in this area. *Id.* at 785. See also *Heller*, 554 U.S. 570 at 635 (holding that a ban on handguns within the District of Columbia was overly broad and infringed upon the petitioner's fundamental rights under the constitution). The Court reasoned that a ban on a whole class of weapons—handguns—overstepped the regulatory authority of the government and intruded upon the petitioner's Second Amendment rights. *Id.* at 628–29. Further, the requirement that a handgun must be disassembled when it is at home takes from the petitioner the right to self-defense. *Id.* at 630. This right of self-defense is inherent in the Second Amendment and cannot be diminished in this fashion by the District of Columbia. *Id.* But see *United States v. Alvarez*, 567 U.S. 709, 717–18 (2012) (emphasizing that restrictions on certain kinds of speech is permissible); *United States v. Miller*, 307 U.S. 174, 178 (1939) (holding that certain limitations on the right to bear arms are permissible).

blueprints of 3D printed firearms against the public's safety and security is paramount to achieving effective legislation in this emerging area of law.¹⁵ In fact, this Note proposes the adoption of the 3D Printed Gun Safety Act of 2019, which prohibits the distribution of CAD files able to automatically produce a firearm, or complete a firearm from an unfinished frame or receiver, in order to maintain public safety and national security.¹⁶

II. History

A. *The Process of 3D Printing Firearms*

“Similar to the way the World Wide Web democratized news, education, and entertainment, 3D printing has tremendous potential to democratize the manufacturing of certain goods.”¹⁷ 3D printing

¹⁵ See Berkowitz, *supra* note 6, at 84 (arguing that a balance between constitutional rights and the risks posed to the public is essential when crafting effective regulations in the sphere of 3D printed guns); Langvardt, *supra* note 4, at 70 (stating that courts must weigh the government's purpose of regulation against any burden on speech in First Amendment cases concerning the posting of CAD files); Katie Fleschner McMullen, *Worlds Collide When 3D Printers Reach the Public: Modeling a Digital Gun Control Law After the Digital Millennium Copyright Act*, MICH. ST. L. REV. 187, 214 (2014) (claiming that over restrictive regulations on the posting of CAD files “hamper[s] the development of technology” while too little regulation may “put the entire nation's security at risk”); Michael L. Smith, *The Second Amendment Implications of Regulating 3D Printed Firearms*, 31 SYRACUSE SCI. & TECH. L. REP. 60, 97 (2014–15) (reiterating that in order to effectively regulate 3D printed firearms, the government must strike a balance between “security, technological development, and constitutionality”).

¹⁶ See 3D Printed Gun Safety Act of 2019, H.R. 3265, 116th Cong. (2019) (containing extensive provisions regulating the distribution, download, and use of 3D printed firearm CAD files, banning those that can automatically instruct a printer to produce or complete a firearm); 3D Printed Gun Safety Act of 2019, 116 S. 1831, 116th Cong. (2019) (containing an identical Bill as introduced in the Senate); *Schenck v. Pro-Choice Network of W. N.Y.*, 519 U.S. 357, 369 (1997) (holding that the rights imbued to individuals under the Constitution may be trumped in certain situations by public safety and national security).

¹⁷ See Yeap, *supra* note 3 (stating that as 3D printing improves more and more objects will be able to be produced by individuals in their home, effectively democratizing many forms of production). See also ERIC VON HIPPEL, *DEMOCRATIZING INNOVATION 1* (2005) (explaining that the democratization of information means that users and producers alike are able to increasingly develop

has thus ushered in a “maker movement” where people can construct goods to meet their exact specifications.¹⁸ In addition to the relatively uncontroversial printing of medical devices, toys, and car parts, this technology also allows the printing of firearms and firearm parts from the privacy of one’s home.¹⁹

The 3D printer works by using a digital code that is able to make a tangible and solid three-dimensional object through the employment of a layering process, known as additive manufacturing.²⁰ The printer “resembles a sort of robotic hot glue

their own products). The major benefit to the democratization of innovation is that users are able to make exactly what they desire without the need to rely on the traditional manufacturers of these products. *Id.* Further, the sharing of information inherent in the process of this democratization allows all involved to learn from the innovation of one another. *Id.*

¹⁸ See Berkowitz, *supra* note 6, at 78 (highlighting the ability of 3D printed firearms to be made in the privacy of one’s own home). See also Deven R. Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. 1691, 1695 (2014) (showing how the rise in 3D printing allows a shift from a society where large corporations dominate the manufacture of goods to putting the power to make in the hands of any who wish to purchase a 3D printer). Thus, 3D printing technology may very well usher in a paradigm shift, “reinvigorat[ing] production by small entrepreneurs.” *Id.* 3D printing technology, promising this paradigm shift, is part of a bigger “maker movement”, permitting individuals to create tailor made goods. *Id.*

¹⁹ See Berkowitz, *supra* note 6, at 55 (setting forth that surgeons and those in the medical field are able to 3D print body replicas in order to practice surgery prior to its performance); *Calibrated in Detroit*, ENVISIONTEC (Oct. 19, 2019), archived at <https://perma.cc/T8TP-9WFX> (showcasing the ability of complex 3D printers to produce superior automotive parts); Allie Nawrat, *3D printing in the medical field: four major applications revolutionizing the industry*, VERDICT MEDICAL DEVICES (Aug. 7, 2018), archived at <https://perma.cc/3PJU-767T> (listing uses of 3D printing in the medical field including the bioprinting of tissues and organoids, surgery preparation, surgical instruments and prosthetics); Michelle J., *Top 10 toys to make for your 3D printed Christmas*, 3DNATIVES (Dec. 14, 2018), archived at <https://perma.cc/47D4-EGWP> (listing toys that are able to be 3D printed including train models, the characters of *Toy Story*, nerf guns, and fidget spinners); Jeremy Straub, *3D-printed guns may be more dangerous to their users than targets*, THE CONVERSATION (Jan. 7, 2019), archived at <https://perma.cc/5KL8-B2GQ> (highlighting the many uses of 3D printed parts including: airplanes, “medical devices, patient-specific surgical instruments, customized time-release drugs, prosthetics and hearing aids”).

²⁰ See Berkowitz, *supra* note 6, at 56 (explaining that the layering process used by 3D printers is also known as additive manufacturing); Blackman, *supra* note 13, at

gun” guided by a laser, emitting material in consecutive two-dimensional layers on a platform until the intended object is complete.²¹ The digital code used to create the finished product including dimensions, materials, and printing processes is contained in the blueprint, or CAD file.²² This digital code giving life to CAD

484 (explaining how 3D objects that are created through the additive manufacturing process are controlled by CAD files and derivatively the source code which compiles them); Curtis, *supra* note 12, at 76 (explaining that additive manufacturing involves the layering of plastic filament to create a 3D object). *See also* Desai & Magliocca, *supra* note 18, at 1692 (reinforcing the ability of additive manufacturing to create tangible objects). *See also* McCutcheon, *supra* note 6, at 222 (stating that a 3D printer works through a layering process called additive manufacturing that requires little human supervision). Various kinds of additive manufacturing exist, each with their own benefits and challenges. *Id.* *See also* Thierer & Marcus, *supra* note 13, at 807 (labelling additive manufacturing as able to “move us away from the Henry Ford era mass production line, and . . . bring us to a new reality of customizable, one-off production”). *See also* MELISSA KOCH, 3D PRINTING: THE REVOLUTION IN PERSONALIZED MANUFACTURING 18–19 (2018) (analogizing the process of 3D printing to the process of baking a pizza). In this analogy, the digital model of the object to be created from the printer, or source code, is the recipe. *Id.* The conversion of that recipe to a file format able to be 3D printed, effectively acts as cooking instructions. *Id.* These “cooking instructions” able to be used by a 3D printer are CAD files, which act as the design plans for the object to be created. *Id.* These CAD files or “cooking instructions” then program a completed product made out of a certain defined material to emerge from the “oven” or 3D printer. *Id.*

²¹ *See* Berkowitz, *supra* note 6, at 56 (explaining that 3D printers “resemble a sort of robotic hot glue gun” that emits filament into the desired object’s shape, eventually creating the desired object). *See also* Desai & Magliocca, *supra* note 18, at 1695 (stating how a laser on a 3D printer is used to harden the material emitted into the final printed object). Also explained is how the printer emits the raw material onto a platform which is raised to set positions in order to construct the object. *Id.*

²² *See* Julia Cosans, *Between Firearm Regulation and Information Censorship: Analyzing First Amendment Concerns Facing the World’s First 3-D Printed Plastic Gun*, 22 AM. U.J. GENDER SOC. POL’Y & L. 915, 919 (2014) (explaining that 3D printing, otherwise known as additive manufacturing, produces three-dimensional objects from a digital file known as a computer aided design file, or CAD file). This type of file outlines the “dimensions and details of a desired object.” *Id.* Blackman, *supra* note 13, at 485 (describing that CAD files contain the source code for the object to be printed). The CAD file uses this code to “define shapes, sizes, and positions of three-dimensional objects.” *Id.* at 484. *See also* Barton Lee, *Where Gutenberg Meets Guns: The Liberator, 3D-Printed Weapons, and the First Amendment*, 92 N.C.L. REV. 1393, 1395 (2014) (stating that

files is known as source code, and may be created from scratch using computer aided design software, produced from 3D modelling programs, 3D scanners, or even from uploaded photos of a given design.²³ Additionally, a pre-designed and further customizable CAD file may be downloaded from the internet without any technical expertise.²⁴

CAD files function more like blueprints for the object to be created rather than general computer code); McMullen, *supra* note 15, at 192 (addressing the function of CAD files, which is to take the design made by an individual on CAD software and transform it into a three dimensional design through interaction with the printer).

²³ See McMullen, *supra* note 15, at 192 (stating that CAD files can be created by the author from scratch, or through a scan of an object onto a computer). See also Desai & Magliocca, *supra* note 18, at 1696 (explaining that pictures of a 3D object, 3D scans of an object, and 3D modelling programs may all be used to create CAD files). The production of a CAD file from scratch is not as daunting as one may expect, as 3D modeling software allows people to draw what they want and transform that into a CAD file. *Id.* Further, 3D modelling programs are not always required in order to produce CAD files, as 3D scanners may employ cameras and lasers to capture the dimensions of an object and turn those dimensions into a CAD file. *Id.* In addition, software exists that allows people to upload photos of an object from different angles in order to create a CAD file. *Id.*

²⁴ See Berkowitz, *supra* note 6, at 57 (stating that there are resources online which allow individuals to bypass creating their own CAD files and download CAD files that someone else has already created); Desai & Magliocca *supra* note 18, at 1696 (claiming that producing a design from scratch in CAD format is not hard); Lauren Fram, *10 Open-Source and Free CAD Software You Can Download Right Now*, G2 (May 18, 2018), archived at <https://perma.cc/4HVD-HL8F> (listing open source CAD file creation programs including “FreeCAD”, “QCAD”, “Onshape”, “3D Slash”, and “TinkerCAD”); *GrabCAD.com*, GRABCAD (Oct. 19, 2019), archived at <https://perma.cc/UWY4-T5R4> (showcasing a community where individuals can share CAD designs and further their skills in the craft of 3D printing); *Thingiverse.com*, THINGIVERSE (Oct. 19, 2019), archived at <https://perma.cc/DZV3-CZVE> (showing the seemingly infinite number of objects able to be 3D printed simply by downloading a pre-made CAD file on the website, requiring no technical expertise).

B. *Printing the Problem: The First 3D Printed Firearm*

The catalysts of the 3D printed firearm movement are Cody Wilson and Ben Denio who founded Defense Distributed in 2012.²⁵ Defense Distributed is a nonprofit which strongly advocates “anti-monopolistic digital publishing” by “writing and releasing software to aid in the disintermediation of state governments and large, collusive corporations.”²⁶ The organization hosts 3D printable gun blueprints to further this goal of reducing governmental and corporate meddling in the affairs of citizens.²⁷

²⁵ See Lee, *supra* note 22, at 1398 (positing that Ben Denio and Cody Wilson founded Defense Distributed in 2012); Carolyn Wilke, *3-D printed ‘ghost guns’ pose new challenges for crime-scene investigators*, SCIENCE NEWS (Sept. 24, 2019) (recognizing that Defense Distributed made the “Liberator” in 2013, the world’s first gun made with all printable parts except for the firing pin); Marrian Zhou, *3D-printed gun controversy: Everything you need to know*, CNET (Sept. 25, 2018), archived at <https://perma.cc/A4KH-GCFA> (quoting Cody Wilson, who claims that “the state should be as weak as possible relative to the individual,” displaying his penchant for libertarian thought). Cody Wilson learned about 3D printing while attending University of Texas Law School. *Id.* Inspired by Wikileaks founder Julian Assange, Cody Wilson wanted to create an open source platform that people could use to share CAD files and have discourse on the topic of firearms. *Id.*

²⁶ See Anne Lewis, *The Legality of 3D Printing: How Technology is Moving Faster than the Law*, 17 TUL. J. TECH. & INTELL. PROP. 303, 305 (2014) (positing Wilson’s goal of “writing and releasing software to aid in the disintermediation of state governments and large, collusive corporations”); Smith, *supra* note 15, at 66 (announcing Defense Distributed as a non-profit); *Defense Distributed*, DEFENSE DISTRIBUTED (Mar. 1, 2020), archived at <https://perma.cc/5NJZ-TJ4Z> (stating the purpose of Defense Distributed as “Private Defense Tech Development in the Public Interest”). Further, the non-profit’s website claims that Defense Distributed was the first company to provide private defense contractor service to the general public. *Defense Distributed, supra.*

²⁷ See Berkowitz, *supra* note 6, at 60 (highlighting Defense Distributed’s goal of “reducing government and corporate interference with weapons manufacturing”). In order to achieve this goal, Wilson has made it clear he wishes to provide widespread and unfettered access to firearms. *Id.* The CAD files are hosted by the group, an “anti-monopolist digital publishing corporation”, to bolster their mission of “defending the human and civil right to keep and bear arms . . . [and] to collaboratively produce, publish, and distribute to the public information and knowledge related to the digital manufacture of arms.” *Id.* See also Michael Siegel, *When It Comes to Firearms, 3D-Printed Guns Aren’t the Biggest Threat*, B.U. SCHOOL OF PUBLIC HEALTH (Aug. 9, 2018), archived at <https://perma.cc/9JFH-TLKM> (highlighting that Defense Distributed posts CAD files online).

In 2013, Defense Distributed made the first fully functional 3D printed gun, christened the “Liberator.”²⁸ The Liberator is made out of all plastic parts except for a removable metal firing pin, available at any hardware store.²⁹ Although bullets fired from the Liberator exit the firearm at half the speed of a bullet from a conventional gun of the same caliber, they cause a similar amount of damage.³⁰ Subsequently, Wilson posted the design blueprints for the

²⁸ See Berkowitz, *supra* note 6, at 60–61 (stating that Defense Distributed and Cody Wilson developed the first fully 3D printed firearm, the Liberator, in 2013). It only took Wilson four hours to print the fifteen parts necessary for completion of the firearm. *Id.* at 61. In order to create the Liberator, Wilson leased a 3D printer from Stratasys, a 3D printing company. *Id.* Upon learning of the purpose for which Wilson was using their printer, Stratasys seized the device, weary of violating federal firearm laws. *Id.* See also Lee, *supra* note 22, at 1393 (describing the Defense Distributed “Liberator” as the first fully functional 3D printed firearm). See also Zhou, *supra* note 25 (showing that the developers of the Liberator pistol were Cody Wilson and Ben Denio, the founders of Defense Distributed). The duo first conceived of the idea for the development of the Liberator in 2012. Zhou, *supra* note 25. Wilson fulfilled his dream of creating the first fully 3D printed firearm in 2013, when the Liberator was brought to life. *Id.* See also Curtis, *supra* note 12, at 78 (describing Cody Wilson’s naming of the Liberator as influenced by the crudely made World War II weapon that was airdropped by the U.S. military to French Resistance fighters). See also Olivia B. Waxman, *The Gun that Sparked the 3D-Printed Weapons Debate has an Unexpected WWII History*, TIME (Aug. 1, 2018), archived at <https://perma.cc/5SK6-579R> (explaining that the name and design of the Defense Distributed pistol developed by Wilson was inspired by a World War II pistol of the same name). The World War II iteration of the firearm was five inches long, weighed one pound, and fired a single .45 caliber round at an effective range of about twenty-five feet. *Id.* The Liberator was especially designed for clandestine operation. *Id.* Never meant to be in frontline use, but instead dropped to civilian resistance fighters, the expectation existed that resistance fighters would kill their more aptly armed enemies from close range, in an effort to take their superior weapons. *Id.*

²⁹ See Berkowitz, *supra* note 6, at 61 (recognizing that the metal component of the Liberator, a firing pin, may be purchased at a hardware store); Blackman, *supra* note 13, at 485 (stating the Liberator is made out of all plastic polymer, except for the metal firing pin).

³⁰ See Wilke, *supra* note 25 (stating that Swiss researchers assembled six Liberator pistols and fired them in a test at which the speed of the projectile fired from the Liberator exited the chamber of the weapon “between 138 and 172 meters per second”). Such speed is about half that of a bullet exiting a comparable traditionally manufactured firearm. *Id.* However, upon firing bullets from the Liberator into ballistics soap, they penetrated twenty-one centimeters, “suggesting

Liberator on the Defense Distributed website where they were then downloaded over 100,000 times in the span of a few days.³¹ Nevertheless, once the State Department caught wind of the Liberator's proliferation online, a letter was sent to Wilson on May 8, 2013, stating that the Liberator's CAD files were regulated under the International Traffic in Arms Regulations ("ITAR").³² Upon receipt of the letter, Wilson and Defense Distributed removed the CAD files

that the gun could cause damage similar to a typical handgun of the same caliber." *Id.* Ballistics soap is used by researchers to deduce the damage a bullet could cause in human flesh. *Id.*

³¹ See *2019 3D Printed Gun Digest: All You Need to Know*, *supra* note 7 (stating that after the Liberator CAD files were posted online, they were downloaded over 100,000 times in the matter of a few days); Wilke, *supra* note 25 (stating that Liberator CAD files were initially downloaded over 100,000 times shortly after their release online).

³² See 22 U.S.C.S. § 2778 (LEXIS 2020) (setting forth the provisions of the Arms Export Control Act ("AECA")); Kathryn Toomey, *Understanding ITAR: The International Traffic in Arms Regulations*, SHIPPING SOLUTIONS (July 29, 2019), archived at <https://perma.cc/9G3A-WXFQ> (stating that the AECA gives power to the "President to designate items that shall be considered as defense articles and services and these items constitute the United States Munitions List"). Further, the "ITAR implements the AECA and is managed by the Directorate of Defense Trade Control ("DDTC") under the Department of State." *Id.* See 22 C.F.R. § 120 (Lexis 2020) (outlining the provisions of the International Traffic and Arms Regulations ("ITAR")). This set of federal export laws prohibits the sending of munitions outside the United States and to foreign nationals. *Id.* See also Lee, *supra* note 22, at 1393 (addressing the letter sent by the State Department to Defense Distributed mandating that the Liberator CAD designs be taken down). See also Thierer & Marcus, *supra* note 13, at 834 (stating that Defense Distributed violated the ITAR requirements that certain arms not be distributed under the AECA). The AECA sets forth that the President shall be in control of the importation and exportation of "defense articles." *Id.* at 834. See Berkowitz, *supra* note 6, at 67 (stating that the President has delegated the authority of the AECA to the State Department, particularly the Secretary of State). See also Philip Bump, *State Department Asks Defense Distributed to Take Down Its 3D-Printed Gun Plans*, THE ATLANTIC (May 9, 2013), archived at <https://perma.cc/4KW8-RM4Y> (stating that the State Department's letter named the worldly and pervasive nature of the internet as a reason for labelling the Liberator CAD files as exports under the ITAR). The State Department previously restricted the Apple Macintosh G4 computer for export, determining the remarkable speed of the processor could be used for military applications. *Id.* This shows the liberalness of the State Department in determining an object as a "defense article." *Id.*

from their website to comply with the State Department's order.³³ However, though the files were removed from the site, they still remained in the possession of those who had already downloaded them.³⁴

After removing the files, Defense Distributed subsequently sued the State Department to challenge the inclusion of Liberator CAD files under the purview of the ITAR.³⁵ In *Defense Distributed v. United States Dep't of State*,³⁶ the plaintiffs asserted that the imposition of the ITAR reflected an impermissible prior restraint on speech, while simultaneously infringing upon Second Amendment rights.³⁷ Pending resolution of their claim, Defense Distributed sought a preliminary injunction against the State Department, the

³³ See Berkowitz, *supra* note 6, at 62 (explaining that Defense Distributed removed the Liberator blueprints after receiving the State Department letter mandating their removal); Danton Bryans, *Unlocked and Loaded: Government Censorship of 3D-Printed Firearms and a Proposal for More Reasonable Regulation of 3D-Printed Goods*, 90 IND. L. J. 901, 908–09 (2015) (stating that upon receiving the letter, Defense Distributed immediately and voluntarily took the Liberator CAD files down from the internet).

³⁴ See Berkowitz, *supra* note 6, at 62 (stating that the Liberator CAD files still remained on various websites and were able to be shared online despite the removal of the files from the Defense Distributed website).

³⁵ See *Defense Distributed v. United States Dep't of State*, 838 F.3d 451, 453 (5th Cir. 2016) (stating the nature of Defense Distributed's suit against the Department of State). Defense Distributed argued that the inclusion of the Liberator files on the Arms Export Control Act Munitions List, preventing their posting online constituted an impermissible prior restraint on the freedom of speech guaranteed by the First Amendment. *Id.* at 456. Defense Distributed also alleged Second and Fifth Amendment violations. *Id.* Ultimately, the United States Court of Appeals for the Fifth Circuit held that the restrictions imposed on Defense Distributed were permissible viewed under the light of harm to the nation and the public interest. *Id.* at 460. See also Lee, *supra* note 22, at 1399 (explaining that ITAR and AECA “impose certain requirements and restrictions on the transfer of, and access to, controlled defense articles and related technical data,” all compiled in the United States Munitions List).

³⁶ See *Defense Distributed v. United States Dep't of State*, 121 F. Supp. 3d 680 (W.D. Tex. 2015); *Defense Distributed v. United States Dep't of State*, 838 F.3d 451 (5th Cir. 2016).

³⁷ See *Defense Distributed*, 121 F. Supp. 3d at 692 (highlighting Defense Distributed's claim that the ITAR prepublication requirement is an “impermissible prior restraint” on free speech). In addition to claiming injury under the First Amendment, Defense Distributed also alleged that their Second Amendment rights were violated by the State Department's enforcement. *Id.* at 688.

effect of which would allow the Liberator CAD files to remain online while the litigation was ongoing.³⁸ The District Court for the Western District of Texas denied the request, stating that national security trumped the non-profit's rights under the Constitution.³⁹

Following the denial of their injunction, Defense Distributed appealed to the Fifth Circuit Court of Appeals.⁴⁰ The appeals court declined to interpret whether CAD files are protected speech under the First Amendment, and recognized that a legal loophole exists where "anyone may make his or her own unserialized, untraceable" firearm parts for personal use, though they are illegal to transfer.⁴¹

³⁸ See *id.* (outlining the injunction sought against the State Department by Defense Distributed to remove the prepublication requirement on their CAD files in order to remedy their alleged prior restraint on speech). The injunction sought would enjoin "the enforcement of any prepublication approval requirement against unclassified information under the ITAR." *Id.* Any prior restraint on speech must overcome a "heavy presumption" against constitutional validity. *Id.* at 692. However, this strong presumption against constitutionality may be overcome by the importance of protecting national security through preventing foreign entities from accessing weapons data. *Id.* at 695–96.

³⁹ See *Defense Distributed*, 121 F. Supp. 3d at 695–96 (holding that national security concerns outweigh Defense Distributed's First Amendment protections as technical data concerning weapons poses great risk when distributed to foreign nationals). Further, "export" is defined under the ITAR and AECA as including "[d]isclosing (including oral or visual disclosure) or transferring technical data to a foreign person, whether in the United States or abroad." *Id.* at 701. The District Court of Western Texas reasoned that the posting of firearm CAD files on the internet meets this definition of export, adding further credence to the contention that they are properly regulated under export control laws. *Id.*

⁴⁰ See *Defense Distributed v. United States Dep't of State*, 838 F.3d 451, 456 (5th Cir. 2016) (showing that Defense Distributed filed the appeal after the denial of their injunction at the Federal District Court of Western Texas).

⁴¹ See *id.* at 461 (stating that whether CAD files are protected speech is a novel legal question that the court declines to engage). The court also acknowledged the existence of a legal loophole that allows anyone to manufacture his or her own firearm parts, although it is illegal to transfer these partial or complete weapons. *Id.* at 454. See also *Bernstein v. United States Dep't of State*, 922 F. Supp. 1426, 1436 (N.D. Cal. 1996) (holding computer source code to be speech). Source code is the code written by humans that when interacting with computer programs is turned into object code. *Id.* at 1436. Object code is written in binary language capable of being translated by computers. *Id.* at 1429. The United States District Court of the Northern District of California held both source and object code to be sufficiently imbued with elements of speech to consider them protected under the First Amendment. *Id.* at 1436. See also *United States v. Elcom Ltd.*, 203 F. Supp.

Ultimately, the appeals court concluded that the district court did not abuse its discretion in denying Defense Distributed's injunction as "the national defense and national security interest" may be permanently harmed by the uploading of additional CAD files.⁴²

C. *The Current State of Firearm Laws and Regulations*

The 3D printing of firearms complicates the already myriad range of gun laws in the United States which stem from state, local, and federal regulators.⁴³ These laws must respect the Second Amendment, which guarantees the right to bear arms to private persons.⁴⁴ The federal laws in existence allow the majority of U.S. citizens to acquire firearms legally.⁴⁵ Citizens are allowed to manufacture their own firearms under the current federal laws;

2d 1111, 1126 (N.D. Cal. 2001) (recognizing qualities of speech necessary for First Amendment protection in computer source code). Although code may not be readily understood by the majority of the general public, that does not preclude it from First Amendment protection. *Id.* at 1126. *See also* Universal City Studios v. Corley, 273 F.3d 429, 449 (2d Cir. 2001) (entitling computer code to First Amendment protection).

⁴² *See* Defense Distributed, 838 F.3d at 459 (holding that the trial court ruled correctly in denying Defense Distributed's injunction in the name of national security and the public interest).

⁴³ *See* Berkowitz, *supra* note 6, at 64 (recognizing that federal, state, and local agencies have attempted to regulate the prevalence of illegal firearms); Curtis, *supra* note 12, at 81 (acknowledging that the regulation of firearms occurs on both federal and state levels and includes a wide range of regulations); McCutcheon, *supra* note 6, at 228 (noting that the proliferation of 3D printed firearms complicate firearm regulatory schemes).

⁴⁴ *See* U.S. CONST. amend. II (ensuring the right to bear arms will not be infringed); McCutcheon, *supra* note 6, at 228 (positing that all firearm regulations must respect the rights granted in the Second Amendment). *See also* U.S. CONST. art. VI, cl. 2 (promulgating the Supremacy Clause, which stipulates that federal laws made in pursuance to the Constitution are binding not only on the federal government, but on the states as well).

⁴⁵ *See* McCutcheon, *supra* note 6, at 228 (stating that the Second Amendment allows all "non-prohibited persons" to obtain firearms). *See also* National Firearms Act of 1934, 26 U.S.C. § 5844 (containing the enumeration of certain prohibited classes, including a prohibition on ownership of weapons for individuals indicted for or convicted of a crime of violence); Gun Control Act of 1968, Pub. L. No. 90-618, § 101, 82 Stat. 1213 (enumerating additional classes prohibited from owning firearms by the Gun Control Act of 1968, including those suffering from mental incompetency, those addicted to drugs, and minors).

however, due to the expertise required and rarity of the occurrence, laws are not tailored to this practice.⁴⁶ Current federal firearm legislation includes the National Firearms Act of 1934, the Gun Control Act of 1968, the Arms Export Control Act of 1976, the Undetectable Firearms Act of 1988 and the Brady Handgun Violence Prevention Act of 1993.⁴⁷ The federal agency primarily responsible for enforcing the federal firearms laws is the Bureau of Alcohol, Tobacco, Firearms and Explosives (“ATF”).⁴⁸

⁴⁶ See *Does an individual need a license to make a firearm for personal use?*, ATF (Nov. 6, 2017), archived at <https://perma.cc/58MC-FXDC> (citing 18 U.S.C. § 922(o), (p) and (r); 26 U.S.C. § 5822; 27 CFR §§ 478.39, 479.62 and 479.105) (stating that an individual may build a firearm for personal use with no license). However, individuals and organizations must procure a license in order to manufacture firearms for sale or distribution. *Id.* Further, there are restrictions on the kind of firearms able to be assembled without a license. *Id.* An individual is only allowed to assemble sporting semi-automatic rifles or shotguns without a license. *Id.* Further, the firearms manufactured by individuals without licenses must not be composed of ten or more imported parts, and must be detectable by metal detectors or X-ray machines. *Id.* See also Berkowitz, *supra* note 6, at 65 (observing that the “current firearm legislation is tailored towards acquiring and possessing commercially-made weapons”). The laws are tailored to the acquiring and possession of commercially made weapons because prior to the advent of 3D printed firearms individuals did not have such an accessibility to the production of homemade weapons. *Id.*

⁴⁷ See Berkowitz, *supra* note 6, at 65–66 (listing federal firearm regulations including the National Firearms Act of 1934, the Gun Control Act of 1968, the Arms Export Control Act of 1976, the Undetectable Firearms Act of 1988 and the Brady Handgun Violence Prevention Act of 1993); McCutcheon, *supra* note 6, at 229 (listing the pertinent federal firearm regulations).

⁴⁸ See Berkowitz, *supra* note 6, at 65 (stating that the Bureau of Alcohol, Tobacco, and Firearms (“ATF”) is the Federal Agency which is responsible for enforcement of federal firearm laws); *About ATF*, ATF (Mar. 1, 2020), archived at <https://perma.cc/3X6M-QSNC> (proffering the ATF’s mission which states “ATF protects the public from crimes involving firearms, explosives, arson, and the diversion of alcohol and tobacco products; regulates lawful commerce in firearms and explosives; and provides worldwide support to law enforcement, public safety, and industry partners.”).

1. National Firearms Act of 1934

The National Firearms Act (“NFA”) was originally enacted in 1934.⁴⁹ The goal of the NFA was to quell the occurrence of crime proliferated by “gangsters.”⁵⁰ The Act imposed a tax on weapons including automatic firearms, short barreled shotguns, and silencers.⁵¹ The Act also banned the sale of firearms to those “under

⁴⁹ See National Firearms Act of 1934, 26 U.S.C. § 5844 (containing the provisions of the National Firearms Act of 1934); *National Firearms Act*, ATF (Feb. 14, 2019), archived at <https://perma.cc/F9NM-X4YX> (giving the date of enactment of the National Firearms Act).

⁵⁰ See John Hill, *North to the Future of the Right to Bear Arms: Analyzing the Alaska Firearms Freedom Act and Applying Firearm Localism to Alaska*, 33 ALASKA L. REV. 125, 129 (2016) (stating that the NFA was passed amid “growing concerns about “gangland crimes””). See also National Firearms Act of 1934, *supra* note 45 (stating an additional purpose for the passage of the National Firearms Act, revenue collection). The Act succeeded in collecting revenue as any transfer of an NFA firearm mandated a two-hundred-dollar tax payment. *Id.* The two-hundred-dollar tax payment was also considered a barrier of entry to acquiring an NFA firearm. *Id.* However, the tax payment on NFA firearms has not increased since 1934, rendering the two-hundred-dollar payment not as severe of a financial barrier of entry today. *Id.* See also *Which firearms are regulated under the NFA?*, ATF (July 18, 2016), archived at <https://perma.cc/UL3N-3AY6> (citing 26 U.S.C. § 5845; 27 CFR § 479.11) (listing the firearm attributes which qualify a firearm as a NFA firearm). The attributes which render a firearm under the Act’s purview are: (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)

Id.

⁵¹ See *Fully-Automatic Firearms*, NRA-ILA (July 29, 1999), archived at <https://perma.cc/NRK2-3J96> (showcasing the tax levied on the possession of automatic weapons under the National Firearms Act); Jeff Johnston, *NFA Rules on Shotguns: Everything You Need to Know*, NRA SHOOTING ILLUSTRATED (July 10, 2019), archived at <https://perma.cc/5XUA-F52U> (professing that short barreled shotguns, those with a barrel length of less than 18 inches, require a NFA tax prior to taking possession of the firearm); *Which firearms are regulated under the NFA?*, *supra* note 50 (explaining that all firearm silencers fall under the NFA, and thus require the payment of a tax prior to possession).

indictment or . . . convicted of a crime of violence,” and mandated dealers of firearms working in interstate commerce to “be federally licensed and record all of their transactions.”⁵² Any firearm that falls under the NFA “requires a tax payment, registration, and approval from the ATF.”⁵³

2. The Gun Control Act of 1968

The purpose of the Gun Control Act of 1968 (“GCA”) is to limit crime by restricting public access to firearms.⁵⁴ The Act “prohibits the importation of firearms, frames, receivers, barrels, and ammunition into the United States.”⁵⁵ The Act was passed after the assassinations of Martin Luther King, Jr. and Robert Kennedy, and banned the “sales of guns to minors, drug addicts and mental

⁵² See Hill, *supra* note 50, at 129 (providing examples of weapons taxed under the NFA and the requirement that those involved in violent crime cannot purchase firearms). Today, as the National Firearms Act of 1934 has been modified by the Gun Control Act of 1968, many iterations of firearms, including machine guns and sawed-off shotguns are effectively banned, and require a special permit in order to legally possess. *Id.* at 129–30. Also, a firearm dealer must be federally licensed, and record all of their transactions. *Id.* at 129. See also Curtis, *supra* note 12, at 84–85 (further listing firearm items subject to tax under the NFA).

⁵³ See McCutcheon, *supra* note 6, at 229 (positing that the manufacture of a NFA firearm “requires a tax payment, registration, and approval from the ATF.”).

⁵⁴ See Gun Control Act of 1968, *supra* note 45 (containing the provisions of the Gun Control Act of 1968). See also Laurel Loomis, *A New Look at Gun Control Legislation: Responding To A Culture Of Violence*, 27 BEVERLY HILLS B. ASS’N J. 160, 162 (1993) (highlighting the purpose of the Gun Control Act of 1968). The Act’s purpose was chiefly to “limit crime by restricting public access to firearms.” *Id.* Congress’s stated purpose underscores their belief that the ease with which firearms can be purchased is a factor multiplying high crime rates. *Id.*

⁵⁵ See McCutcheon, *supra* note 6, at 229 (listing the items prohibited from importation under the GCA). The items prohibited from importation include any completed firearm as well as firearm parts such as barrels and receivers. *Id.* The purpose of the GCA was to “keep firearms out of the hands of those not legally entitled to possess them because of age, criminal background, or incompetency, and to assist law enforcement authorities in the states and their subdivisions in combating the increasing prevalence of crime in the United States.” *Id.* at 230.

incompetents.”⁵⁶ In addition to creating these prohibited classes, the GCA mandated that firearms bear a unique serial number.⁵⁷

3. The Arms Export Control Act of 1976 and the International Traffic in Arms Regulations

The Arms Export Control Act (“AECA”) sets forth that the President shall be in control of the importation and exportation of “defense articles.”⁵⁸ The President has the sole power to determine what constitutes a “defense article” under the Act.⁵⁹ Upon this determination, the article is added to the United States Munitions List (“USML”), which lists these items according to their attributes.⁶⁰ The AECA considers “technical data recorded or stored in any physical form, models, mockups, or other items that reveal technical data directly relating to items designated in [the USML] as defense

⁵⁶ See *Gun Control Act*, ATF (July 2, 2019), archived at <https://perma.cc/6ZZG-CUDS> (announcing that the GCA was passed after the assassinations of Martin Luther King, Jr. and Robert Kennedy). See also Waxman, *supra* note 28 (stating certain classes of people to which firearm sales are restricted). The Gun Control Act is the first piece of American Legislation that grapples with the idea that “mental incompetents” and convicted criminals should not be able to own firearms. *Id.* In addition to broadening the list of individuals who cannot own firearms, the GCA bolstered the licensing and record-keeping requirements for gun dealers. *Id.* ⁵⁷ See Berkowitz, *supra* note 6, at 70 (stating an additional requirement of the GCA is that firearms bear a unique serial number).

⁵⁸ See 22 U.S.C.S. § 2778 (2020) (setting forth the provisions of the Arms Export Control Act). The act posits the authority of the President to control the movement of defense articles both in and out of the nation. *Id.* at (a). See also Lee, *supra* note 22, at 1399 (stating that the President shall be in control of the importation and exportation of “defense articles”).

⁵⁹ See Lee, *supra* note 22, at 1399 (stating that the President has the sole authority to determine what constitutes a defense article under the AECA).

⁶⁰ See Berkowitz, *supra* note 6, at 67 (delineating the power of the President to determine what constitutes a “defense article” under the AECA). Once a determination has been made, the item is then placed into the United States Munitions List, which does not name specific instruments, but instead lists them according to their specific attributes. *Id.* According to the ITAR, the Munitions List regards “technical data recorded or stored in any physical form, models, mockups or other items that reveal technical data directly relating to items designated in [the Munitions List]” as defense articles. *Id.* Thus, “blueprints, drawings, and instructions” may be considered defense articles subject to inclusion in the Munitions List. *Id.*

articles.”⁶¹ The President has delegated the authority of the AECA to the State Department, and specifically the Secretary of State under the ITAR.⁶² As a result of this delegation, the Directorate of Defense Trade Controls (“DDTC”) must authorize the exportation of data related to a “defense article” on the USML.⁶³ Under the AECA, what constitutes an “export” and is thus subject to prior authorization by the DDTC is very broad, including: shipments of physical defense articles into or out of the United States, releasing technical data to a foreign national, and performing a device service for the benefit of a foreign nation.⁶⁴

⁶¹ See Berkowitz, *supra* note 6, at 67 (stressing that digital blueprints, copies, models and other technical data may also be included in the Munitions List if they qualify as “defense articles”).

⁶² See 22 C.F.R. § 120 (2020) (outlining the provisions of the International Traffic in Arms Regulation (“ITAR”)); Berkowitz, *supra* note 6, at 67 (explaining the delegation to the Department of State of the United States Munitions List by the President pursuant to ITAR).

⁶³ See Berkowitz, *supra* note 6, at 67–68 (explaining the authority of the Directorate of Defense Trade Controls (“DDTC”) in authorizing the export of technical data relating to defense articles). In order for any entity to export data encompassed in the Munitions List, they must first receive approval from the DDTC. *supra*. See also *Directorate of Defense Trade Controls*, U.S. DEP’T OF STATE (Mar. 1, 2020), archived at <https://perma.cc/TMA7-4YDD> (outlining the purpose and mission of the DDTC division of the Department of State). The Directorate of Defense Trade Controls, a part of the Bureau of Political-Military Affairs of the Department of State “implements the ITAR including the United States Munitions List.” *Id.*

⁶⁴ See 22 C.F.R. § 120.17(a) (2020) (listing what constitutes an “export” under the United States Munitions List and is thus under the control of the DDTC). The United States Munitions List currently defines “export” as:

- (1) An actual shipment or transmission out of the United States, including the sending or taking of a defense article out of the United States in any manner;
- (2) Releasing or otherwise transferring technical data to a foreign person in the United States (a “deemed export”);
- (3) Transferring registration, control, or ownership of any aircraft, vessel, or satellite subject to the ITAR by a U.S. person to a foreign person;
- (4) Releasing or otherwise transferring a defense article to an embassy or to any of its agencies or subdivisions, such as a diplomatic mission or consulate, in the United States;
- (5) Performing a defense service on behalf of, or for the benefit of, a foreign person, whether in the United States or abroad

Id.

4. The Undetectable Firearms Act of 1988

The Undetectable Firearms Act of 1988 (“UFA”) prohibits the importation, sale, shipping, delivery, possession, transfer, or receipt of any firearm that is undetectable by metal detectors or X-ray machines.⁶⁵ The Act achieves these objectives through mandating that firearms contain at least 3.7 ounces of metal.⁶⁶ The UFA was passed following the movie *Die Hard* which created panic that Glock pistols were made of plastic and were therefore undetectable by metal detectors and X-rays.⁶⁷ However, the panic was undeserved as the pistol was in fact detectable by these machines.⁶⁸

5. Brady Handgun Violence Prevention Act of 1993

The Brady Handgun Violence Prevention Act of 1993 (“Brady Act”) amended the Gun Control Act of 1968.⁶⁹ Among the provisions of the Brady Act is the requirement that a background check be conducted on a person purchasing a firearm unless an

⁶⁵ See Undetectable Firearms Act of 1988, 18 U.S.C.A. § 922(p)(1) (2019) (providing the provisions of the act). The Act lists the requirements of firearms to be detectable by security measures employed where screenings occur including X-ray machines and metal detectors. *Id.* Namely, the Act prohibits the possession, transfer, sale, receipt, and shipping of firearms not able to be detected by metal detectors or X-ray machines. 18 USCA § 992(p)(1)(b).

⁶⁶ See Berkowitz, *supra* note 6, at 66 (highlighting the requirement that firearms contain 3.7 ounces of metal to comply with the Undetectable Firearms Act).

⁶⁷ See Blackman, *supra* note 13, at 509 (describing the panic caused by the movie *Die Hard* and the particular Glock pistols which caused the public to believe they were undetectable). However, “Glocks have never been made out of plastic.” *Id.* Therefore, the panic surrounding the Glock brand pistols was unfounded, as they were in fact detectable by X-ray machines and metal detectors. *Id.*

⁶⁸ See Blackman, *supra* note 13, at 509 (stating that the frenzy surrounding the danger of Glock pistols was unfounded as the firearms were in fact detectable).

⁶⁹ See Brady Handgun Violence Prevention Act, H.R. Res. 1025, 103rd Cong. §§ 921–924 (1993) (enacted) (containing the provisions of the Brady Act). See also *Brady Law*, ATF (July 2, 2019), archived at <https://perma.cc/38TS-L5JH> (stating that the Brady Act was enacted in 1993 in order to amend the Gun Control Act of 1968). The law imposes various provisions adding to the Gun Control Act including an interim waiting period before obtaining a handgun. *Id.*

exception applies.⁷⁰ Interim provisions included in the Act, which remained in effect until the National Instant Criminal Background Check System (“NICS”) became operational, included a five day waiting period on the purchase of handguns.⁷¹ Local law enforcement was notified of pending handgun transactions in order to conduct background checks on the purchasers.⁷² The NICS created by the Brady Act is used by federally licensed firearms dealers to ascertain if a potential firearm purchaser is of a prohibited class.⁷³

⁷⁰ See *Brady Law*, *supra* note 69 (showcasing the background check provision of the Act). See also *Loomis*, *supra* note 54, at 167 (stating that President Clinton signed the Bill into law on November 30, 1993, “after a lengthy and difficult battle for its passage.”).

⁷¹ See *Loomis*, *supra* note 54, at 167 (describing the provision of the waiting period for handgun purchases). Exceptions to the waiting period are afforded to special permit holders. *Id.* See also *Brady Law*, *supra* note 69 (explaining the temporary nature of the waiting period).

⁷² See *Loomis*, *supra* note 54, at 167 (explaining that the requirement of the waiting period allows time for background checks from law enforcement in order to ensure the characteristics of handgun purchasers).

⁷³ See *Berkowitz*, *supra* note 6, at 71 (explaining that firearm dealers use the NICS to screen potential firearm purchasers to see if they are prohibited from owning a firearm); *National Instant Criminal Background Check System (NICS)*, FBI (Mar. 1, 2020), archived at <https://perma.cc/MR5L-3W9Y> (describing the NICS process).

When a person tries to buy a firearm, the seller, known as a Federal Firearms Licensee (FFL), contacts NICS electronically or by phone. The prospective buyer fills out the ATF form, and the FFL relays that information to the NICS. The NICS staff performs a background check on the buyer. That background check verifies the buyer does not have a criminal record or isn’t otherwise ineligible to purchase or own a firearm. Since launching in 1998, more than 300 million checks have been done, leading to more than 1.5 million denials.

Id. See also Christopher Ingraham, *There are more guns than people in the United States, according to a new study of global firearm ownership*, THE WASHINGTON POST (June 19, 2018), archived at <https://perma.cc/G832-QDAK> (recognizing the implicit administrative burdens of maintaining such a system in a nation with a civilian gun ownership of over 393 million firearms). Thus, the effectiveness of such a massive system may be imperiled by the sheer number of firearms and firearm owners. *Id.*

D. *3D Printed Gun Safety Acts*

In 2018, the House and Senate of the United States introduced identical bills, both entitled the 3D Printed Gun Safety Act of 2018.⁷⁴ These bills were introduced to ban the publishing of CAD files or other digital blueprints that can automatically program a 3D printer to “produce or complete” a firearm.⁷⁵ The bills state that the “proliferation of 3D printed firearms threatens to undermine the entire federal firearms regulatory scheme and endanger public safety and national security.”⁷⁶ However, the bills failed upon introduction in both Houses.⁷⁷ Unperturbed, members of the Senate and House

⁷⁴ See 3D Printed Gun Safety Act of 2018, H.R. 6649, 115th Cong. (2018) (showing the House’s proposed bill to amend chapter 44 of title 18, United States Code “to prohibit the publication of 3D printer plans for the printing of firearms, and for other purposes”); 3D Printed Gun Safety Act of 2018, S. 3304, 115th Cong. (2018) (showing the identical corresponding Bill that was introduced in the Senate). Both the House and Senate introduced Bills are exactly congruent in their language. *Id.*

⁷⁵ See 3D Printed Gun Safety Act of 2018, H.R. 6649, 115th Cong. (2018) (proposing a total ban on the distribution of CAD files that contain code which could automatically program a 3D printer to produce or complete production of a firearm); 3D Printed Gun Safety Act of 2018, S. 3304, 115th Cong. (2018) (showing the corresponding identical Bill that was introduced in the Senate).

⁷⁶ See 3D Printed Gun Safety Act of 2018, H.R. 6649, 115th Cong. (2018) (stating the fear of the sponsors of the Bill in regards to the growing threat of 3D printed firearms); 3D Printed Gun Safety Act of 2018, S. 3304, 115th Cong. (2018) (parroting the same concern in the Senate version of the Bill). See also Peter H. Diamandis, *5 Big Breakthroughs to Anticipate in 3D Printing*, SINGULARITYHUB (Apr. 8, 2019), archived at <https://perma.cc/7LAM-ED9C> (claiming that within the next four years 3D printing technology speeds will increase, 3D printed homes will emerge, edible food will be printed, and more efficient metal printers will become more prolific). The advancement of 3D printing technology necessarily mandates that the quality and number of 3D printed firearms will increase, adding additional credence to the fear of the legislators. *Id.* See also Alexandra Filindra, *3D printed guns could be a very real threat in the future*, THE HILL (Jan. 31, 2020), archived at <https://perma.cc/2BJ7-AEGH> (describing that the proliferation of 3D blueprints online, in addition to the availability of 3D printers will lead to increased experimentation with the technology, and consequently improvements to the printing process). These improvements will only make the practice of 3D printing more prolific in the future. *Id.*

⁷⁷ See 3D Printed Gun Safety Act of 2018, H.R. 6649, 115th Cong. (2018) (stating that the Bill failed when it was introduced); 3D Printed Gun Safety Act of 2018, S.

introduced identical bills the following year both entitled the 3D Printed Gun Safety Act of 2019, and are still awaiting passage in both Houses.⁷⁸

Of course, the Act must stand up to constitutional scrutiny, most notably the protections afforded under the First and Second Amendments.⁷⁹ The text of the First Amendment seemingly only applies to speech that is written or spoken, in other words—pure speech.⁸⁰ Nevertheless, the Supreme Court has interpreted the First Amendment as applying to other forms of expression including video games, prescription drug formulas, encryption code and campaign donations.⁸¹ As CAD files represent a different form of communication than pure speech, a reviewing court must determine that this medium contains sufficient elements of communicative nature, both intended by the speaker and understandable by the

3304, 115th Cong. (2018) (providing the same result for the identical bill introduced in the Senate).

⁷⁸ See 3D Printed Gun Safety Act of 2019, H.R. 3265, 116th Cong. (2019) (introducing the same legislation that previously failed in 2018). The legislation is currently awaiting passage. *Id.* See also 3D Printed Gun Safety Act of 2019, S. 1831, 116th Cong. (2019) (showcasing the identical Bill introduced in the Senate. As its House counterpart, the Senate bill is still awaiting passage).

⁷⁹ See U.S. CONST. amend. I (stating the government of the United States shall make no law to abridge free speech); U.S. CONST. amend. II (guaranteeing the right to bear arms shall not be infringed); *Defense Distributed v. United States Dep’t of State*, 838 F.3d 451, 453 (5th Cir. 2016) (recognizing that computer code, and therefore CAD files may be considered speech); Berkowitz, *supra* note 6, at 64 (claiming that any regulation on 3D printed firearms will implicate not only the First Amendment, but the Second Amendment as well).

⁸⁰ See Berkowitz, *supra* note 6, at 72 (explaining that on its face the First Amendment only applies to “pure speech” which is the written or spoken word).

⁸¹ See Langvardt, *supra* note 4, at 67–68 (positing that First Amendment protection extends to prescription drug data, campaign donations and encryption code). See also *Brown v. Entm’t Merchants Ass’n*, 564 U.S. 786, 790 (2011) (holding that video games qualify for First Amendment protection). In the same way that “protected books, plays, and movies that preceded them, video games communicate ideas--and even social messages--through many familiar literary devices (such as characters, dialogue, plot, and music) and through features distinctive to the medium (such as the player’s interaction with the virtual world.”). *Id.* Even though printing the guns is conduct, the government is regulating expression which is “sufficiently imbued with elements of communication to fall within the scope of the First . . . Amendment.”). *Id.* See also Blackman, *supra* note 13, at 498 (stating that communication in electronic format is considered protected speech under the First Amendment).

listener, in order to fall under the purview of the First Amendment.⁸² This test articulated by the Supreme Court in *Spence v. Washington*⁸³ is used to determine whether expressive conduct, like the formulation of digital files to convey a particular idea, is protected under the First Amendment's guarantee of free speech.⁸⁴

In addition, any law that infringes upon an individual's ability to access firearms must respect the grant of the right to bear arms imbued in the Second Amendment.⁸⁵ As the Supreme Court highlights in *District of Columbia v. Heller*,⁸⁶ the right to bear arms is an individual right, not necessarily connected to service in a well-

⁸² See U.S. CONST. amend. I (stating the government of the United States shall make no law to abridge free speech). Therefore, all those within the United States are afforded the freedom of speech under the First Amendment. *Id.* *Spence v. Wash.*, 418 U.S. 405, 417 (Rehnquist, J., Dissenting) (1974) (outlining the definition used by the Supreme Court in determining whether an activity contains sufficient elements of speech which qualifies as speech for the purposes of First Amendment protection). The Spence court recognized the qualities of speech inherent in distorting the image of the American Flag. *Id.* at 418. The Court reasoned that a speaker's intention of conveying a particular message, coupled with surrounding circumstances that would result in a likelihood of the expression to be understood qualifies as speech for First Amendment protection. *Id.* See also Berkowitz, *supra* note 6, at 73 (claiming that the expressive nature of the websites that host CAD files coupled with their demand, may delineate the CAD files as protected speech under the First Amendment). See also *Anderson v. City of Hermosa Beach*, 621 F.3d 1051, 1068 (9th Cir. 2010) (holding that tattooing is fully protected by the First Amendment as speech due to the process's expressive nature).

⁸³ See *Spence*, 418 U.S. at 422–23.

⁸⁴ See *id.* at 409 (promulgating the Court's analysis to be used in order to determine whether an activity is considered speech for the purposes of First Amendment protection). The most important elements are that the speaker wishes to communicate an idea and that the idea is able to be understood by observers. *Id.*

⁸⁵ See U.S. CONST. amend. II (guaranteeing that the right to bear arms shall not be infringed); Berkowitz, *supra* note 6, at 54 (claiming that any regulation on 3D printed firearms will implicate not only the First Amendment, but the Second Amendment as well). See also *Bridgeville Rifle & Pistol Club, Ltd. v. Small*, 176 A.3d 632, 653 (Del. 2017) (holding that laws which infringe upon the right to bear arms must comply with the grant afforded to the people in the Second Amendment of the Constitution).

⁸⁶ See generally *District of Columbia v. Heller*, 554 U.S. 570, 626 (2008) (highlighting that the rights secured by the Second Amendment are not unlimited).

regulated militia.⁸⁷ Although the Court in *Heller* determined a ban on the possession of handguns in Washington D.C. constitutionally impermissible, they recognized that the right to bear arms is subject to reasonable restrictions.⁸⁸ Harkening on the reasoning in *United States v. Miller*,⁸⁹ where possession of a short barreled shotgun was not protected under the Second Amendment due to its failure to be “in common use at the time,” the *Heller* court agreed that Second Amendment protection does not extend to possession of weapons deemed “dangerous and unusual.”⁹⁰ Thus, a judgment that 3D printed firearms are sufficiently “dangerous and unusual” may ultimately preclude their possession from protection under the Constitution.⁹¹

⁸⁷ *See id.* at 595 (holding that the right to bear arms emboldened in the Second Amendment is an individual right, able to be exercised unconnected to service in a militia). The Court analyzed the history of the use of firearms in the United States, and found that unequivocally firearms were held for both public and private self-defense and protection. *Id.* at 594.

⁸⁸ *See id.* at 629 (holding that the ban on handguns in the District of Columbia was unconstitutional). The Court reasoned that the District of Columbia allowing the possession of long guns (rifles and shotguns), was not enough to allow such a restriction on other types of firearms. *Id.* The fact that many Americans use handguns to defend themselves in their home due to their accessibility, ease of use, or any other reasoning makes them accepted by the general public, and impermissible to outright ban under the Second Amendment. *Id.* The Court however expounded upon the idea that the Second Amendment does not give an unbridled right to the possession of firearms. *District of Columbia v. Heller*, 554 U.S. at 627. Among the restrictions on the right, which are reasonable, are the restrictions on the sale of weapons to prohibited classes, current licensing schemes, and the banning of dangerous and unusual weapons. *Id.*

⁸⁹ *See United States v. Miller*, 307 U.S. 174, 178 (1939) (articulating that the Second Amendment does not guarantee defendants the right to keep and transport shotguns).

⁹⁰ *See id.* at 178 (holding that the short-barreled shotgun was not in common use at the time, concluding that the unusual weapon was banned permissibly under the Second Amendment). The *Miller* Court furthered this line of reasoning to hold that the Second Amendment does not protect the possession of dangerous and unusual weapons. *Id.*

⁹¹ *See District of Columbia v. Heller*, 554 U.S.570 at 627 (stating the longstanding prohibition of dangerous and unusual weapons from protection under the Second Amendment).

III. Premise

“If [the government] were to come after me, they’d first have to find my identity,” exclaimed an active participant in the 3D firearm printing universe solely known by his online alias, “Ivan the Troll.”⁹² Ivan is part of a loosely connected digital community routinely sharing CAD files, advice, instruction, and videos of their Frankenstein’s monster firearms on platforms such as Twitter, Discord, Reddit, Signal, and Gunstreamer.⁹³ He describes the community as “thousands strong,” many of whom share congruent

⁹² See Jake Hanrahan, *3D-printed guns are back, and this time they are unstoppable*, WIRED (May 20, 2019), archived at <https://perma.cc/53KD-53RW> (outlining “Ivan the Troll’s” involvement in 3D printing, while showing his penchant for anonymity).

⁹³ See *id.* (outlining the various mediums through which information, files and commentary relating to the 3D printing of firearms is shared); Carlota V., *The irrepressible spread of 3D printed firearms*, 3D NATIVES (May 22, 2019), archived at <https://perma.cc/2WYR-VRBQ> (stating further that videos of Ivan creating firearms are accompanied by text inspiring their proliferation such as “anyone can make it” and “live free or die”). See also Andrew Melcon, *Discord: Everything You Need to Know*, TOM’S GUIDE (Mar. 11, 2018), archived at <https://perma.cc/CN46-KUWT> (explaining that Discord is a streamlined service that provides effective means for communication between large groups of people across platforms). See also CrazyIvan3D, *The FGC-9 Is Officially Released To The Public Domain For Free Download*, R/GUNS REDDIT (Mar. 28, 2020), archived at <https://perma.cc/KJN9-3PMQ> (showcasing Ivan’s design of a fully functional all 3D printed firearm). Ivan posted the video of his firearm creation to Reddit in order to advertise its ability to be downloaded elsewhere on the internet. *Id.* In the video’s description, Ivan states that the gun is able to be made from zero “firearm parts” allowing even users in Europe to download the CAD files. *Id.* Additionally, Ivan boasts that the firearm build is “15 years ahead of US gun regulation efforts – and undoes those already in place across the world.” *Id.* See also CrazyIvan3D, *When life gives you 3D printed AKM receivers, go innacreek*, R/GUNS REDDIT (Mar. 28, 2020), archived at <https://perma.cc/4X2Q-XG9P> (presenting a 3D printed AK-47 style receiver created by Ivan); *Firearm-Guides - Importation & Verification of Firearms, Ammunition - Gun Control Act Definitions - Firearm*, ATF (Apr. 27, 2018), archived at <https://perma.cc/DE2R-WQZP> (explaining that a firearm receiver is “that part of a firearm which provides housing for the hammer, bolt or breechblock, and firing mechanism, and which is usually threaded at its forward portion to receive the barrel”).

views of radical libertarianism.⁹⁴ The fervor with which Ivan attempts to make gun schematics more available and constantly improved stems from his absolute belief in the First and Second Amendments—going so far as to theorize that these rights should afford him the ability to personally own Tomahawk Cruise Missiles.⁹⁵ In fact, Ivan founded a group aptly named “Deterrence Dispensed,” a play on words of Cody Wilson’s “Defense Distributed,” in an effort to provide the public with access to firearm blueprints, knowledge and support.⁹⁶ Where groups such as Deterrence Dispensed succeed in promulgating the continuous upload of firearm designs, tips concerning the process of printing, and advice on how to successfully wield these creations, the use of 3D printed firearms becomes more prolific.⁹⁷

⁹⁴ See Hanrahan, *supra* note 92 (providing Ivan the Troll’s statement as to the size of the 3D firearm printing community). See also Tasha Robinson, *The New Radical, Cody Wilson, and the Future of 3D Printed Guns*, THE VERGE (Jan. 25, 2017), archived at <https://perma.cc/4AYY-4ZFH> (claiming that Cody Wilson, the creator of the Liberator pistol, as well as other 3D printed firearms enthusiasts created these firearms from a notion of “radical equality”).

⁹⁵ See Hanrahan, *supra* note 92 (professing Ivan the Troll’s fervor and even radical belief in both the First and Second Amendments). His belief in the autonomy of the citizen extends so far as to believe in the legal ownership of weapons of all sorts, including missiles. *Id.* See also *Tomahawk Cruise Missile*, RAYTHEON (Mar. 28, 2020), archived at <https://perma.cc/M8X5-MMVG> (explaining the nature and capabilities of a Tomahawk cruise missile). Raytheon, the producer of the armament, states that the “Tomahawk cruise missile is a precision weapon that launches from ships and submarines and can strike targets precisely from 1,000 miles away, even in heavily defended airspace.” *Id.*

⁹⁶ See Hanrahan, *supra* note 92 (showing how Ivan the Troll’s group, Deterrence Dispensed, is a “tongue-in-cheek nod” to Cody Wilson’s group, Defense Distributed). The groups effectively set out to accomplish the same goal — providing the public with access to firearm know-how, CAD files, and support. *Id.*

⁹⁷ See *Welcome to Ivan’s Safe Place!*, IVANTHETROLL (Nov. 16, 2019), archived at <https://perma.cc/ZC5T-GGJJ> (professing that the name of Ivan’s group “Deterrence Dispensed” was inspired by Defense Distributed); Blackman, *supra* note 13, at 485–86 (reinforcing that Defense Distributed created the first 3D printed firearm called the Liberator in 2013); Champe Barton, *3D-Printed Gun Group Moves to Tumblr*, THETRACE (Aug. 27, 2019), archived at <https://perma.cc/QR3S-M9QE> (announcing that Ivan the Troll’s group has moved to Tumblr amidst many other sites banning his content). A member of Ivan’s group explained that when one site bans their content such as YouTube, Reddit, Twitter and Facebook they simply begin sharing their content through another medium. *Id.* Fittingly, Ivan the Troll removed his blueprints and designs from Tumblr the day after the article was

A. *Firearm or Firework? The Danger of 3D Printed Guns Malfunctioning in the Hands of Their Users.*

Ironically, one of the greatest dangers posed by firearms that have been 3D printed involves the physical safety of those wielding them.⁹⁸ The ATF printed and test fired two models of Defense Distributed's Liberator pistol, one made with Visijet Plastic, and the other with a much stronger plastic called acrylonitrile butadiene styrene or more commonly, ABS.⁹⁹ The pistol comprised of the ABS plastic fired eight rounds without incident.¹⁰⁰ However, the Visijet pistol exploded at once when the trigger was pulled.¹⁰¹ Australian authorities conducting a similar test experienced "catastrophic failure" of the 3D printed Liberator pistol, with serious injury hypothesized for any would be wielder of the weapon.¹⁰² These

published. *Id.* See also Hanrahan, *supra* note 92 (stating that in addition to the sharing of firearm CAD files and blueprints, members of Ivan the Troll's group "offer advice, talk theory, and collaborate on future blueprints").

⁹⁸ See Smith, *supra* note 15, at 86 (stating that 3D guns which are printed by personal printers may be prone to explosion); Straub, *supra* note 19 (articulating the idea that 3D-printed guns may be more dangerous to their users than any potential targets).

⁹⁹ See Andy Greenberg, *3D-Printed Gun Stands Up To Federal Agents' Testfiring-- Except When It Explodes (Video)*, FORBES (Nov. 14, 2013), archived at <https://perma.cc/YT2F-WBM8> (explaining that the ATF printed these two firearms comprised of differing plastics to show the dangers of 3D printed guns). Also, ABS plastic is more durable than its Visijet counterpart. *Id.* See also *ABS Plastics Testing Services*, POLYHEDRON LABORATORIES, INC. (Nov. 17, 2019), archived at <https://perma.cc/EK7C-BF2W> (explaining that ABS or Acrylonitrile Butadiene Styrene is a "lightweight, tough, rigid thermoplastic that has high impact and high mechanical strength"). Compare Aaron Steckelberg, *The challenges of regulating 3-D-printed guns*, THE WASHINGTON POST (Aug. 20, 2018), archived at <https://perma.cc/6D3D-CERF> (stating that the quality of the material utilized by most 3D printers is not strong enough to withstand the immense forces incumbent when discharging the firearm).

¹⁰⁰ See Greenberg, *supra* note 99 (stating that the more sophisticated ABS plastic firearm fired eight rounds without incident).

¹⁰¹ See Greenburg, *supra* note 99 (describing the explosion of the Visijet firearm upon firing).

¹⁰² See Rohan Pearce, *NSW Police issues warning on 3D printed guns*, COMPUTERWORLD (May 24, 2013), archived at <https://perma.cc/45F6-D4V8> (outlining a test conducted by New South Wales police on 3D printed firearms where the pistol suffered "catastrophic failure," capable of serious injury).

potential explosions pose a real threat for the hobbyist, or non-professional creator of 3D printed firearms.¹⁰³

Nonetheless, this problem is not caused by the inherent nature of 3D printing, but largely by human error due to the great complexity of the process.¹⁰⁴ The firearm may detach during the printing process creating uneven or lopsided designs.¹⁰⁵ A faulty or compromised blueprint may be downloaded lending itself to explosion.¹⁰⁶ Perhaps most dangerous are latent defects caused by material being too hot, too cold, or lain into form too fast or slow; both problems invisible to the user and rendering the structural integrity of the firearm unsound.¹⁰⁷ These issues may place the tinkerer, enthusiast, hobbyist, or criminal with limited knowledge of the printing process, and without commercial quality assurance, at risk of death or serious bodily harm upon pulling the trigger.¹⁰⁸

B. *The Ghost Gun—Sans Serial Number, Blind Ballistics*

Dissimilar from firearms produced by a licensed firearms manufacturer, 3D printed firearms do not have serial numbers, the existence of which allows law enforcement to trace the firearm's

¹⁰³ See Straub, *supra* note 19 (explaining common problems that plague those who create 3D-printed designs and especially firearms at home, stating many variables in the production process).

¹⁰⁴ See Straub, *supra* note 19 (stating that the process of 3D printing, which must be strictly adhered to, causes problems with any deviation).

¹⁰⁵ See Straub, *supra* note 19 (describing the occurrence of shifting during printing that creates problems with the design, which could be dangerous).

¹⁰⁶ See Smith, *supra* note 15, at 89 (stating that the download of a “compromised” blueprint may very well make the end product more susceptible to explosion).

¹⁰⁷ See *3D print tip: What to do with overheating*, DDDROP (Nov. 17, 2019), archived at <https://perma.cc/5L5Y-P9H6> (explaining common problems with 3D printing including temperature fluctuations, which can shrink the plastic and thus warp it). Also discussed as an issue is the layering of filament on the design too fast—causing the plastic to experience additional temperature issues. *Id.* See also Straub, *supra* note 19 (claiming that these issues are dangerous when printing firearms as they are hard to detect and can compromise the structural integrity of the design).

¹⁰⁸ See Straub, *supra* note 19 (stating that non-commercial 3D printers used at home do not produce consistent enough designs to support the printing of firearms). Further, commercial manufacturers of guns have rigorous quality assurance standards that prevent defective gun designs from reaching the public. *Id.* Homemade creators of 3D printed firearms do not have the luxury of such quality assurance. *Id.*

ownership history.¹⁰⁹ Firearm tracing is used extensively by law enforcement, who collaborate with the ATF to trace the firearms to the first retail purchaser.¹¹⁰ This important method of investigation is wholly dependent upon the serial number engraved on the firearm by the manufacturer, which 3D printed guns lack.¹¹¹ Consequently, criminals seek guns devoid of serial numbers.¹¹² In an effort to thwart criminals having the ability to obtain guns lacking serial numbers, Congress passed the Gun Control Act in 1968, which required serial numbers on all manufactured firearms.¹¹³ However, the engraving of a serial number is not mandated for homemade guns.¹¹⁴ Today, the ability to create 3D printed firearms with little to no specialized knowledge threatens to increase the volume of “homemade” guns available, a result not foreseen at the passage of the Gun Control Act.¹¹⁵ Thus, the inability to trace 3D printed firearms by serial number coupled with their ease of manufacture

¹⁰⁹ See Josh Hafner, *What is a 3D printed gun, and how is it legal? Your questions, answered*, USA TODAY (Aug. 2, 2018), archived at <https://perma.cc/TUA9-EPR8> (explaining that dissimilar from a manufacturer of firearms, 3D printed firearms do not bear serial numbers, hindering law enforcement in tracing crimes); 164 Cong. Rec. S. 5506, (Jul. 31, 2018) (statement of Sen. Dianne Feinstein) (recognizing that a large part of what makes 3D printed firearms dangerous is their lack of serial numbers).

¹¹⁰ See 3D Printed Gun Safety Act of 2019, 2019 H.R. 3265, 116th Cong. (2019) (explaining that firearms tracing is used to trace the gun back to the first retail purchaser, in order to investigate crimes). The ATF conducted 408,000 firearm traces in 2017, which in turn aided in criminal investigations involving firearms. *Id.*

¹¹¹ See *id.* (highlighting the importance of the serial number when tracing guns, and reminding that 3D printed guns lack such numbers).

¹¹² See *id.* (stating that criminals seek to possess firearms that lack serial numbers).

¹¹³ See Berkowitz, *supra* note 6, at 70 (describing the restrictions the Gun Control Act placed on gun ownership, including mandating the engraving of serial numbers on all new firearms).

¹¹⁴ See Richard Johnson, *Am I Required To Apply A Serial Number To A Homemade Firearm*, GUNSHOLSTERSANDGEAR (Nov. 17, 2019), archived at <https://perma.cc/QH3M-UYY9> (explaining that it is not illegal to create a firearm for personal use without a serial number).

¹¹⁵ See Berkowitz, *supra* note 6, at 64 (highlighting that the manufacturing of firearms requires very specialized skills and has prevented the extensive home manufacture of weapons). However, 3D printing requires no such specialized skill set, allowing the average person to readily create 3D printed homemade firearms. *Id.*

may frustrate law enforcement's efforts to solve crimes perpetrated with these weapons.¹¹⁶

In addition to tracing serial numbers on firearms, law enforcement agencies use the “telltale markings on the bullet and cartridge case that’s ejected when the pistol or rifle is fired” to link a particular firearm with a particular incident.¹¹⁷ The ATF catalogs these unique marks in the National Integrated Ballistics Information Network (“NIBIN”) which uses ballistics imaging technology to solve crimes.¹¹⁸ In December of 2017, Cleophus Cooksey Jr. was arrested after his mother and stepfather were found dead in Phoenix.¹¹⁹ The NIBIN database helped law enforcement charge Cooksey with an additional six murders after his guns were linked to the crimes using ballistics technology.¹²⁰ The NIBIN has matched over 110,000 firearms to crimes since its inception in 1999 and proves to be an invaluable investigative tool.¹²¹ However, the use of a 3D printed firearm “would make it very difficult for NIBIN to detect the signature of that weapon” stated Frank Fernandez, a retired police chief from Florida and the chair of the International Association of Chiefs of Police.¹²² In fact, the barrel of a 3D printed gun leaves no identifying marks on the bullet, rendering it impossible to solve crimes like in the case of the Cooksey murders.¹²³

¹¹⁶ See 3D Printed Gun Safety Act of 2019, 2019 H.R. 3265, 116th Cong. (2019) (stating the importance of serial numbers in tracing firearm related incidents, which 3D printed guns lack).

¹¹⁷ See Wilke, *supra* note 25 (describing the technique of analyzing the unique identifiers on bullet and shell casings in order to identify firearms).

¹¹⁸ See *National Integrated Ballistic Information Network (NIBIN)*, ATF (Nov. 17, 2019), archived at <https://perma.cc/96C9-E8PY> (highlighting the NIBIN's purpose of solving crimes through ballistics); Wilke, *supra* note 25 (stating that firearms leave unique markings on the bullets and shells which eject from the weapon, leaving investigators clues as to which weapon has fired them).

¹¹⁹ See Wilke, *supra* note 25 (describing Cooksey's murder of his mother and stepfather).

¹²⁰ See *id.* (stating that the additional murders were linked to Cooksey due to ballistics technology from the firearm used in the crimes).

¹²¹ See *id.* (stating the number of matches achieved by the NIBIN system and its power to be an effective investigative tool for law enforcement agencies).

¹²² See *id.* (explaining Fernandez's qualms over the use of 3D-printed firearms and their propensity to evade ballistics investigations conducted by NIBIN).

¹²³ See *id.* (explaining that barrels of 3D-printed firearms do not leave identifying marks on fired bullets).

C. *More than a Theory: Recent Incidents Concerning 3D Printed Firearms*

In 2017, after failing to obtain a firearm through a licensed dealer due to an outstanding restraining order, a Texas man was arrested for being in possession of a 3D printed firearm.¹²⁴ Also in his possession was a “hit list” of government personnel.¹²⁵ In August of 2018, a Utah man was arrested for making threats to commit a shooting at a school using a 3D printed gun.¹²⁶ He specifically planned to use a 3D printed firearm because of their untraceable nature.¹²⁷ Further, on July 3, 2019, a Kansas man was stopped by airport security after attempting to travel with an unassembled 3D printed gun in his carryon luggage.¹²⁸ These are just some of the many 3D printed firearms cases in the United States, however 3D printed firearm incidents are not exclusive to any particular nation.¹²⁹ In June of 2019, a London student plead guilty to charges of manufacturing a 3D printed firearm.¹³⁰ Also, on October 9, 2019, a

¹²⁴ See Jack Date, *Texas man sentenced in 3D-printed gun case, had ‘hit list’ of US lawmakers*, ABC (Feb. 14, 2019), archived at <https://perma.cc/BW2X-T9JJ> (stating that the man had failed a background check and was denied a firearm).

The man was then arrested in possession of an AR-15 with 3D-printed parts. *Id.*

¹²⁵ See *id.* (explaining that a hit list including the names of various government personnel was also in the man’s possession).

¹²⁶ See Tess Owen, *This guy threatened to shoot up a school with a 3D-printed gun*, VICE (Aug. 29, 2018), archived at <https://perma.cc/SE5K-UY7X> (explaining how James David West from Utah was apprehended before he could effectuate his plan of conducting a school shooting using a 3D printed firearm).

¹²⁷ See *id.* (describing the arrest of James David West for making a threat of violence due to his threat to commit a shooting at a school using a 3D-printed firearm, “specifically because they are untraceable”).

¹²⁸ See *3D-printed gun found in carry-on bag at LaGuardia Airport*, FOX5NY (Jul. 8, 2019), archived at <https://perma.cc/WB2L-EWMY> (explaining how a man attempted to bring an unassembled 3D printed firearm onto a flight in his carry-on luggage).

¹²⁹ See Thomas Marquenie, *(Warning) Toner low: 3D printed guns and the law*, KU LEUVEN (Aug. 6, 2019), archived at <https://perma.cc/U2P7-7CTQ> (summarizing 3D printed gun incidents in Europe).

¹³⁰ See Charlie Osborne, *UK student charged for manufacturing gun through 3D printing*, ZDNET (June 20, 2019), archived at <https://perma.cc/PW64-8D9D> (stating the student charged for 3D printing a firearm received the first charge of its kind in the nation); Adi Robertson, *UK Home Office adds formal ban on 3D-*

neo-Nazi gunman attacked a synagogue, killing two people.¹³¹ According to his manifesto, the gunman deliberately avoided using conventional firearms in an effort to “prove the viability of improvised weapons.”¹³² As terrorists are “more imitative than innovative,” the livestream of the gunman’s attack coupled with his manifesto highlights the availability of 3D printed firearms for nefarious use and could inspire other tragedies.¹³³

IV. Analysis

A. *Beating the Hare with the Tortoise: Examining the Law’s Slow Reaction to Technological Advances, and the Necessity for Expedited Legislation in the Area of 3D Printed Firearms*

“Law is, at its best and most legitimate—in the words of Ghandi—’codified ethics,’” states former White House General Counsel Preeta Bansal, rationalizing the slow progression of law in comparison to new technological advances.¹³⁴ These laws or codes of ethics to which society submits are unable to be formed prior to a general social consensus.¹³⁵ The printing press, as archaic to our modern sense of novel technological advancement as the wheel, ushered massive social upheaval, disrupting the nature of the

printed guns to firearms rules, THE VERGE (Dec. 6, 2013), *archived at* <https://perma.cc/M7AE-6P5A> (outlining the United Kingdom’s Home Office’s promulgation of a formal ban on 3D printed firearms in the nation).

¹³¹ See Bruce Hoffman & Jacob Ware, *Is 3-D Printing the Future of Terrorism?*, THE WALL STREET JOURNAL (Oct. 25, 2019), *archived at* <https://perma.cc/DCL7-S3GS> (stating the date and location of the first fatal 3D printed gun attack). The gunman who attacked the synagogue in Halle was a neo-Nazi who targeted members of the Jewish faith. *Id.* The attack was planned to take place on Yom Kippur and the gunman killed two individuals. *Id.*

¹³² See *id.* (outlining the gunman’s manifesto and goal of spreading awareness of the utility and viability of 3D printed firearms).

¹³³ See *id.* (explaining terrorists usually copy others’ work so the Halle gunman’s manifesto may very well inspire others to copy his actions).

¹³⁴ See Wadhwa, *supra* note 12 (claiming the reason law lags behind technological innovations is that society has not formulated ethical opinions on the novel technology).

¹³⁵ See *id.* (positing that these ethical standards comprising law can only naturally be formulated once a general social consensus has been reached by the public).

ownership of ideas by allowing the free flow of information.¹³⁶ As the dissemination of information crippled the Holy Roman Empire, and led to questioning of the Catholic Church, the world grappled with who owned these ideas that were copied and proliferated to the masses.¹³⁷ It was not for another 300 years before the first copyright statutes addressing this problem were promulgated in England.¹³⁸

3D printing, a kind of new age printing press, tempts a social upheaval of a different nature: the ability to not only learn, but to create objects once so far from the purview of the individual as to be called dreams.¹³⁹ When this ability is utilized to create such controversial, yet constitutionally guaranteed devices such as firearms, public policy may clash with fundamental freedoms.¹⁴⁰

¹³⁶ See *id.* (addressing how the printing press disrupted the social fabric of the time by enabling ideas to be shared on a large scale). This fabric was held together in part by suppressing information to the public, which the printing press gravely threatened. *Id.*

¹³⁷ See *id.* (showing that the printing press helped usher in the decline of the Holy Roman Empire and other institutions of the time). The sharing of information on a widespread scale led to such important historical developments as the questioning of the Catholic Church, nationalism, and even the Renaissance. *Id.*

¹³⁸ See *Copyright Timeline: A History of Copyright in the United States*, *supra* note 12 (explaining that the statute of Anne, promulgated in 1710, was the first English law to directly address the issue of printer's monopolies on books and other printed materials following the introduction of the printing press in England). The statute dealt with the ability of the printing press to copy and distribute printed works, by protecting the work of the original author against appropriation by the distributing printers. *Id.* Thus, effectively creating the modern body of copyright law. *Id.*

¹³⁹ See Mendoza, *supra* note 7 (likening the effect of 3D printing technology to that of the printing press); Desai & Magliocca, *supra* note 18 (claiming that 3D printing technology "reorders access to the means of production"). This reordering, still in its infancy, promises a gradual shift from corporation dominated production to personal production of complex goods. *Id.*

¹⁴⁰ See U.S. CONST. amend. II (guaranteeing the right to bear arms shall not be infringed); McDonald v. City of Chicago, 561 U.S. 742, 768–69 (2010) (holding the right to bear arms as a fundamental right, greatly limiting the ability of the government to regulate in this area). See also District of Columbia v. Heller, 554 U.S. 570, 635 (2008) (declaring an outright ban on handguns by the District of Columbia as overly broad and intrusive of Second Amendment rights). Consequently, the "enshrinement of constitutional rights necessarily takes certain policy choices off the table." *Id.* at 636. See also Berkowitz, *supra* note 6, at 78 (stating that policy promulgated by lawmakers in regard to 3D-printed guns must be in accord with the fundamental rights afforded by the Constitution); Cosans,

This inevitable confrontation creates a strong dichotomy between reasonable minds on the type of laws needed to balance these conflicting considerations.¹⁴¹ Although society has not fully grappled with the advent of 3D printed firearms to determine which ethical standards should be codified as law, the implications to public safety make it imperative to administer a preemptive strike at this looming danger.¹⁴² The adoption of the 3D Printed Gun Safety Act of 2019 would be sufficient ammunition needed for this strike.¹⁴³ The Act effectively balances the rights afforded under the Constitution against public safety and national security.¹⁴⁴ This

supra note 22, at 943 (recognizing that despite the fundamental nature of the right to bear arms, public policy considerations dictate the need to address the issue of 3D-printed guns “before technology outpaces the law”).

¹⁴¹ See 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (proposing a total ban on the distribution of CAD files that contain code which could automatically program a 3D printer to produce or complete production of a firearm); 3D Printed Gun Safety Act of 2018, 115 H.R. 6649 (2018) (demonstrating the failure of an identical bill introduced under the same name in 2018). The failure of the bill in 2018, coupled with its subsequent introduction in 2019 shows that members of the house differ on whether the law should be introduced. *Id.* Thus, reasonable minds may differ on the level and degree of regulation needed, if at all. *Id.*

¹⁴² See Reichental, *supra* note 9 (claiming that the reason for the drama surrounding 3D printed firearms does not stem from their dangerousness, but from the technological upheaval ushered by 3D printing); *Defense Distributed v. United States Dep’t of State*, 838 F.3d 451, 453 (5th Cir. 2016) (holding that the interests of national security and defense are threatened by the uploading of firearm CAD files).

¹⁴³ See 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (stating how the Act would ban the sharing and download of CAD files able to program a printer to automatically print a 3D-printed firearm). The purpose of the Act is to quell the dangers of 3D printed firearms by prohibiting the proliferation of CAD files to those who may simply click “download” to create a firearm. *Id.* See 3D Printed Gun Safety Act of 2019, 116 S. 1831, 116th Cong. (2019) (presenting identical provisions as introduced into the House of Representatives).

¹⁴⁴ U.S. CONST. amend. I (enshrining the right of freedom of speech, guaranteed to all those in the United States); U.S. CONST. amend. II (positing the second right emboldened in the Constitution, the guarantee of the right to bear arms); 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (stating that 3D printed firearms pose a grave danger to national security and public safety); *District of Columbia v. Heller*, 554 U.S. 570, 627 (2008) (holding that dangerous and unusual weapons are able to be freely regulated as they fall outside the scope of the Second Amendment). See also *Spence v. Wash.*, 418 U.S. 405, 418 (1974) (Rehnquist, J.,

equilibrium does more than pass constitutional muster, providing a potent vaccine able to insulate from the scourge of 3D printed firearms before the threat becomes incurable.¹⁴⁵ In an effort to avoid the chaos society experienced after the institution of the printing press, and to ensure a standard through which both public safety and fundamental rights are not infringed, it is necessary to act preemptively in adopting this effective legislation that addresses the novel issue of 3D printed firearms, we do not have the luxury to wait 300 years.¹⁴⁶

B. *The CAD Conundrum: Navigating 21st Century Speech Concerns in Light of Public Safety*

“If you’re not with me you’re my enemy” quoth Anakin Skywalker, precariously close to his demise as a Jedi and rebirth as Darth Vader.¹⁴⁷ “Only a Sith deals in absolutes, I will do what I

dissenting) (articulating the test used to determine whether conduct may be considered speech for purposes of First Amendment protection). Under the test where conduct is analyzed to determine if the protections of speech apply, the speaker must intend to promulgate an idea and the audience must understand what the speaker intends to convey. *Id.* See also *United States v. Alvarez*, 567 U.S. 709, 717–18 (2012) (positing examples of speech that is not protected by the First Amendment, illustrating that the First Amendment’s protection is not absolute). See also *United States v. Miller*, 307 U.S. 174, 178 (1939) (recognizing that dangerous and unusual weapons are not protected under the Second Amendment).¹⁴⁵ See *Defense Distributed v. United States Dep’t of State*, 838 F.3d 451, 454 (5th Cir. 2016) (recognizing that the current status of firearm regulation allows for a loophole where anyone can create an untraceable and functional firearm); Berkowitz, *supra* note 6, at 53–54 (highlighting the extreme dearth of laws in the realm of 3D printed firearm regulation); Langvardt, *supra* note 4, at 66 (professing there have been no serious attempts to regulate the posting of firearm CAD files online).

¹⁴⁶ See Wadhwa, *supra* note 12 (noting that the invention of the printing press, in part, led to chaos such as the fall of the Holy Roman Empire, the Protestant Reformation, and the grappling with ownership rights of re-printed information); Smith, *supra* note 15, at 97 (stressing the necessity of finding a balance between constitutionality, development of technology and public security when regulating 3D printed firearms); Steckelberg, *supra* note 99 (addressing how 3D printed firearms will only improve in their design, functionality and thus lethality as the technology develops).

¹⁴⁷ See *STAR WARS EPISODE III: REVENGE OF THE SITH* (Lucasfilm 2005) (placing Anakin on the precipice of turning to the dark side of the force).

must” replies his one-time master Obi Wan Kenobi in an effort to explain the duality of his allegiance to both the plight of his apprentice and the democracy emboldened in the Republic.¹⁴⁸ Obi Wan’s reluctance to state where he stands definitively, spoken in a galaxy far away and a long time ago, bears a striking resemblance to First Amendment jurisprudence.¹⁴⁹ The First Amendment guarantees that Congress make no law prohibiting the free exercise of speech; however, this seemingly absolute statement remains pockmarked with exceptions.¹⁵⁰ Since CAD files are a necessary component in the manufacture of 3D printed firearms, their regulation is one of the avenues lawmakers have at their disposal to quell this danger.¹⁵¹ Indeed, the 3D Printed Gun Safety Act of 2019 takes this direction of regulation, proposing a ban on the intentional publishing of CAD files online which can “automatically program a 3-dimensional printer or similar device to produce a firearm or complete a firearm from an unfinished frame or receiver.”¹⁵²

¹⁴⁸ See *id.* (showing the pair in the heat of imminent battle). The scene critiques how evil forces absolute choice. *Id.*

¹⁴⁹ See STAR WARS EPISODE IV A NEW HOPE (Lucasfilm 1977) (containing the first instance of Star War’s famous opening explanatory crawl, “A Long Time Ago, In a Galaxy Far, Far Away . . . “); Cosans, *supra* note 22, at 924 (highlighting how the protections of the First Amendment are in no way absolute).

¹⁵⁰ See U.S. CONST. amend. I (declaring that Congress shall make no law abridging the freedom of speech); *United States v. Alvarez*, 567 U.S. 709, 717 (2012) (summarizing certain speech that is not subject to First Amendment protection including: defamation, fighting words, and incitement).

¹⁵¹ See Cosans, *supra* note 22, at 919 (explaining the necessity of a CAD file in providing the printer with instructions on the size, dimension, and other qualities of the completed object); Tran, *supra* note 22, at 508 (stating that the blueprints which dictate the object to be printed are found in CAD files); Blackman, *supra* note 13, at 484 (delineating the importance of CAD files in creating a finished 3D printed object); Langvardt, *supra* note 4, at 66 (explaining the regulation of CAD files as an avenue for 3D printed gun regulation).

¹⁵² See 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (stating that the Act proposes a prohibition on firearm CAD files that are able to automatically produce a firearm or firearm parts from a 3D printer); 3D Printed Gun Safety Act of 2019, 116 S. 1831, 116th Cong., (2019) (including the same provision in the House version of the Act).

1. Code as Communication, Delineating CAD Files as Speech

The first constitutional protection which the 3D Printed Gun Safety Act of 2019 implicates is perhaps the nation's most important, the freedom of speech guaranteed by the First Amendment.¹⁵³

Although not words or language used in everyday parlance, code, such as that which CAD files utilize, has been deemed to constitute speech by United States district and circuit courts.¹⁵⁴ Although the Supreme Court is yet to rule on whether computer code, and more specifically CAD files constitute speech, the Court has held that First Amendment protections extend beyond the written and spoken word to include the process of tattooing, and altering the American flag.¹⁵⁵

In determining whether CAD files constitute speech, the Supreme Court resorts to the *Spence* test of analyzing whether “the activity was sufficiently imbued with elements of communication to fall within the scope” of the First Amendment, while considering the activity's nature, context, and environment.¹⁵⁶ The information

¹⁵³ See U.S. CONST. amend. I (guaranteeing the freedom of speech to citizens of the United States); *Defense Distributed v. United States Dep't of State*, 838 F.3d 451, 453 (5th Cir. 2016) (recognizing that computer code, and therefore CAD files may be considered speech).

¹⁵⁴ See *Bernstein v. United States Dep't of State*, 922 F. Supp. 1426, 1436 (N.D. Cal. 1996) (holding computer source code to be speech worthy of First Amendment protections); *United States v. Elcom Ltd.*, 203 F. Supp. 2d 1111, 1126 (N.D. Cal. 2001) (granting First Amendment protection to computer code); *Universal City Studios v. Corley*, 273 F.3d 429, 449 (2nd Cir. 2001) (granting First Amendment protection to computer source code).

¹⁵⁵ See *Anderson v. City of Hermosa Beach*, 621 F.3d 1051, 1068 (9th Cir. 2010) (regarding tattooing as an expressive activity, garnering the protections of the First Amendment). See also *Spence v. Wash.*, 418 U.S. 405, 410 (1974) (recognizing qualities of speech inherent in altering the American flag, that place the conduct within the protections of the First Amendment).

¹⁵⁶ See *Spence v. Wash.*, 418 U.S. 405, 418 (1974) (Rehnquist, J., dissenting) (outlining the test used by the Supreme Court in determining whether an activity contains sufficient elements of speech which will render the activity within the protections of the First Amendment). This test asks whether the “speaker” of the conduct intends to convey a particular message, containing ideas. *Id.* at 410–11. Additionally, the speaker's audience must understand the demonstration or activity and the message encapsulated in it. *Id.* at 412. The context in which the activity occurs, the environment surrounding the conduct, and the nature of the activity are

contained in CAD files likely satisfies the elements of communication outlined in *Spence* as the creator of the file possesses an “intent to convey a particularized message” and the viewer of the material will understand what the file contains when he or she downloads the file for printing.¹⁵⁷ The CAD file creator, whether advocating for an armed populace to resist governmental intrusion, or sharing his love of firearm design and function, is undoubtedly advocating a particularized message. Further, the audience interacting with these CAD files undoubtedly did not stumble upon them by mistake or confusion, but understands the message imbued in the CAD files, and wishes to bring that message quite literally to life.¹⁵⁸ However, the categorization of CAD files as speech does not end the inquiry into the constitutionality of prohibiting CAD files that have the ability to automatically instruct a printer to produce a firearm.¹⁵⁹ Assuming the Supreme Court would rule in accordance with the lower courts in determining CAD files as speech, the burden of such regulation on the CAD files’ expressive nature must next be elucidated.¹⁶⁰

relevant in determining whether the conduct is indeed speech deserving of First Amendment protection. *Id.* at 409–10.

¹⁵⁷ See *id.* at 410–11 (positing the definition of communication imbued within the *Spence* test for speech). See also Hanrahan, *supra* note 92 (outlining that Ivan the Troll’s ideology of radical libertarianism is expressed through his posting of CAD files online). Further, many in the community that access these files share the same views of libertarian thought, and the just proliferation of firearms to the general public. *Id.* Thus, the requirement that the audience understands what the “speaker” or creator of the CAD file wishes to convey is likely satisfied. *Id.*

¹⁵⁸ See Hanrahan, *supra* note 92 (addressing that the individuals who access these CAD files often share the same ideologies which the creators of the CAD files possess). The act of accessing these files underlies a reason for accessing, including the downloader’s belief in the democratization of manufacturing, the thrill of making one’s own firearm, or any other motivation shared between the creator of the file and those accessing the fruits of his labor. *Id.*

¹⁵⁹ See *United States v. Alvarez*, 567 U.S. 709, 717 (2012) (summarizing certain speech that is not subject to First Amendment protection including defamation, fighting words, and incitement).

¹⁶⁰ See Berkowitz, *supra* note 6, at 73 (delineating that CAD files should be considered speech deserving of First Amendment protection); *Brown v. Entm’t Merchants Ass’n*, 564 U.S. 786, 799 (2011) (holding that video games constitute speech under the First Amendment and thus deserve protection, and a regulation banning violent video games is overly broad); Bryans, *supra* note 33 (arguing that CAD files constitute expressive speech). See also *United States v. Elcom Ltd.*, 203

2. Viewpoint Neutral, Content Charged: The 3D Printed Gun Safety Act of 2019 Evades Viewpoint Discriminatory Classification, yet is Content Based

When speech is regulated based on content or viewpoint, courts apply strict scrutiny.¹⁶¹ Under this demanding standard of review, the inquiry is whether the governmental regulation furthers a compelling interest and whether the means are narrowly tailored to achieve that goal.¹⁶² Constitutionally impermissible viewpoint discriminatory laws are based on “the specific motivating ideology or the opinion or perspective of the speaker.”¹⁶³ A ban on these highly technical blueprints, meant to be read and processed not by those of human mind, but by a machine, cannot be said to infringe upon speech in a way that hinders certain ideologies or favors others.¹⁶⁴

F. Supp. 2d 1111, 1126 (N.D. Cal. 2001) (recognizing qualities of speech necessary for First Amendment protection in computer source code); *Universal City Studios v. Corley*, 273 F.3d 429, 449 (2nd Cir. 2001) (entitling computer code to first amendment protection); *Bernstein v. United States Dep’t of State*, 922 F. Supp. 1426, 1436 (N.D. Cal. 1996) (holding computer source code to be speech).

¹⁶¹ See *Reed v. Town of Gilbert*, 135 S. Ct. 2218, 2224 (2015) (recognizing that strict scrutiny is the standard to be applied when regulations interfering with the freedom of speech are challenged).

¹⁶² See *District of Columbia v. Heller*, 554 U.S. 570, 687 (2008) (stating what the demanding standard of strict scrutiny entails, namely the necessity for a compelling governmental interest in regulation and a means implemented towards that end in the least intrusive way possible).

¹⁶³ See *Reed v. Town of Gilbert*, 135 S. Ct. 2218 (2015) (instructing when regulation becomes impermissible viewpoint discrimination). When governmental regulation inhibits speech based upon the ideology, belief, or opinion of the speaker, those laws are said to discriminate on the basis of viewpoint. *Id.* If a regulation is determined to be viewpoint discriminatory after judicial review, then it may only stand if the reviewing court determines the standards of strict scrutiny are met. *Id.*

¹⁶⁴ See *Koch*, *supra* note 20, at 19 (acknowledging that the innerworkings of CAD files are complicated and highly technical); *Jensen-Haxel*, *supra* note 4, at 450 (noting the autonomous nature of the CAD file working in conjunction with the 3D printer, removing the need for any human interaction at the creation stage). See also *Blackman* *supra* note 13, at 527 (highlighting the distinction between source code and object code). Source code is created by a human and thus envelops elements of expression; whereas object code is source code transformed into computer language, directing the printer to create. *Id.*

For example, the ideology of the anarchist, or terrorist, compared to that of the simple firearms enthusiast is quite palpable, yet the 3D Printed Gun Safety Act of 2019 would ban all three individuals from sharing CAD files able to automatically program a 3D printer to produce a firearm.¹⁶⁵ Thus, the legislation would not favor or hinder the sharing of firearm CAD files based on the viewpoint or ideology of the speaker.¹⁶⁶

Further, the proposed ban would not precariously subject the government to “endorsing or suppressing ideas or viewpoints” as those who are interested in firearm design would still be free to post and download gun blueprints, pictures, and schematics.¹⁶⁷ Thus, the government is neither endorsing, nor condemning an interest in firearms or even the knowledge of how to successfully create one, so long as the information cannot automatically program a printer to

¹⁶⁵ See 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (containing the provision that all instances of sharing CAD files that are able to automatically program a 3D printer to produce or complete a firearm would be prohibited under the act); Hanrahan, *supra* note 92 (outlining Ivan the Troll’s ideology of radical libertarianism that he expresses through the posting of firearm CAD files). His belief in the autonomy of the citizen and absolute belief in the First and Second Amendment’s give him the notion that weapons of all sorts should be protected under the Second Amendment, including missiles. *Id.* See Lewis, *supra* note 26, at 305 (positing the goal of Cody Wilson to write and release “software to aid in the disintermediation of state governments and large, collusive corporations”); *Defense Distributed*, DEFENSE DISTRIBUTED, (Mar. 1, 2020), *archived at* <https://perma.cc/5NJZ-TJ4Z> (stating the nature of Defense Distributed as “Private Defense Tech Development in the Public Interest,” showing his ideology in releasing firearm CAD files to the public).

¹⁶⁶ See 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (showing that the prohibition on firearm CAD files that are able to automatically produce a firearm or firearm parts from a 3D printer is a blanket ban). Thus, the viewpoint of the creator of the CAD file, or speaker, is not taken into consideration. *Id.* See also 3D Printed Gun Safety Act of 2019, 116 S. 1831, 116th Cong., (2019) (containing the exact same provisions as the House version of the Act).

¹⁶⁷ See *Reed v. Town of Gilbert*, 135 S. Ct. 2218, 2229 (2015) (articulating the standard that the government cannot use regulation to suppress certain viewpoints or show favoritism to others). See also 3D Printed Gun Safety Act of 2019, 116 H.R. 3265 (2019) (stating that only CAD files which can automatically program a printer to print without additional human input are prohibited under the act); 3D Printed Gun Safety Act of 2019, 116 S. 1831, 116th Cong., (2019) (containing the same provision in the identical bill introduced in the Senate).

produce such object.¹⁶⁸ Although not likely to be found discriminatory from a viewpoint perspective, a ban on firearm designs carved out of the infinite catalog of potential CAD file designs constitutes a ban on a particular subset of ideas, likely making an outright ban on their sharing content based.¹⁶⁹

3. Content Based, yet Crucial: The 3D Printed Gun Safety Act of 2019 Serves a Compelling Governmental Interest

As an outright ban on firearm CAD files is likely a content based restriction on speech, the government must therefore defend the law against any challenge by not only showing a compelling governmental interest, but showing it is also narrowly tailored to address the problem at issue.¹⁷⁰ Surely, stifling the proliferation of undocumented, unreasonably dangerous, readily available firearms qualifies as a compelling governmental interest.¹⁷¹ Furthering the public safety and national security by removing the ability of people from owning guns that are prohibited under the laws of this nation from owning them and protecting otherwise lawful gun owners from injury due to defective design certainly constitutes a compelling

¹⁶⁸ See 3D Printed Gun Safety Act of 2019, H.R. 3265 116th Cong. § 4 (2019) (emphasizing the automatic production requirement inherent in the bill); 3D Printed Gun Safety Act of 2019, S. 1831, 116th Cong., (2019) (instituting the same automatic production requirement present in the House Bill in the Senate Bill).

¹⁶⁹ See *United States v. Alvarez*, 567 U.S. 709, 716 (2012) (holding that without meeting the requirements of strict scrutiny, government cannot restrict speech based on its message, ideas, or subject matter).

¹⁷⁰ See *District of Columbia v. Heller*, 554 U.S. 570, 689 (2008) (Breyer, J., dissenting) (holding that a compelling government interest must be served by a law that is narrowly tailored when a law regulates the content of speech); Langvardt, *supra* note 4, at 72 (stating that the existence of a compelling governmental interest is not enough to justify regulation when the content of speech is regulated). In addition to the existence of a compelling governmental interest that needs remedying, the law must be narrowly tailored to meet that goal. *Id.*

¹⁷¹ See Hafner, *supra* note 109 (recognizing that unlike traditionally produced firearms, 3D printed guns do not contain unique and identifying serial numbers); Greenberg, *supra* note 99 (detailing how a 3D printed Liberator pistol exploded during test-firing after discharging the first round); Stokes, *supra* note 11 (explaining that all one needs in order to create a 3D printed firearm is an internet connection, and a 3D printer).

governmental interest.¹⁷² Additionally, 3D printed firearms, without serial numbers and reliable ballistics, threaten to undermine the efforts of law enforcement in bringing perpetrators of gun violence to justice.¹⁷³ In fact, these interests are arguably more compelling than making sure railway workers abstain from drugs, and roadway safety signs remain distinguishable from temporary informational signs, both considered compelling governmental interests by the Supreme Court.¹⁷⁴

¹⁷² See National Firearms Act 26 U.S.C.S. § 5844 (LEXISNEXIS 2020) (prohibiting certain people from owning firearms including those convicted of or under indictment for a felony); Greenberg, *supra* note 99 (citing the propensity of 3D printed firearms to explode under stress from firing).

¹⁷³ See Hafner, *supra* note 109 (explaining that dissimilar from commercially manufactured firearms, homemade 3D printed firearms do not bear serial numbers, hindering law enforcement in tracing crimes); 164 CONG. REC. S5506, (Jul. 31, 2018) (statement of Sen. Dianne Feinstein) (recognizing that a large part of what makes 3d printed firearms dangerous is their lack of serial numbers). See also 3D Printed Gun Safety Act of 2019, H.R. Res. 3265, 116th Cong. (2019) (explaining that firearms tracing is used to trace the gun back to the first retail purchaser, in order to investigate crimes). The ATF conducted 408,000 firearm traces in 2017, which in turn aided in criminal investigations of firearms. *Id.* The Act also highlights the importance of the serial number when tracing guns, and reminds that 3D printed guns lack such numbers. *Id.* Additionally, criminals seek to possess firearms that lack serial numbers. *Id.* See also Richard Johnson, *supra* note 114 (explaining that it is not illegal to create a firearm for personal use without a serial number). See also Wilke, *supra* note 25 (describing the common ballistics technique of analyzing the unique identifiers on bullet and shell casings in order to identify firearms). The head of the International Association of Police Chiefs states that the association has many qualms regarding 3D printing firearms, perhaps the foremost being the propensity of these firearms to evade ballistics investigations. *Id.*

¹⁷⁴ See *Reed v. Town of Gilbert*, 135 S. Ct. 2218, 2221 (2015) (highlighting the public's ability to distinguish important road signs from temporary directional signs as a compelling government interest); *Skinner v. Ry. Labor Executives' Ass'n*, 489 U.S. 602, 602 (1989) (holding that the public safety concern of having safe railways demarcates the drug testing of railway employees as a compelling governmental interest).

4. Broad Implications with Narrow Application: The 3D Printed Gun Safety Act of 2019 is Narrowly Tailored to Serve the Compelling Interests of Public Safety and National Security

Concluding that the prohibition concerns a compelling governmental interest, the next analysis is whether the regulation is narrowly tailored to further that compelling interest using the least restrictive means.¹⁷⁵ Leaving open ample avenues for the communication of ideas regarding the manufacture, design, and function of firearms, a ban on CAD files that automatically instruct a 3D printer with no input from the maker, does not unduly inhibit conversation surrounding firearms.¹⁷⁶ Alternatively, the fact that the proposed ban only speaks to the functional and not expressive nature of these CAD files may persuade the court in inquiry that the ban is not a content-based restriction at all.¹⁷⁷ This contention is bolstered through the fact that a blueprint containing the exact information present in a banned CAD file, excluding the ability to print directly after download, would be a permissible exercise of speech.¹⁷⁸ Therefore, the ban of certain firearm CAD files proposed by the 3D

¹⁷⁵ See *Reed v. Town of Gilbert*, 576 U.S. 155 S. Ct. 2218, 2224 (2015) (imposing the most demanding standard of judicial review when laws infringe upon an individual's free speech, strict scrutiny). This two-part test mandates first that a compelling governmental interest is served by the law or regulation. *Id.* Secondly, the regulation or law must be narrowly tailored to serve that purpose so as to not infringe needlessly on other liberties. *Id.*

¹⁷⁶ See 3D Printed Gun Safety Act of 2019, H.R. Res. 3265, 116th Cong. (2019) (allowing by implication all which is not forbidden in the Bill, including all conversation surrounding firearms that does not automatically program a printer to produce a completed firearm); 3D Printed Gun Safety Act of 2019, S. 1831, 116th Cong., (2019) (allowing the same discourse on the topic of firearms as its sister bill in the House).

¹⁷⁷ See Blackman, *supra* note 13, at 528 (suggesting a difference between source code and object code). Source code has a better chance at being labelled speech by the court of inquiry as it is human created. *Id.* Thus, object code, the code read and understood by the computer, may be able to be regulated outside of the parameters of the First Amendment. *Id.*

¹⁷⁸ See 3D Printed Gun Safety Act of 2019, H.R. Res. 3265, 116th Cong. (2019) (allowing digital blueprints as long as the corresponding object code does not automatically produce a finished object through interaction with the printer).

Printed Gun Safety Act of 2019 will stand up to First Amendment challenge.

C. *The Right to Bear Reasonably: How a Ban on Certain CAD Files Does not Infringe Upon the Individual Gun Ownership Right*

In addition to First Amendment implications, the 3D Printed Gun Safety Act of 2019 must be analyzed under the protections of the Second Amendment.¹⁷⁹ The Second Amendment's guarantee of the right to bear arms includes not only the right to purchase firearms, but the right to self-manufacture.¹⁸⁰ This historical right to personal production of a firearm; however, could not have grappled with the complexity of 3D printed firearms, nor the democratization of the process to those with no skill or expertise.¹⁸¹ Thus, as the First Amendment before it, the seemingly plenary right emboldened in the Second Amendment is bridled with exception.¹⁸²

¹⁷⁹ See U.S. CONST. amend. II (guaranteeing that the right to bear arms shall not be infringed); Berkowitz, *supra* note 6, at 64 (claiming that any regulation on 3D printed firearms will implicate not only the First Amendment, but the Second Amendment as well).

¹⁸⁰ See Berkowitz, *supra* note 6, at 75 (claiming that the Second Amendment protects not only the right to acquire firearms, but logically the right of individuals to build their own). See also ATF, *supra* note 46 (stating that an individual may build a firearm for personal use with no license).

¹⁸¹ See ATF, *supra* note 46 (stating that an individual does not need a license to build a firearm for personal use). If an individual wishes to manufacture a firearm for sale or distribution, that individual must procure a license. *Id.* Further, restrictions exist on the kind of firearms able to be assembled without a license. *Id.* An individual is only allowed to assemble sporting semi-automatic rifles or shotguns without a license. *Id.* Additionally, the firearms manufactured by individuals without licenses must not be comprised of ten or more imported parts, and must be detectable by metal detectors or X-ray machines. *Id.* See also Berkowitz, *supra* note 6, at 65 (observing that the "current firearm legislation is tailored towards acquiring and possessing commercially-made weapons"). The laws are tailored to the acquiring and possession of commercially made weapons because prior to the advent of 3D printed firearms, individuals did not have the opportunity to produce complex homemade weapons. *Id.* However, 3D printing does not require a specialized knowledge of firearms manufacturing, allowing the average person to readily create 3D printed homemade firearms. *Id.* at 64.

¹⁸² See *District of Columbia v. Heller*, 554 U.S. 570, 647 (2008) (outlining exceptions inherent in the plenary language of the Second Amendment including a

1. Not in Common Usage . . . Yet: The 3D Printed Gun Safety Act of 2019 Does Not Deprive Law Abiding Individuals from a Firearm in Common Use

The Supreme Court's holding in *Heller* delineated perhaps the most important of these exceptions, inquiring whether the firearm regulated or banned is "typically possessed by law-abiding citizens for lawful purposes."¹⁸³ As the use of 3D printed firearms pales in comparison to the staggering proliferation of the use of traditional firearms in America, a reviewing court would be hard pressed to state they are in common usage.¹⁸⁴ Further, this exception provides urgency to the passage of the 3D Printed Gun Safety Act before 3D printed firearms achieve widespread popularity.¹⁸⁵ Despite the tragedies which have been perpetrated with 3D printed firearms, improvements to the 3D printing process threaten even graver consequences.¹⁸⁶ For instance, developers are finding ways to monitor the printing process to minimize quality control errors, including software which can detect inconsistencies in parts during printing.¹⁸⁷ As technological developments increase the quality of

not in common usage exception and an exception prohibiting the ownership of dangerous and unusual weapons).

¹⁸³ See *id.* (outlining the not in common usage exception, allowing the regulation of firearms that are not in common use at the time of a law's passage).

¹⁸⁴ See Ingraham, *supra* note 73 (noting that the number of guns owned by civilians in the United States outnumbers the number of citizens by 50 million). Compare McCue, *supra* note 5 (stating that around 500,000 3D printers were sold to the public between 2016 and 2018).

¹⁸⁵ See Diamandis, *supra* note 76 (positing upcoming improvements to the 3D printing process that may make the proliferation of 3D printing firearms even more widespread).

¹⁸⁶ See Hoffman & Ware, *supra* note 131 (outlining the first instance of a deadly attack with a 3D printed gun). See also Diamandis, *supra* note 76 (outlining expected major developments in 3D printing including an increase in speed of print times and the increased use of 3D printing metals as prices decrease); Hafner, *supra* note 109 (detailing how a 3D printed gun made of metal is likely to be more functional than one made out of plastic). However, metal 3D printers cost far more than plastic 3D printers. *Id.*

¹⁸⁷ See Straub, *supra* note 19 (showing that currently the quality control of 3D printers is largely left to the person doing the printing). The absence of commercial

3D printed firearms, the availability of such weapons will also increase.¹⁸⁸ As more and more individuals turn to 3D printing to acquire their firearms, these firearms may ultimately become “typically possessed by law-abiding citizens for lawful purposes,” rendering regulation far harder to implement under the Second Amendment.¹⁸⁹

2. Unconventional and Unsafe: The 3D Printed Gun Safety Act of 2019 Protects Against the Proliferation of Dangerous and Unusual Weapons

The *Heller* Court further recognized another limitation on the Second Amendment’s grant of rights first outlined in *United States v. Miller*—the prohibition on “carrying dangerous and unusual weapons.”¹⁹⁰ Akin to the short-barreled shotgun being ruled dangerous and unusual in *Miller* for its ability to be concealed and potential for nefarious abuse, 3D printed firearms pose immeasurable risks.¹⁹¹ Not only are they able to be manufactured to any dimension,

level quality control is especially problematic when printing firearms, due to the stresses put upon the plastic when firing projectiles. *Id.* Recent innovators have developed software which can detect inconsistencies in the 3D printed material, acting as a virtual quality assurance mechanism. *Id.*

¹⁸⁸ See *id.* (outlining improvements to the 3D printing process that will necessarily increase the quality of printed materials); Filindra *supra* note 76 (explaining that the demand for 3D printable gun files online will increase the demand for cheaper printers that can produce these files). The nature of the economic forces of supply and demand dictate that the increased interest in CAD files will naturally translate to an increased demand for printers that can produce these designs at a cheaper cost. *Id.*

¹⁸⁹ See *District of Columbia v. Heller*, 554 U.S. 570, 646 (2008) (Stevens, J., dissenting) (highlighting that Second Amendment protection does not usually extend to weapons which are not in common usage); Mendoza, *supra* note 7 (stating projections for an estimated and impending explosion of 3D printing technology).

¹⁹⁰ See *United States v. Miller*, 307 U.S. 174, 178 (1939) (recognizing the ability of government to prohibit classes of firearms deemed to be dangerous and unusual).

¹⁹¹ See *id.* (outlining the dangerous propensities of short barreled shotguns which make them unusual and dangerous including their ability to be concealed); 164 CONG. REC. S5506 (Jul. 31, 2018) (statement of Sen. Dianne Feinstein) (recognizing that a part of what makes 3D printed firearms dangerous is their lack of serial numbers); Hafner, *supra* note 109 (explaining that dissimilar from commercially manufactured firearms, 3D printed firearms do not bear serial

making them especially liable for clandestine operation, but they are also virtually undetectable by X-ray machine, able to be produced by prohibited classes, lack traditional tracing tools such as serial numbers, lack reliable ballistics matching technology, and are incredibly dangerous to the user.¹⁹² Further, a prohibition on the spread of CAD files that are capable of autonomously producing firearms through very minimal participation of the user does not impinge upon the most important values that the Amendment protects; namely self-defense, and hunting.¹⁹³ Conventional firearms are available to all those who are not prohibited from using them for the aforementioned purposes, are safer, and are able to be effectively regulated under current law.¹⁹⁴ Therefore, a complete ban on the sharing and downloading of CAD files that can automatically program a 3D printer to produce or complete a firearm, like that proposed in the 3D Printed Gun Safety Act of 2019, is congruent with current Second Amendment jurisprudence, and does not deprive law abiding citizens of their right to bear arms.

numbers, thus hindering law enforcement in tracing crimes); Hoffman, *supra* note 131 (outlining the first instance of a deadly shooting perpetrated with 3D printed firearms); Smith, *supra* note 15, at 86 (stating that 3D printed guns which are printed by personal printers may be prone to explosion); Straub, *supra* note 19 (claiming that 3D printed guns may be more dangerous to their users than any potential targets).

¹⁹² See Berkowitz, *supra* note 6, at 53 (explaining that virtually no barriers of entry exist to the 3D printer market, enabling anyone to produce 3D printed firearms); Greenberg, *supra* note 99 (detailing 3D printed firearms' propensity to explode when fired); Hafner, *supra* note 109 (explaining that 3D printed guns have the ability to bypass metal detectors, a security measure used to screen for weapons).

¹⁹³ See *District of Columbia v. Heller*, 554 U.S. 570, 599 (2008) (explaining the purposes for the Second Amendment's promulgation and continuance, including self-defense and hunting).

¹⁹⁴ See generally National Firearms Act of 1934, 26 U.S.C. § 5844 (enumerating protections established by the first major gun control legislation in the history of the United States); Gun Control Act of 1968, Pub. L. No. 90-618, § 101, 82 Stat. 1213 (enumerating the safeguards promulgated by the Gun Control Act including establishment of prohibited classes); 22 U.S.C.S. § 2778 (setting forth the provisions of the Arms Export Control Act, namely the Executive Branch's ability to determine weapons and weapon information which are placed on the United States Munitions List, and thus prohibited from export to other nations).

V. Conclusion

Since the advent of viable 3D printed firearms, announced by the introduction of Defense Distributed's Liberator in 2013, the public has grappled with this remarkably alien technology. In providing an outlet for creative expression and an avenue through which individuals may exercise their Second Amendment rights, the 3D printing of firearms seemingly champions the first two freedoms guaranteed by the Constitution. Conversely, the propensity of 3D printed firearms to explode given the lack of quality assurance in the manufacturing process, coupled with their undetectable, untraceable, and clandestine nature make these weapons dangerous to those who wield them and to the public at large. Given the futility of the current federal firearms regulations in dealing with this threat, strong and sensible regulation is needed to address this issue. The adoption of the 3D Printed Gun Safety Act of 2019 and its ban on the sharing of CAD files that are able to automatically program a 3D printer to produce or complete a firearm is a constitutionally permissible exercise of authority that will assist in addressing the issue.