

3D-PRINTED FIREARMS, DO-IT-YOURSELF GUNS, & THE SECOND AMENDMENT

JAMES B. JACOBS* AND ALEX HABERMAN**

I

INTRODUCTION

In December 2012, Cody Wilson, a law student and self-described anarchist,¹ posted to the Internet free software that instructs a three-dimensional (3D) printer² to make plastic gun parts and a functional gun. At a demonstration widely covered by the media, Wilson fired a single bullet from a 3D-printed gun called “the Liberator.”³ He also posted to Kim Dotcom’s website⁴ the software (computer numerical code) that directs the printing.⁵ Wilson and his supporters hailed this technological breakthrough as a giant step toward making firearms more publicly accessible and unsusceptible to regulation.⁶ According to Wilson,

Copyright © 2017 by James B. Jacobs and Alex Haberman.

This article is also available online at <http://lcp.law.duke.edu/>.

* Chief Justice Warren E. Burger Professor of Law, NYU School of Law.

** Fordham School of Law.

1. Nick Leghorn, *An Interview with Cody R. Wilson of the WikiWeapon 3D Gun Printing Project*, THE TRUTH ABOUT GUNS.COM (Oct. 9, 2012), <http://www.thetruthaboutguns.com/2012/10/foghorn/an-interview-with-cody-r-wilson-of-the-wiki-weapon-3d-gun-printing-project/> [<https://perma.cc/9ATD-ABSD>].

2. *What is 3D Printing?*, 3DPRINTING.COM, <http://3dprinting.com/what-is-3d-printing/> [<https://perma.cc/G6T8-DU6D>] (last visited Aug. 26, 2016).

3. John Biggs, *What You Need To Know About The Liberator 3D-Printed Pistol*, TECHCRUNCH (May 6, 2013), <http://techcrunch.com/2013/05/06/what-you-need-to-know-about-the-liberator-3d-printed-pistol/> [<https://perma.cc/36GS-ZBYK>].

4. See Andy Greenberg, *3D Gun’s Printed Blueprints Downloaded 100,000 Times In Two Days (With Some Help From Kim Dotcom)*, FORBES (May 8, 2013, 5:12 PM), <http://www.forbes.com/sites/andygreenberg/2013/05/08/3d-printed-guns-blueprints-downloaded-100000-times-in-two-days-with-some-help-from-kim-dotcom/#10da66cd88c6> [<https://perma.cc/5JBR-GXBW>]; Andy Greenberg, *\$25 Gun Created With Cheap 3D Printer Fires Nine Shots (Video)*, FORBES (May 20, 2013, 11:51AM), <http://www.forbes.com/sites/andygreenberg/2013/05/20/25-gun-created-with-cheap-3d-printer-fires-nine-shots-video/#41f4a5da457e> [<https://perma.cc/6TKX-W7GD>]; see also Michael L. Smith, *The Second Amendment Implications of Regulating 3D Printed Firearms*, 31 SYRACUSE J. SCI. & TECH. L. REP. 60, 66 (2015) (stating that shortly after Wilson’s demonstration, an engineer in Wisconsin printed a firearm that fired nine shots).

5. Kim Dotcom is the creator of Megaupload, an online file-sharing website that has been accused of sharing copyrighted material. Stacey Higginbotham, *Everything You Need to Know About Kim Dotcom and Megaupload*, FORTUNE: NEWS (Dec. 23, 2015, 3:03 PM), <http://fortune.com/2015/12/23/kim-dotcom-megaupload/> [<https://perma.cc/JSQ3-M4HN>].

6. Cody Wilson stated, “[i]t’s a total cultural victory[.]” Brian Doherty, *What 3-D Printing Means*

“[I]n this world, in the world we want to create, anyone who wants access to a firearm can have access. Because we believe that is a right that no one should be allowed to infringe. Especially political actors Gun rights are human rights.”⁷ Wilson’s demonstration was excoriated by gun control advocates because a 3D-printed plastic gun evades metal detection and is not traceable to its maker.⁸

The Directorate of Defense Trade Controls (DDTC), the U.S. State Department’s unit in charge of administering and enforcing the Arms Export Control Act, advised Wilson to remove his 3D firearm printing software from the Internet⁹ because it “might” violate the Act as interpreted by the State Department’s International Traffic in Arms Regulations.¹⁰ The Regulations require State Department permission to export “defense articles.”¹¹ Export means: (1) “sending or taking a defense article out of the United States in any manner, except by mere travel outside of the United States by a person whose personal knowledge includes technical data,” and (2) “disclosing (including oral or visual disclosure) or transferring technical data to a foreign person, whether in the United States or abroad.”¹² “Defense article” means articles and items on the U.S. Munitions List.¹³ The list includes “technical data,” defined as “information

for Gun Rights, REASON.COM (Dec. 12, 2012), <http://reason.com/archives/2012/12/12/what-3-d-printing-means-for-gun-rights> [<https://perma.cc/W9VP-Q66V>]. On Pirate Bay, one of the file sharing websites hosting Wilson’s software, one person posted the following comment: “This is the first in what will become an avalanche of undetectable, untraceable, easy-to-manufacture weapons that will turn the tables on evil-doers the world over.” Greenberg, *3D Gun’s Printed Blueprints*, *supra* note 4.

7. Leghorn, *supra* note 1.

8. See Michael Zennie & Tim Perone, *Texas anarchist group fires world’s first 3-D printed gun made entirely from plastic that can pass through airport metal detectors*, DAILYMAIL.COM: NEWS (May 6, 2013, 11:52 AM), <http://www.dailymail.co.uk/news/article-2320264/3D-printer-gun-Texas-anarchist-group-fires-worlds-pistol-entirely-plastic.html> [<https://perma.cc/XN85-R45T>].

9. Defendant, United States Department of State, sent Defense Distributed a letter stating: “DTCC/END is conducting a review of technical data made publicly available by Defense Distributed through its 3D printing website, DEFCAD.org, the majority of which appear to be related to items in Category I of the [Munitions List]. Defense Distributed may have released ITAR-controlled technical data without the required prior authorization from the Directorate of Defense Trade Controls (DDTC), a violation of the ITAR.” Complaint at 25, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W. D. Tex. Aug. 4, 2015) (No. 1:15-cv-372), 2015 WL 2149795. Wilson himself said, “The technology will break gun control.” QUOTES, <http://www.quotes.net/authors/Cody%20Wilson> [<https://perma.cc/7ZAU-TZHP>], (last visited Aug. 26, 2016).

10. The Arms Export Control Act authorizes the President to control the import and export of defense articles and defense services and to promulgate regulations for the import and export of such articles and services. 22 U.S.C. § 2778(a)(1) (2012). Exporting a defense article without permission is a federal felony punishable by a 20-year maximum prison term, million-dollar fine and \$500,000 civil penalty. 22 U.S.C. § 2778(c) (2012); 22 C.F.R. § 127.3 (2016).

11. The President delegated his Arms Export Control Act authority to the State Department, which promulgated the ITAR. The State Department’s Directorate of Defense Trade Controls (DDTC) administers the ITAR. See Exec. Order No. 13637, 78 Fed. Reg. 16,129 (March 13, 2013); 22 C.F.R. §§ 120–130 (2016). See Jonathan Sanger, *A Brief History of: 3D Guns*, VOCATIV (Feb. 6, 2016, 4:38 PM), <http://www.vocativ.com/video/usa/guns/a-brief-history-of-3d-printed-guns/> [<https://perma.cc/MW72-EDDS>] for a brief history of 3D-printed guns.

12. 22 C.F.R. § 120.17(a)(1)–(4) (2016).

13. 22 C.F.R. § 120.10(a)(2) (2016). See also 22 C.F.R. § 120.6 (2016) (defining “defense article”).

in the form of blueprints, drawings, photographs, plans, instructions or documentation” and “*software* directly related to defense articles.”¹⁴ Therefore, posting to the Internet technical data related to manufacturing defense articles constitutes arms exporting under the Act.

Wilson complied with DDTC’s request. However, in the few days before he removed the software from the Internet, it was downloaded more than 100,000 times¹⁵ and reposted to other websites.¹⁶ Moreover, neither DDTC nor any other government agency prohibited Wilson from selling or giving his software away on a flash drive or via email as long as it is distributed in the United States. He formed a company, Defense Distributed, to sell 3D printers programmed to print firearms and firearms parts to Americans within the United States. Thus, anyone in the United States could easily obtain Wilson’s 3D firearms printing software and hardware from Wilson himself, and a foreign person or entity could easily obtain these products through a willing U.S. intermediary, or from a foreign person who downloaded the software either from Wilson’s website before he removed it from the Internet or from another website.¹⁷

Wilson sought to overturn the removal order by obtaining a “commodity jurisdiction determination”¹⁸ from DDTC.¹⁹ Consequently, Wilson, on behalf of Defense Distributed, submitted ten “commodity jurisdiction requests” pertaining to his software for 3D printing firearms.²⁰ On September 25, 2014,²¹ while its commodity jurisdiction requests were pending, Defense Distributed sought prepublication approval from the Defense Office of Prepublication and

14. 22 C.F.R. § 120.10(a)(1)–(4) (2016) (emphasis added).

15. Greenberg, *3D Gun’s Printed Blueprints*, *supra* note 4.

16. Jennifer Preston, *Printable-Gun Instructions Spread Online After State Dept. Orders Their Removal*, N.Y. TIMES (May 10, 2013, 5:19 PM), http://thelede.blogs.nytimes.com/2013/05/10/printable-gun-instructions-spread-online-after-state-dept-orders-their-removal/?_r=1 [<https://perma.cc/YF7E-GANV>]; *see also* *Defiant Pirate Bay to continue hosting banned 3D printer gun designs*, RT (May 10, 2013, 9:07 PM), <https://www.rt.com/news/liberator-gun-defcad-pirate-bay-122/> [<https://perma.cc/9YAV-HCLV>].

17. Though Wilson was briefly allowed to sell his software in this manner, after litigation commenced he was required to obtain approval before selling or releasing the software outside the United States.

18. A potential exporter may resolve any doubts about whether the real or intellectual property he intends to export is covered by the U.S. Munitions List by obtaining a “commodity jurisdiction determination” from DDTC. *See* U.S. Dep’t of State, Directorate of Def. Trade Controls, *Commodity Jurisdiction*, http://www.pmdtc.state.gov/commodity_jurisdiction/ [<https://perma.cc/QP7Y-FXNS>].

19. Brief for the Appellants at 23, *Def. Distributed v. U.S. Dep’t of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 8593070, at *24; *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680, 687 (W. D. Tex. Aug. 4, 2015); *see also* 22 C.F.R. § 120.4(a) (2016).

20. The purpose of a commodity jurisdiction request is to obtain a State Department opinion on whether an item or service is covered by the U.S. Munitions List and therefore subject to export controls. *See* U.S. Dep’t of State, Directorate of Def. Trade Controls, *supra* note 18; *see also* Brief for the Appellants at 23, *Def. Distributed v. U.S. Dep’t of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 8593070, at *23.

21. Brief for Appellants at 23, *Def. Distributed v. U.S. Dep’t of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 8593070, at *24, and *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680, 687 (W.D. Tex. Aug. 4, 2015).

Security Review²² to publish on the Internet computer numerical control²³ files for producing “Ghost Gunner,” a computer-instructed machine that mills a metal block—or, “blank”—into a lower receiver for an AR-15.²⁴ Uncertain as to whether Ghost Gunner was subject to the International Traffic in Arms Regulations, the Office of Prepublication and Security Review decided not to provide an opinion.²⁵ Defense Distributed then submitted to DDTC a commodity jurisdiction request pertaining to the computer numerical code that operates Ghost Gunner as well as to the Ghost Gunner itself.²⁶ On April 15, 2015, DDTC informed Defense Distributed that the Ghost Gunner milling machine, user manual, and operating software were not covered by the Regulations, but that six items of technical data (software, data files, project files, coding, and models for producing a defense article, including an AR-15 lower receiver)²⁷ could not be posted to the Internet.²⁸

Wilson, joined by the Second Amendment Foundation, filed a federal lawsuit in the Western District of Texas against the United States Department of State, Secretary of State John Kerry, the DDTC, and certain DDTC personnel in their official and individual capacities, seeking a declaratory judgment, an injunction, and compensatory and punitive damages.²⁹ The complaint alleged that the prepublication review procedure violated the First Amendment (as a prior restraint on speech), Second Amendment (as a denial of right to make firearms implicit in right to keep and bear arms), and Fifth Amendment (as a denial of

22. See *Defense Office of Publication and Security Review (DOPSR): Military Industrial Base*, WASHINGTON HEADQUARTERS SERVICES: ESD ONLINE, http://www.dtic.mil/whs/esd/osr/osr_mib.html [<https://perma.cc/MZ5S-MGQP>] (last visited Aug. 26, 2016), for more information about the Defense Office of Prepublication and Security Review.

23. Computer numerical control (CNC) is a computer-aided design (CAD) protocol that converts spatial designs into a series of numbers. *Computer Numerical Control (CNC)*, TECHOPEDIA, <https://www.techopedia.com/definition/11228/computer-numerical-control-cnc> [<https://perma.cc/L69C-89KC>] (last visited Nov. 8, 2016).

24. Brief for Appellants at 24, *Def. Distributed v. U.S. Dep’t of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 8593070, at *24. See Caleb Kraft, *Ghost Gunner: A CNC Mill For Making Untraceable Guns*, MAKEZINE.COM (Oct. 1, 2014, 7:12 AM), <http://makezine.com/2014/10/01/ghost-gunner-a-cnc-mill-for-making-untraceable-guns/> [<https://perma.cc/K7ML-YMQW>], for additional information on “Ghost Gunner” and how a CNC mill specifically makes gun parts. See also *Modern Sporting Rifle Facts*, NATIONAL SHOOTING SPORTS FOUNDATION, <http://www.nssf.org/msr/facts.cfm> [<https://perma.cc/9QWD-5ADA>] (last visited Nov. 8, 2016), for more information on the modern sporting rifle based on the AR-15 platform.

25. See Brief for Appellants at 24, *Def. Distributed v. U.S. Dep’t of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 8593070, at *24.

26. See *id.*

27. The first step in manufacturing a firearm is milling a blank. Colloquially a blank is often referred to as an “80%” receiver, a piece of metal or plastic which, after drilling and milling, can accommodate the various parts of the firearm (trigger, grip, ammunition feeder, barrel, etc.). See *What is an “80%” or “unfinished” receiver?*, ATF.GOV, <https://www.atf.gov/firearms/qa/what-80-or-unfinished-receiver> [<https://perma.cc/TU4S-CZEN>] (last visited Sept. 23, 2016).

28. Complaint at 8, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015), (No. 1:15-cv-372), 2015 WL 2149795.

29. *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680, 688 (W.D. Tex. Aug. 4, 2015).

due process).³⁰ According to Defense Distributed, but for the government's prepublication procedures, it would distribute CDC files for manufacturing Ghost Gunner.³¹ The Second Amendment Foundation argued that the State Department's order violated its members' Second Amendment right to acquire firearms.³²

This article focuses on plaintiffs' Second Amendment challenge to the government's attempt to keep 3D printing firearms software off the Internet. However, this should not be construed as a comment on the substantiality of the plaintiffs' statutory and First and Fifth Amendment arguments, that is, whether the Arms Export Control Act authorizes prepublication review of privately generated software for making small arms and, if it does, whether this regulatory scheme violates the First and Fifth Amendments. Part II examines the Second Amendment arguments made by plaintiff and defendants in *Defense Distributed v. United States Department of State*. Parts III and IV place 3D firearms printing in the context of do-it-yourself gunsmithing. Part V considers the future regulation of gunsmithing in light of these technological developments. Part VI offers concluding thoughts.

II

SECOND AMENDMENT ISSUE

Defense Distributed and the Second Amendment Foundation ("SAF") maintain that the Second Amendment guarantees to the people the right to operate a business that disseminates information about the production and use of small arms, and that Defense Distributed properly exercised that right by posting to the Internet files that promote gunsmithing technology.³³ SAF argues that it has standing to participate as co-plaintiff because the Regulations and DDTC's rulings on Defense Distributed software limit its members' opportunity to acquire 3D-printed firearms and firearm parts necessary for self-defense in the home.³⁴ "Because there is a right to possess handguns, there is, necessarily, a right to acquire them. And the most basic means of acquiring something, is to make it."³⁵ Thus, according to SAF, the State Department's refusal to permit Defense Distributed software to be posted to the Internet "[i]nfring[es] upon the creation

30. Complaint at 11, *Def. Distributed v. U.S. Dep't of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015), (No. 1:15-cv-372), 2015 WL 2149795.

31. Previously, the U.S. Department of Justice advised the State Department that its prepublication procedure constituted an unconstitutional prior restraint on speech.

32. Memorandum of Points and Authorities in Support of Plaintiffs' Motion For Preliminary Injunction at 25, *Def. Distributed v. U.S. Dep't of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015) (No. 15-CV-372-RP), 2015 WL 11022446.

33. *Def. Distributed v. U.S. Dep't of State*, 121 F. Supp. 3d 680, 688 (W.D. Tex. Aug. 4, 2015).

34. *See id.* at 697-98.

35. Memorandum of Points and Authorities in Support of Plaintiffs' Motion For Preliminary Injunction at 26, *Def. Distributed v. U.S. Dep't of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015) (No. 15-CV-372-RP), 2015 WL 11022446.

and acquisition of arms of the kind in common use for traditional lawful purposes.”³⁶

In response, Defendants acknowledge that the Supreme Court’s decisions in *District of Columbia v. Heller*³⁷ and *McDonald v. City of Chicago*³⁸ establish that, at its core, the Second Amendment guarantees to Americans the right to armed self-defense in their homes with firearms that are in common use for self-defense purposes.³⁹ The Defendants argue that DDTC’s decisions restricting Defense Distributed’s export of small arms technology do not violate the Second Amendment because Defense Distributed is free to distribute its firearms and software within the United States and SAF’s American members are free to purchase Defense Distributed’s products.⁴⁰ The government’s refusal to permit Defense Distributed’s software to be posted to the Internet aims to prevent that software’s acquisition by foreign governments, organizations, and individuals, none of whom have Second Amendment rights.⁴¹ Defendants also emphasize that *Heller* stated that the Second Amendment is not infringed by firmly historically rooted⁴² regulations. They insist that restrictions on arms exports are firmly and historically rooted,⁴³ pointing to a one-year moratorium on the exportation of arms just three years after ratification of the Bill of Rights.⁴⁴ Moreover, in 1902, Congress approved a treaty to prevent the export of arms to Pacific nations.⁴⁵ Therefore, according to the defendants, prohibiting export of firearms blueprints and designs is a “firmly historically rooted” regulation.⁴⁶

36. Complaint at 50, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015) (No. 1:15-cv-372), 2015 WL 2149795 (quoting *District of Columbia v. Heller*, 554 U.S. 570, 627 (2008)).

37. *District of Columbia v. Heller*, 554 U.S. 570 (2008).

38. *McDonald v. City of Chicago*, 561 U.S. 742 (2010).

39. *Heller*, 554 U.S. at 571 (internal citation omitted).

40. Defendants’ Opposition to Plaintiffs’ Motion for a Preliminary Injunction at 25–26, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015), (No. 1:15-cv-372-RP), 2015 WL 9666486.

41. As a general matter, the U.S. Constitution applies to U.S. citizens worldwide and to non-U.S. citizens within the fifty states and the District of Columbia, but not to non-U.S. citizens in foreign countries. See *Zadvydas v. Davis*, 533 U.S. 678, 693 (2001); *United States v. Verdugo-Urquidez*, 494 U.S. 259, 264–75, 275–78 (1990); *Reid v. Covert*, 354 U.S. 1, 5–14 (1957) (plurality opinion); *Johnson v. Eisentrager*, 339 U.S. 763, 768–85 (1950).

42. Defendants’ Opposition to Plaintiffs’ Motion for a Preliminary Injunction at 26, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015), (No. 1:15-cv-372-RP), 2015 WL 9666486.

43. See Peter K. Tompa, *The Arms Export Control Act and Congressional Codetermination Over Arms Sales*, 1 AM. U. INT’L L. REV. 291, 291–330 (1986) (discussing the historical background of the Arms Export Control Act’s restrictions on arms exportation).

44. Defendants’ Opposition to Plaintiffs’ Motion for a Preliminary Injunction at 26, *Def. Distributed v. U.S. Dep’t of State*, 121 F. Supp. 3d 680 (W.D. Tex. Aug. 4, 2015) (No. 1:15-cv-372-RP), 2015 WL 9666486.

45. *Id.*

46. *Id.*

Judge Robert Pitman, drawing on Fifth Circuit precedent, adopted a two-step inquiry for resolving the Second Amendment issue: First, determine whether the challenged governmental action impinges on a right protected by the Second Amendment. If it does, next determine whether the government interests are strong enough to justify the infringement.⁴⁷ On the first issue, he found no Second Amendment violation because “SAF members are not prohibited from manufacturing their own firearms [by methods other than 3D printing], nor are they prohibited from keeping and bearing [non-3D printed] firearms” that are widely available throughout the United States.⁴⁸ SAF members in the United States are free to acquire 3D printers, software, and products directly from Defense Distributed or from a third party wholesaler or retailer.⁴⁹

Though his holding that the plaintiff’s Second Amendment rights had not been violated could have concluded his opinion, Judge Pitman went on to consider whether, under intermediate scrutiny review,⁵⁰ the defendants’ orders furthered an important government interest.⁵¹ Judge Pitman found that the government has an important interest in preventing foreign governments and nationals from obtaining weaponry that could harm U.S. national security or foreign relations.⁵² Therefore, he denied plaintiffs’ motion for a declaratory judgment and preliminary injunction.

The plaintiffs appealed to the Fifth Circuit. Amici for Defense Distributed and SAF⁵³ include: Representative Thomas Massie (R. Ky) and Certain Other Members of the U.S. House of Representatives; Reporter’s Committee for Freedom of the Press; the Thomas Jefferson Center for the Protection of Free Expression; Cato Institute; Electronic-Frontier Foundation; Madison Society Foundation; and the Texas Public Policy Foundation. All the amici, except the Madison Society Foundation, argue that requiring State Department approval before posting CAD files to the Internet is an unconstitutional prior restraint on

47. Def. Distributed v. U.S. Dep’t of State, 121 F. Supp. 3d 680, 698 (W.D. Tex. Aug. 4, 2015).

48. *Id.* at 699.

49. *Id.*

50. In the wake of *Heller* and *McDonald*, practically all courts have adopted intermediate scrutiny review of Second Amendment claims. Intermediate scrutiny requires the government to demonstrate a “reasonable fit” between the challenged regulation and an important government objective. See Tina Mohr & Adam Winkler, *The Standardless Second Amendment*, AM. CONST. SOC’Y (2010), https://www.acslaw.org/sites/default/files/Mehr_and_Winkler_Standardless_Second_Amendment.pdf [<https://perma.cc/F5RX-YX6K>] (discussing how, in the wake of *Heller*, courts continue to use the reasonable regulation standard); Allen Rostron, *Justice Breyer’s Triumph in the Third Battle over the Second Amendment*, 80 GEO. WASH. L. REV. 703, 706–07 (2012) (discussing the lower courts adoption of an intermediate scrutiny test that is highly deferential to legislative determinations); Brett Snider, *Challenging Laws: 3 Levels of Scrutiny Explained*, FINDLAW: BLOGS (Jan. 27, 2014, 9:05 AM), http://blogs.findlaw.com/law_and_life/2014/01/challenging-laws-3-levels-of-scrutiny-explained.html [<https://perma.cc/66BF-8LQD>] (discussing the three levels of scrutiny courts commonly apply).

51. Def. Distributed v. U.S. Dep’t of State, 121 F. Supp. 3d 680, 699–700 (W.D. Tex. Aug. 4, 2015).

52. *Id.*

53. No amicus briefs were filed in support of the defendants’ position.

speech.⁵⁴ The Madison Society Foundation's amicus brief⁵⁵ provides a history of U.S. gunsmithing, argues that Americans have always been free to make guns for their own use and that producing firearms via 3D-printing technology follows that tradition.

The government has the better of the Second Amendment issue. Regulating do-it-yourself gun making has negligible, if any, impact on accessibility of firearms, which are so easily and plentifully available.⁵⁶ Even prohibiting 3D-printed firearms might be justifiable given that: (1) 3D-printed firearms are not in common use;⁵⁷ (2) 3D-printed firearms pose special safety and regulatory problems; and (3) people wishing to have a gun at home for self-defense can select from hundreds, or perhaps thousands, of firearms models. Just as courts have rejected constitutional challenges to assault weapon bans,⁵⁸ they would likely also reject challenges to 3D-printed firearms bans. Indeed, the Second Amendment challenge to assault weapon prohibition is much stronger than a challenge to 3D-printed firearms prohibition because Colt's AR-15 is the best-selling rifle model in the United States,⁵⁹ and thus clearly "in common use," whereas there are today probably only a mere handful of functional 3D-printed firearms.

Furthermore, the government's restriction on Defense Distributed's dissemination of information about firearms and its distribution of its products is far from an outright ban. Defense Distributed can freely advertise, give away, or sell its 3D-printed firearms and firearms technology throughout the United States. What it cannot do is export its products abroad. Given the federal government's long-standing diplomatic and military interest in regulating the export of weapons,⁶⁰ this exercise of State Department discretion seems easily to overcome Defense Distributed's Second Amendment objections.

54. *Defense Distributed v. U.S. Department of State*, JOSH BLACKMAN'S BLOG, <http://joshblackman.com/blog/about-josh/defense-distributed-v-u-s-department-of-state/> [<https://perma.cc/V2ZR-42R9>] (last visited Jan. 12, 2017).

55. Brief of the Madison Soc'y Found., Inc., as Amicus Curiae in Support of Plaintiffs-Appellants, *Def. Distributed v. U.S. Dep't of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 9289398.

56. See generally Jessica Chasmar, *Hillary Clinton: We have too many guns 'in our homes'*, WASH. TIMES (Apr. 21, 2016) <http://www.washingtontimes.com/news/2016/apr/21/hillary-clinton-we-have-too-many-guns-in-our-homes/> [<https://perma.cc/Z6GX-MG9G>], for the proposition that America is awash with firearms.

57. Any new firearm model will initially not be in common use.

58. *Compare* *Kolbe v. Hogan*, 636 F. App'x 880 (4th Cir. 2016), with *New York State Rifle & Pistol Ass'n, Inc. v. Cuomo*, 804 F.3d 242 (2d Cir. 2015), and *Friedman v. City of Highland Park*, 784 F.3d 406 (7th Cir. 2015). Recently, the Fourth Circuit reversed a panel decision that held an assault weapon ban unconstitutional. See *Kolbe v. Hogan*, 849 F.3d 114.

59. *Top 5 Best Sellers List*, GUNBROKER.COM, <http://www.gunbroker.com/Top5/2016-02-GunBroker-Top-5-Guns.html> [<https://perma.cc/Z3GW-9SHQ>] (last visited Aug. 26, 2016).

60. *Overview of U.S. Export Control System*, STATE.GOV, <https://www.state.gov/strategictrade/overview/> [<https://perma.cc/L6E9-4QNT>] (last visited Jan. 12, 2017).

SAF's insistence that the government has violated its members' right to acquire firearms is even weaker. The State Department's order to remove certain 3D firearms printing software from the Internet still leaves SAF's members free to acquire Defense Distributed's products, including software, directly from that company in person, by email, or snail mail, or to purchase those products indirectly via wholesalers and retailers. In addition, they have complete freedom to make all manner of firearms by means of traditional gunsmithing technologies. Of course, they can purchase from licensed firearms dealers or from private sellers hundreds, or perhaps thousands, of models of mass-produced handguns, rifles, and shotguns. In short, SAF members have access to a vast selection of firearms suitable for self-defense in the home. That the State Department's limited marketing restriction has generated such a vigorously contested lawsuit is a telling comment on the proliferation of Second Amendment litigation since the Supreme Court's decisions in *District of Columbia v. Heller* and *McDonald v. Chicago*.⁶¹

The brouhaha caused by Cody Wilson's demonstration of a rudimentary 3D-printed firearm is a good example of the symbolic character of much gun control debate. For all intents and purposes, Wilson's software was already public information by the time DDTTC told him to remove it from the Internet. And his software, 3D printers, and products were and are available from the manufacturer and retailers. Thus, the dispute over keeping Wilson's software off the Internet has little, if any, practical importance. However, it does call attention to whether gunsmithing should be regulated and, if so, how.

III

"TRADITIONAL" GUNSMITHING

3D firearms printing is the most recent chapter in the long history of American gunsmithing. Indeed, all firearms in the early republic were made by blacksmiths or specialized gunsmiths until the founding of Remington Arms in 1816.⁶² Guns were not mass-produced until the mid-nineteenth century.⁶³

61. Several organizations' websites keep track of Second Amendment litigation. See *Second Amendment Basics*, LAW CTR. TO PREVENT HANDGUN VIOLENCE, <http://smartgunlaws.org/the-second-amendment/> [<https://perma.cc/GT5X-CL4Q>] (last visited Aug. 26, 2016); *Second Amendment Legal Action*, SECOND AMEND. FOUND., <https://www.saf.org/2nd-amendment-legal-action/> [<https://perma.cc/VL3L-R5TM>] (last visited Aug. 26, 2016).

62. Brief of the Madison Soc'y Foundation, Inc., as Amicus Curiae in Support of Plaintiffs-Appellants at 6, *Def. Distributed v. U.S. Dep't of State*, No. 15-507559, 2016 WL 5383110 (5th Cir. 2016), 2015 WL 9289398 at *6.

63. See *Important Dates in the History of Firearms*, AMERICAN FIREARMS INSTITUTE: GUN HISTORY, <http://www.americanfirearms.org/gun-history/> [<https://perma.cc/2EXV-N8JK>] (last visited Aug. 26, 2016) (attributing the development of the first mass-produced, multi-shot, revolving firearm to Samuel Colt); Bruce Holsinger, *The Medieval Roots of our DIY Gun Culture*, SLATE (May 7, 2015, 6:56 PM) http://www.slate.com/articles/news_and_politics/history/2015/05/medieval_roots_of_our_diy_gun_culture_people_have_been_making_their_own.html [<https://perma.cc/M72T-52N4>] (claiming that the first experiments with gun-making dates back to the late Middle Ages); see also *Top 10 Frequently Asked*

However, even after that date, some individuals fixed and made guns in home workshops.⁶⁴ The total number of extant homemade guns is unknown.⁶⁵

Gunsmithing includes making a firearm from scratch, making a firearm from both self-manufactured and store-bought parts, and assembling a firearm from commercially available parts. Manufacturing from scratch requires more tools and greater expertise. Until the advent of computer numerical code machining, a gunsmith needed to cut, drill, and mill a metal blank to produce a receiver suitable for accommodating a barrel, grip, trigger mechanism, hammer or sear, and other parts.⁶⁶ Highly skilled gunsmiths did and still do produce very high-quality guns. However, there is also a history of criminals making crude guns, like the so-called “zip guns” popular throughout New York City in the 1950s⁶⁷ and guns made by prisoners.⁶⁸ Today, crude firearms are commonly made in small workshops in some countries that restrict mass-produced firearms for the civilian market.⁶⁹

Do-it-yourself gunsmithing today is supported and facilitated by books, manuals, websites, associations, and videos that explain and illustrate step-by-step how to manufacture various types of firearms.⁷⁰ Some gun enthusiasts also

Firearms Questions and Answers, ATF.GOV, <https://www.atf.gov/file/61721/download> [<https://perma.cc/V4LW-266H>] (last visited Aug. 26, 2016).

64. See generally Andy Greenberg, *After Orlando, The Homemade AR-15 Industry Surges*, WIRED (June 22, 2016, 7:00 AM), <https://www.wired.com/2016/06/orlando-homemade-ar-15-industry-surges/> [<https://perma.cc/S2RG-5C46>], for a modern day example.

65. Sari Horwitz, *Homemade guns exploit gun law loophole*, PORTLAND PRESS HERALD (May 15, 2014), http://www.pressherald.com/2014/05/15/homemade_guns_exploit_gun_law_loophole/ [<https://perma.cc/5DPJ-JQMV>]. It has been estimated that in California alone there are tens of thousands of homemade AR-15 assault weapons, but any estimate of the number of homemade assault weapons has to be taken with a grain of salt because there is no definitive definition of “assault weapon,” See James B. Jacobs, *Why Ban “Assault Weapons?”*, 37 CARDOZO L. REV. 681, 687 (2015).

66. The 80% unfinished receiver or blank has not yet reached a stage of manufacture that would qualify it as a firearm frame or receiver under the 1968 Gun Control Act (GCA). *What is an “80%” or “unfinished” receiver?*, ATF.GOV, <https://www.atf.gov/firearms/qa/what-80-or-unfinished-receiver> [<https://perma.cc/TU4S-CZEN>] (last visited Sept. 23, 2016).

67. See Bruce B. Koffler, *Zip Guns and Crude Conversions—Identifying Characteristics and Problems*, 61 J. CRIM. L. & CRIMINOLOGY 115, 116 (1970); see also HARLAN ELLISON, MEMOS FROM PURGATOR, 116 (1961).

68. See *10 Most Terrifying Prison Weapons*, YOUTUBE (Jan. 5, 2015), <https://www.youtube.com/watch?v=HqsgjZD1toE> [<https://perma.cc/43US-8RT9>] (displaying photos of prisoner-made crude guns).

69. See *Impro Guns*, HOME MADE GUNS, <https://homemadeguns.wordpress.com> [<https://perma.cc/RG9R-HJ48>] (last visited Aug. 26, 2016), for examples of crude, homemade guns; see also *Underworld Inc: Illegal Hand Made Colt 1911 Pistols Ghost Gun*, YOUTUBE (Apr. 8, 2016), https://m.youtube.com/watch?v=pq1TXEE_QK4 [<https://perma.cc/85LB-WBZU>], for a documentary on the underground gun market in the Philippines.

70. See *How to Build an AR-15 Video*, BROWNELLS, <http://www.brownells.com/.aspx/lid=11004/learn/> [<https://perma.cc/6VW3-2VHE>] (last visited Aug. 26, 2016); *Assembling an AR-15 Parts Checklist*, BROWNELLS, <http://www.brownells.com/UserDocs/Miscellaneous/ARCLform.pdf> [<https://perma.cc/CQ5W-9S2L>] (last visited Aug. 26, 2016); see also B. Gil Harmon, *Building a Custom AR-15 At Home*, NRA: AM. RIFLEMAN (Oct. 31, 2014), <http://www.americanrifleman.org/articles/2014/10/31/building-a-custom-ar-15-at-home/> [<https://perma.cc/T5JX-NF63>].

offer “group builds” for aspiring do-it-yourselfers.⁷¹ The build leader assigns participants to workstations that contain the materials and tools necessary to manufacture a particular firearm model. Then he or she guides the participants through the manufacturing process, taking care not to handle the student’s work product in order to avoid violating federal law governing unlicensed gun manufacturing.⁷² If the instructor has a manufacturing license, he can handle the student’s work product, but a gun made by a licensed manufacturer must bear an ATF-issued serial number and the transferee student must pass a NICS background check.⁷³

Less ambitious do-it-yourselfers can assemble a gun from commercially available kits that contain finished lower receivers and all necessary firearm parts.⁷⁴ The lower receiver, whether purchased from a licensed dealer in a kit or by itself, is the only part of the firearm that requires a serial number, and the retailer must initiate a federal background check on the purchaser and retain information about both the gun and its purchaser.⁷⁵ Considering how common

71. See Jay Grazie, *Build Your Own AR-15*, DAILY CALLER (Jan. 19, 2016, 11:02 AM), <http://dailycaller.com/2016/01/19/build-your-own-ar-15/> [<https://perma.cc/K3H5-RNMK>], for a build participant’s description.

72. The process can be completed in a day, especially if you build the rifle at a “building party,” where experts can assist you.

73. See 27 C.F.R. § 478.92 (2016); *When does a receiver need to have markings and/or serial numbers?*, ATF.GOV, <https://www.atf.gov/firearms/qa/when-does-receiver-need-have-markings-and-or-serial-numbers> [<https://perma.cc/G3YT-H89W>] (last updated Sept. 23, 2016); see also 18 U.S.C. § 922(t) (2012). It is illegal to make a firearm for someone else without a manufacturing license. 18 U.S.C. § 923 (2012).

74. See *Build A Firearm*, AMERICAN WEAPONS COMPONENTS, <http://aresarmor.com/store/Category/build-a-firearm> [<https://perma.cc/726U-96XA>] (last visited Aug. 26, 2016). The Polymer80 “Glock” is essentially a custom, plastic frame for a Glock 17 handgun (which also has a plastic frame). The frame requires minor work in order to make it capable of accepting Glock parts, which, when assembled, function with almost as much reliability as a store-bought Glock. In order to transform the frame into a working handgun the builder need only have a file, handheld electric drill, and sandpaper. YouTube videos show the frame being converted into a working firearm and all of the internal components assembled in under an hour. Converting the frame into a functional receiver and assembling the parts requires no special expertise or knowledge of handguns. Once complete, the handgun is visibly and functionally indistinguishable from a standard Glock handgun. See *M1911 pistol*, WIKIPEDIA, https://en.wikipedia.org/wiki/M1911_pistol [<https://perma.cc/R8YD-H37Y>] (last visited Jan. 12, 2016). The Stealth Arms 80% frame is in the 1911 handgun configuration (an all metal handgun). The kit is sold with an 80% frame and a vice-type device that holds the frame in place. The kit also contains a “sled” with a carbide cutter. Once the frame is placed in the vice, the sled is dragged over the frame in order to shave off excess material and allow the frame to accept a slide and barrel. This process turns the 80% frame into a functional receiver. See STEALTHARMS, <https://www.stealtharms.net>, [<https://perma.cc/ZM2Q-XTAT>] (last visited Jan. 12, 2016).

75. A private (unlicensed) person who sells a lower receiver need not retain information on the sale nor submit the purchaser’s name to the FBI for a background check. See Janet Gilger-Vander Zanden, *Homemade Guns: Are They Legal? Must They Be Registered?*, CRIM. DEF. LAW., <http://www.criminaldefenselawyer.com/resources/homemade-guns-are-they-legal-must-they-be-registered> [<https://perma.cc/WZ4N-YQ24>] (last visited Aug. 26, 2016) (stating that an individual wishing to avoid a background check can buy an unfinished receiver that falls outside the scope of the Gun Control Act of 1968); *Does an individual need a license to make a firearm for personal use?*, ATF.GOV, <https://www.atf.gov/firearms/qa/does-individual-need-license-make-firearm-personal-use> [<https://perma.cc/TV7D-ATGL>] (last visited Sept. 23, 2016) (stating that a license is not required to make firearms solely for personal use). See

gunsmithing has been, and is, the advent of 3D-printed firearms is arguably a modest technological development rather than a game changer.

IV

3D GUNSMITHING

Computer numerical controlled machines and 3D printers are new manufacturing technologies that can produce a wide range of products.⁷⁶ 3D printing is often called “additive” manufacturing.⁷⁷ A computer-directed 3D printer deposits successive layers of liquid plastic material over a platform to create the desired article.⁷⁸ However, applying this technology to gunsmithing is still in its early days. Cody Wilson’s “Liberator” fired only a single bullet before becoming dysfunctional or unreliable.⁷⁹ Plastic cannot withstand the explosion produced when the primer is ignited by the firing pin striking the cartridge. Even if a plastic gun survives the firing intact, it would likely be dented or cracked,⁸⁰ and firing subsequent bullets safely and accurately would be problematic. In terms of safety, durability, accuracy, and functionality, the best plastic 3D-printed firearms that now exist or are likely to be produced in the near future are significantly inferior to mass-produced metal firearms. Moreover, a 3D printer capable of printing rudimentary firearms parts costs approximately \$2,000; higher quality 3D printers \$6,000 to \$10,000.⁸¹ However, entrepreneurs can rent 3D printers at competitive rates. Cody Wilson’s Liberator is a crude gun printed in a single piece. Other 3D-printed firearms involve printing one part at a time, then

also 18 U.S.C. 922(o), (p), (r) (2012).

76. See Elizabeth Royte, *What Lies Ahead For 3-D Printing?*, SMITHSONIAN MAG. (May 2013), <http://www.smithsonianmag.com/science-nature/what-lies-ahead-for-3-d-printing-37498558/?no-ist> [<http://perma.cc/P427-NART>] (describing a collection of objects that can be produced through 3D printing).

77. See *What is Additive Manufacturing?*, ADDITIVE MANUFACTURING AMAZING, <http://additivemanufacturing.com/basics/> [<https://perma.cc/H8JN-2APA>] (last visited Aug. 26, 2016) (providing a description of the process of additive manufacturing whereby 3D objects are built using a layering process).

78. Matt Petronzio, *How 3D Printing Actually Works*, MASHABLE (Mar. 28, 2013), <http://mashable.com/2013/03/28/3d-printing-explained/> [<https://perma.cc/D99A-WXUU>] (“A 3D printer makes a solid, three dimensional object from a digital file . . . the user creates a design with computer aided design (CAD) or animation modeling software. The software creates a blueprint of the desired object and divides the object into digital cross sections. . . . [The printer makes] . . . a three dimensional object by laying down successive layers of material, which may be plastic, rubber, paper, polyurethane, or even metal. . . . Using the design created by the software, the printer transfers material by making multiple passes over a platform, depositing layer on top of layer in order to make the finished product.”); Janet Gilger-VanderZanden, *Are 3D Guns Legal?*, CRIM. DEF. LAW., <http://www.criminaldefenselawyer.com/resources/are-3d-guns-legal.htm> [<https://perma.cc/X6Q9-NE8A>] (last visited Sept. 30, 2016).

79. See Andy Greenberg, *Meet the ‘Liberator’: Test Firing the World’s First Fully 3d Printed Gun*, FORBES (May 5, 2013, 5:30 PM), <http://www.forbes.com/sites/andygreenberg/2013/05/05/meet-the-liberator-test-firing-the-worlds-first-fully-3d-printed-gun/#21a4fce5511e> [<https://perma.cc/Z46P-LZFH>].

80. See Scott J Grunewald, *What You Need to Know About 3D Printed Guns and Why You Don’t Need to Fear Them*, 3DPRINT.COM (June 23, 2016), <https://3dprint.com/139537/3d-printed-guns/> [<https://perma.cc/TM3Y-EPJ5>].

81. See Greenberg, *supra* note 79.

assembling them.⁸² This produces better firearms, but takes many hours and requires more complex software.⁸³

Since the Liberator demonstration, Cody Wilson and others have debuted a number of more durable and efficient 3D-printed firearms.⁸⁴ Defense Distributed's Ghost Gunner is a general-purpose milling machine,⁸⁵ programmed to mill a metal blank into an AR-15 lower receiver.⁸⁶ In November 2013, Solid Concepts released a handgun made of 3D-printed *metal* parts.⁸⁷ In November 2014, a machinist from Pennsylvania claimed to have designs for a plastic 3D-printed firearm with a bullet chamber capable of firing multiple rounds.⁸⁸ Proliferating announcements of manufacturing advances are hard to confirm, but it seems inevitable that this technology will advance and that cost will decrease. It is therefore none too soon to bring 3D gunsmithing into the debate about gun control. The following subparts discuss potential causes for concern.

A. Evading Metal Detection

Some observers feared that Wilson's 3D-printed gun would evade metal detection. If so, even if unreliable, it might be used by assassins and terrorists. As Representative Steve Israel (D. NY) warned: "[i]t's just a matter of time before you can construct an entire firearm that any terrorist with a thousand dollars and a 3D printer can get past the metal detector at the local airport and get on a plane."⁸⁹

82. Grunewald, *supra* note 80.

83. *Id.*

84. See Bridget Butler Millsaps, *Cody Wilson Announces Impending Release of 3D Files For \$150 Machine Gun; Some Fear He is 'Making Things Easier' for Terrorists*, 3DPRINT.COM (Jan. 25, 2016), <https://3dprint.com/116658/wilson-3d-files-machine-gun/> [<https://perma.cc/2XCK-QBDZ>] (announcing Wilson's debut of 3D files for a machine gun).

85. A CNC milling machine is a manufacturing device that responds to computer instructions. See *More About CNC Machine*, THOMASNET.COM, <http://www.thomasnet.com/about/cnc-machining-45330503.html> [<https://perma.cc/4Z6X-9RBP>] (last visited Aug. 26, 2016).

86. Defense Distributed promotional materials for ordering the Ghost Gunner can be found at *Ghost Gunner 2*, DEF. DISTRIBUTED, <https://www.ghostgunner.net/> [<https://perma.cc/2DQ7-N79N>] (last visited Aug. 26, 2016).

87. Brittany Severson, *Solid Concepts 3D Prints Another Metal Gun, 'Reason', a 10mm Auto 1911*, 3DPRINT.COM (Oct. 26, 2014), <https://3dprint.com/21109/3d-print-metal-gun-reason/> [<https://perma.cc/FZ3C-TZS3>].

88. Paul Gardner, *Pennsylvania machinist creates steel-reinforced for 3D-printed guns*, UNCOVER MICHIGAN (Nov. 21, 2014), <http://uncovermichigan.com/content/21993-pennsylvania-machinist-creates-steel-reinforced-bullet-3d-printed-guns> [<https://perma.cc/437R-YDBS>].

89. See Sen. Leland Yee *Proposes Regulating Guns From 3-D Printer*, CBS SACRAMENTO (May 8, 2013, 10:48), <http://sacramento.cbslocal.com/2013/05/08/sen-leland-yee-proposes-regulations-on-3-d-printers-after-gun-test/> [<https://perma.cc/NLX6-J8Z2>]; *Schumer Announces Support For Making 3D Printed Guns Illegal*, CBS NEW YORK (May 5, 2013, 12:17 PM), <http://newyork.cbslocal.com/2013/05/05/schumer-announces-support-for-measure-to-make-3d-printed-guns-illegal/> [<https://perma.cc/Q5BA-J5WB>]; Glenn Reynolds, *Should We Be Afraid of the 3D Printed Gun?*, POPULAR MECHANICS NOW (Apr. 17, 2014), <http://www.popularmechanics.com/technology/gadgets/a12935/should-we-be-afraid-of-the-3d-printed-gun-16700086/> [<https://perma.cc/5F56-MXLW>].

This is not a new concern. In 1988, Congress passed the Undetectable Firearms Act, which prohibited manufacture, sale, and possession of a firearm not detectable by walk-through metal detectors or x-ray machines used at airports.⁹⁰ The Act required that a firearm contain enough metal (3.7 ounces) to be detectable by an airport screening-device.⁹¹ To comply with that law, Cody Wilson fitted the Liberator with a small metal piece that would set off a standard metal detector.⁹² In addition, because there is no such thing as a plastic bullet, someone intending to use a plastic gun would have to carry metal bullets, which would likely set off a standard metal detector.

Nevertheless, Wilson's demonstration stimulated Congress to renew the 1988 Act, which otherwise would have sunset.⁹³ Moreover, the government began to deploy at airports a new generation of x-ray machines that reveal shapes, including plastic guns, below clothing. Full deployment of these machines at airports, public buildings, and other sensitive sites should alleviate the risk of undetectable guns.

B. Evading Background Checking

Wilson's Liberator demonstration also generated concern that the advent of 3D-printed firearms would enable persons prohibited from owning firearms (for example, ex-felons, fugitives, dangerous mentally ill persons) to evade the FBI's National Instant Background Checking System. According to the Law Center to Prevent Handgun Violence:

3D-printed guns give criminals a new and easy way to completely circumvent California's otherwise smart, comprehensive gun laws. In fact, Cody Wilson, the anarchist founder of Defense Distributed, the organization that developed the first 3D-printed handgun and distributed the blueprint on the Internet last year, has openly stated that his project is a way to get around laws about who is allowed to own a firearm.⁹⁴

Similarly, the Brady Campaign to Prevent Gun Violence warned:

As technology continues to advance and it becomes possible to make guns in homes and garages across the country, it creates a dangerous loophole for domestic abusers, felons and other criminals to make guns without any background checks and use them to harm

90. Undetectable Firearms Act of 1988, Pub. L. No. 113-57, 127 Stat. 656 (codified at 18 U.S.C. § 922(p) (2012)).

91. *Id.*

92. John Biggs, *What You Need to Know About the Liberator 3D-Printed Pistol*, TECHCRUNCH (May 6, 2013), <https://techcrunch.com/2013/05/06/what-you-need-to-know-about-the-liberator-3d-printed-pistol/> [https://perma.cc/FUL3-ZNMJ].

93. 18 U.S.C. § 922(p). Representative Steve Israel (D. NY) has tried to pass a strengthened bill that would prohibit firearms that could be rendered undetectable by removing a metal component. Michael Molitch-Hou, *Rep. Steve Israel Renews Fight For Undetectable Gun Control*, 3D PRINTING INDUSTRY (June 10, 2015), <http://3dprintingindustry.com/2015/06/10/rep-steve-israel-renews-fight-for-undetectable-gun-control/> [https://perma.cc/QP5J-DN7T].

94. *Sighting the Homemade Gun Threat*, LAW CTR. TO PREVENT GUN VIOLENCE (Oct. 14, 2014), <http://smartgunlaws.org/sighting-the-homemade-gun-threat/> [https://perma.cc/4JTB-L36X].

others Any gun made should not be able to slip through security checkpoints and certainly should not slip into the hands of dangerous people.⁹⁵

In truth, the evolution of 3D firearm printing will significantly undermine the effort to keep firearms out of the hands of unreliable and dangerous individuals. Firearms-ineligible individuals will be able to make guns themselves or acquire them from unlicensed gunsmiths using 3D-printing technology. Although guns are already easily acquired by prohibited persons, the advent of 3D printing will make it even easier.⁹⁶

The 1993 federal Brady Law requires FBI background checking only for gun purchasers who buy from federally licensed firearms dealers.⁹⁷ There is no background check for purchasers from private sellers.⁹⁸ A person who knows he cannot pass a background check can place a “gun-wanted” ad in a newspaper or visit a guns-wanted or guns-for-sale website to make contact with a willing seller. The transaction will be consummated without a background check or any record.⁹⁹

However, even with universal background checking, firearms-ineligible individuals could easily get a gun by persuading a relative or friend, who has a clean record, to buy a gun for him (for example, by playing the role of “straw purchaser”).¹⁰⁰ The firearms-ineligible individual can also buy a gun on the black market from a seller who specializes in supplying criminals.¹⁰¹ Moreover, persons or groups wishing to avoid background checking can make a gun using traditional gunsmithing technology.¹⁰² They can also steal guns. Thus, although 3D printing

95. Andy Greenberg, *Bill to Ban Undetectable 3D Printed Guns is Coming Back*, WIRED (Apr. 6, 2015, 7:00 AM), <http://www.wired.com/2015/04/bill-ban-undetectable-3-d-printed-guns-coming-back/> [<https://perma.cc/373C-KPV3>].

96. Philip Cook, *Gun Control: Where Do Criminals Get Their Weapons?*, NEWSWEEK (Jan. 7, 2016, 1:13 PM), <http://www.newsweek.com/gun-control-where-criminals-get-weapons-412850> [<https://perma.cc/9AM5-SH6S>].

97. See JAMES B. JACOBS, *CAN GUN CONTROL WORK?* 94–95 (Oxford University Press, 2004).

98. *Id.* at 100–101.

99. After the December 14, 2012 Sandy Hook Elementary School massacre in Newtown Connecticut, Congress rejected the Manchin-Toomey bill that would have extended background checking to private gun sales. See Aaron Blake, *Manchin-Toomey gun amendment fails*, WASH. POST (Apr. 17, 2013), <https://www.washingtonpost.com/news/post-politics/wp/2013/04/17/manchin-toomey-gun-amendment-fails/> [<https://perma.cc/3CCW-DCLS>].

100. See *Straw Purchases Policy Summary*, LAW CTR. TO PREVENT GUN VIOLENCE, <http://smartgunlaws.org/straw-purchases-policy-summary/> [<https://perma.cc/N2JR-Z7XJ>] (last updated May 21, 2012).

101. See, e.g., Torsten Ove, *Two Pittsburgh straw buyers convicted in gun running network sentenced*, PITTSBURGH POST-GAZETTE (Aug. 2, 2016, 8:59 AM), <http://www.post-gazette.com/local/city/2016/08/02/Two-Pittsburgh-straw-buyers-convicted-in-gunrunning-network-sentenced/stories/201608020154> [<https://perma.cc/8RXQ-ZVX5>].

102. See 27 C.F.R. § 478.34 (2016) (“No person shall knowingly transport, ship, or receive in interstate or foreign commerce any firearm which has had the importer’s or manufacturer’s serial number removed, obliterated, or altered, or possess or receive any firearm which has had the importer’s or manufacturer’s serial number removed, obliterated, or altered and has, at any time, been shipped or transported in interstate or foreign commerce.”). A firearms-ineligible person could build a firearm in his garage, thereby avoiding the NICS background check.

provides an additional way for a firearms-prohibited person to acquire a gun without a background check, given the inferior quality of 3D-printed guns, it is unlikely for the foreseeable future that many would-be criminals or terrorists would prefer a 3D-printed gun to an easily acquired mass produced gun.¹⁰³ Of course, that calculus could change as 3D printing evolves.

C. Evading Tracing

All things being equal, terrorists and criminals should prefer firearms that have no serial numbers and therefore cannot be traced to the manufacturer and first retail seller.¹⁰⁴ Tracing runs out after identification of the gun's first purchaser.¹⁰⁵ That purchaser is not required to retain information about, or even ascertain the name of, the person to whom he resold the gun.¹⁰⁶ In any event, criminals can and do obliterate serial numbers.¹⁰⁷ There are few crimes that are solved by tracing guns left at a crime scene.¹⁰⁸ Nevertheless, even fewer crimes would be solved by gun tracing if perpetrators of gun crimes regularly use 3D-printed firearms.

D. Evading The Machine Gun Ban

Machine guns (automatic-fire weapons) have been more or less banned since the 1930s.¹⁰⁹ Someday a 3D printer might produce an untraceable automatic weapon. If 3D printing is used to produce automatic-fire weapons, the plastic currently used would not likely withstand the stress of automatic fire.¹¹⁰ However,

103. *But see* Brian Krassenstein, *3 Dangers Society Faces From 3D Printing*, 3D PRINT.COM (Jul. 16, 2015), <http://3dprint.com/81526/3d-print-dangers/> [<https://perma.cc/9HRE-ATF4>].

104. *ATF Firearms Tracing Guide: Tracing Firearms to Reduce Violent Crime*, ATF.GOV, <https://www.atf.gov/file/58631/download> [<https://perma.cc/8YB9-HUDD>] (last visited Jan. 12, 2017).

105. *Id.*

106. If the gun can be traced to the person who transferred it to the gun-crime perpetrator, it might be possible to prove that the transferor knew that the purchaser was firearms-ineligible if the transferor is an active black market dealer. However, it would be very hard to prove that the seller *knew* that the purchaser was ineligible to possess a firearm.

107. *When a gun has no serial number*, WEAPONSMAN, <http://weaponsman.com/?p=9264> [<https://perma.cc/QK3P-CQAM>] (last visited Jan. 12, 2016).

108. David B. Kopel, *Clueless: The Misuse of BATF Firearms Tracing Data*, DAVE KOPEL, <http://davekopel.org/2A/LawRev/CluelessBATFtracing.htm#chb1a> [<https://perma.cc/X56K-EGVN>] (last visited Jan. 12, 2016).

109. "More or less" because the 1934 law imposed a confiscatory tax, not a ban, on automatic weapons. The 1986 Gun Owners Protection Act prohibited production, sale and possession of automatic fire weapons after the effective date of the Act. Pub. L. No. 99-308, 100 Stat. 449. However, possession of pre-1986 automatics is lawful if the possessor obtains a license from the Bureau of Alcohol, Tobacco and Firearms. There are half a million private sector machine gun licensees, many of them gun clubs and firing ranges. *See* Letter from Stephanie M. Boucher to Jeffrey E. Folloder (Feb. 24, 2016), NFATCA.ORG, http://www.nfatca.org/pubs/MG_Count_FOIA_2016.pdf [<https://perma.cc/VNM7-SGN7>]; *see generally*, JACOBS, *supra* note 97.

110. *See* John Biggs, *Don't Worry: You Can't 3D Print A Machine Gun*, TECHCRUNCH (Jan. 26, 2016), <http://techcrunch.com/2016/01/26/dont-worry-you-cant-3d-print-a-machine-gun/> [<https://perma.cc/9HGK-FHW6>] (discussing how "Ghost Gunner" is not a gun but a publicity stunt).

this could change with improvements in technology and materials. Gunsmiths using traditional technologies can already convert semi-automatic weapons to automatic-fire weapons.¹¹¹ Moreover, terrorists and criminals can purchase foreign or domestic automatic-fire weapons on the black market, but how much easier would that make it to acquire an automatic weapon?¹¹² In sum, while 3D-printed firearms technology poses real risks, especially as technology improves, the same risks already exist in our extremely weak regime for regulating access to firearms.

V

REGULATING DIY FIREARMS AND THE SECOND AMENDMENT

How should gunsmithing, by traditional and computer-driven manufacturing, be regulated? Under current federal law, gunsmiths, who make firearms with intent to sell or otherwise transfer them to someone else, must obtain a license from ATF, keep a record showing to whom they transferred each gun, and imprint an ATF-issued serial number on each gun,¹¹³ but gunsmiths who make firearms for themselves are not subject to these regulations.¹¹⁴ There is no reason to believe that an individual who makes (or claims to make) guns for his own use, by whatever technology, is less likely to misuse them than an individual who acquires a gun made by someone else. Even if gunsmiths are more reliable gun owners than non-gunsmiths, their self-made guns could still end up in the hands of firearms-ineligible persons through sale, gift, or theft. Therefore, a person who makes a gun for his own use should be subject to the same or similar regulation as a person who makes a gun for sale.¹¹⁵ Likewise, a person who possesses a self-

111. Gunsmiths willing to risk a 10-year federal prison sentence can convert semi-automatics into automatics or build machineguns. 18 U.S.C. § 924(ci)(Bii). Conversion kits and advice can be found on the Internet. *See, e.g., How to Turn Any Glock Into FULL AUTO “Legally”*, YOUTUBE (Mar. 10, 2014), <https://www.youtube.com/watch?v=4CUXkY9bmnU> [<https://perma.cc/5PB4-UGMX>]; *Full Auto and Select Fire Glock Kits \$85-\$185 Free Shipping*, PINTEREST, <https://www.pinterest.com/pin/397513104592864320/> [<https://perma.cc/GQN4-U923>].

112. Focusing on homemade and black market weaponry also raises concerns about weapons other than firearms. The Tsarnaev brothers used homemade pressure bombs to kill three people and injure over 200 at the 2013 Boston Marathon. Michael Crowley, *A Short Recent History of Pressure Cooker Bombs*, TIME (Apr. 16, 2013), <http://swampland.time.com/2013/04/16/a-short-history-of-pressure-cooker-bombs/> [<https://perma.cc/464S-99LH>].

113. *See* Gilger-Vander Zanden, *supra* note 75.

114. *Id.*; *see also* Mike Flacy, *New California Law Requires Registration of All 3D-Printed Guns*, DIGITAL TRENDS (July 25, 2016), <http://www.digitaltrends.com/cool-tech/new-california-law-requires-registration-of-all-3d-printed-guns/> [<https://perma.cc/NAS9-5J2N>] (discussing California’s law requiring those who produce homemade firearms via 3D printing to affix a serial number to the product). It is becoming easier than ever to serialize 3D-printed guns or in the case of 80% pistol frames, some offerings now come complete with a “Blank Serialization Plate.”

115. In November 2013, Philadelphia became the first U.S. city to ban production or possession of 3D-printed guns. Simon Van Zuynen-Wood, *Philly Becomes First City to Ban 3-D Gun Printing*, PHILA.: NEWS + OPINION, (Nov. 21, 2013), <http://www.phillymag.com/news/2013/philly-becomes-first-city-ban-3-d-gun-printing/> [<https://perma.cc/AN9T-NCZT>]. And, in early 2015, an Illinois state representative introduced a bill making it a crime “to knowingly use a three-dimensional printer to create

made gun should be subject to the same or equivalent regulation as a person who possesses a gun manufactured by someone else.¹¹⁶ Courts would likely defer to the legislative judgment that homemade guns present a special danger because they circumvent the regulatory system and present a risk of escaping metal detection.

California recently passed a law to do just that.¹¹⁷ By July 1, 2018, a person who makes or assembles a gun must obtain a serial number from the state's Department of Justice.¹¹⁸ Self-made guns must be registered with the Attorney General and they may not be transferred to anyone else.¹¹⁹

The problem is compliance and enforcement. Like all gun controls, this policy would be easy to evade. A gunsmith who cannot pass a background check would likely not be concerned about a misdemeanor violation of a license requirement.¹²⁰ Gunsmiths with criminal or terroristic intentions, or who knowingly sell guns to criminals would not likely comply.¹²¹ Similarly, many gun enthusiasts, like Cody Wilson, who for ideological reasons object to government controls on small arms, also would not comply. It is hard to imagine that enforcement would be vigorous or effective. Arrests would typically involve cases where the non-complying gunsmith has been apprehended for using the gun to commit a crime. This is not an argument against the law. It is simply an observation about how hard it is to effectively prohibit articles for which there is strong demand.¹²²

VI

CONCLUSION

Firearms technology has been evolving since the fourteenth century. Before mass production, firearms were produced individually in workshops and forges. With the emergence of mass production, reliable standardized firearms could be

a fully-functioning firearm." H.B. 1467, 99th Gen. Assemb., (Ill. 2015); *see also* Tina Moore, *EXCLUSIVE: New bill would stamp out 3-D guns*, DAILY NEWS (June 12, 2013, 4:42 AM), <https://www.nydailynews.com/new-york/exclusive-bill-stamp-3-d-guns-article-1.1370118> [<https://perma.cc/NQF4-PWKZ>]. The New York bill can be found at <https://www.scribd.com/doc/147703591/3D-Firearms-Bill-Text> [<https://perma.cc/E7W4-XN62>].

116. "In one respect, at least in some states, the law treats gun possession by gunsmiths and non-gunsmiths equivalently. In some states it is a crime for an unlicensed person to possess a gun regardless of who made it. . . . In practically all states, a license is required to carry a firearm in public; once again unlicensed carry is unlawful no matter who made the gun." *See* Concealed Carry Permit Information By State, USACARRY.COM, http://www.usacarry.com/concealed_carry_permit_information.html [<https://perma.cc/49VZ-Z42G>].

117. Assemb. B. No. 857, 60 (Cal. 2016).

118. *Id.*

119. *Id.*

120. *Id.*

121. A trace could identify a scofflaw dealer or black market seller.

122. The drug war, of course, comes to mind. *See* Michael B Kelley, *Pablo Escobar's Right-Hand Man Explains Why The Drug War Is Unwinable*, BUS. INSIDER (Feb. 25, 2013), <http://www.businessinsider.com/why-the-drug-war-is-unwinnable-2013-2> [<https://perma.cc/75WS-6VKC>].

produced at low cost. However, gunsmithing survives mostly as a hobby. Some gunsmiths still make guns from scratch. A larger number of gun makers (who probably don't call themselves gunsmiths) customize their guns with after-market parts and accessories.¹²³

Computer-directed manufacturing, of which 3D printing is an example, is a new and potentially revolutionary manufacturing technology. It could eventually simplify and decentralize manufacturing so that unskilled people, using commercially available software and modestly priced (and modestly rented) 3D printers, will be able to produce diverse products. Some gun enthusiasts and entrepreneurs have already sought ways to utilize this new manufacturing technology to produce small arms. Production will inevitably increase as technology improves and cost falls. However, at least in the short term, 3D-printed guns will not compete successfully with traditionally manufactured guns in terms of reliability, quality, and cost. By far, most terrorism and gun crime will, for the foreseeable future, continue to be perpetrated with mass produced weapons. This does not mean that we should ignore the future threat of 3D-printed weapons. Quite the contrary. The threat should be confronted while it is still young and there is time to experiment with new regulatory controls. The Second Amendment is not likely to be an obstacle.

123. See B. Gil Horman, *Building a Custom AR-15 at Home*, AM. RIFLEMAN (Oct. 31, 2014), <https://www.americanrifleman.org/articles/2014/10/31/building-a-custom-ar-15-at-home/> [<https://perma.cc/V9MR-G4P5>].