

WORLDS COLLIDE WHEN 3D PRINTERS REACH THE PUBLIC: MODELING A DIGITAL GUN CONTROL LAW AFTER THE DIGITAL MILLENNIUM COPYRIGHT ACT

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INTRODUCTION

The leaves have changed, and the brisk morning air signals that the opening day of deer hunting season is near. Your neighbor, John, has been talking for weeks about his plans to hunt with his father on opening day. A few days before opening day, John decides to go ahead and get his hunting gear prepared. As John places his binoculars, camouflage clothing, and insulated gloves in a pile on his bedroom floor, he remembers that the last time he went hunting, the accuracy of his faithful long-range rifle had decreased significantly. He had planned to take the rifle to his dealer to have it checked for problems, but he had forgotten to do so. John picks up the phone and calls the dealer to see if he can bring his rifle in to be examined. Not surprisingly, the dealer says if there is a problem with the gun, the gun will not be ready for opening day of deer season. Disappointed, John hangs up the phone. Then, a thought comes to him. He can fix this problem. He can just print a new gun.¹ John walks over to his desk and turns on his computer. He clicks on his favorite three-dimensional (3D) printing site and searches for a “blueprint” of a long-range gun. He finds an exact replica of his faithful long-range rifle, and he presses print. *Crisis averted*. John walks back to his bedroom and continues to pack as his new long-range rifle prints in the next room.

Three blocks away, another man, Chris, is also using his 3D printer. Sweat drips down Chris’s forehead as he remembers how last night’s drug deal had suddenly gone awry. Chris’s gun had jammed during his narrow escape. Knowing his criminal record would prevent him from purchasing a gun from a registered dealer, Chris searches a 3D-printing site, clicks on his desired handgun, and prints it from the secrecy of his home. *Crisis created*. Now fully armed, the drug deal that evening should happen as planned.

In 1977, additive manufacturing, also known as 3D printing, emerged, enabling individuals to print 3D objects such as raised relief maps through the process of placing two-dimensional layers on top of one another.² Since the 1970s, 3D printing has made great

1. “Print” refers to the printing of a 3D object through the use of a 3D printer. Davis Doherty, *Downloading Infringement: Patent Law as a Roadblock to the 3D Printing Revolution*, 26 HARV. J.L. & TECH. 353, 354 (2012).

2. THOMAS CAMPBELL ET AL., ATL. COUNCIL, COULD 3D PRINTING CHANGE THE WORLD?: TECHNOLOGIES, POTENTIAL, AND IMPLICATIONS OF ADDITIVE MANUFACTURING 4 nn.3-4 (2011) (citing TERRY WOHLERS, WOHLERS REPORT 2009:

advances, and it is poised to become a huge technological phenomenon.³ 3D printing has been predicted to have as powerful of an impact on the world as the World Wide Web.⁴ The positive impacts of 3D printing on the world are endless—a short list includes the increased availability of customized goods to the public;⁵ the ability of the medical industry to provide quick, on-site, personalized equipment;⁶ and a decrease in the human race’s carbon footprint.⁷ Along with the benefits of 3D printing, however, come significant drawbacks.⁸ 3D printing gives the consumer the ability to create nearly anything the consumer desires—including dangerous weapons.⁹ It follows then that 3D printing will drastically increase the need for regulation of digital files that can be printed from 3D printers in homes.¹⁰

The use of 3D printers in the home is just now gaining momentum, but regulations governing designs of printable 3D

STATE OF THE INDUSTRY (2009)), *available at* http://www.acus.org/files/publication_pdfs/403/101711_ACUS_3DPrinting.PDF.

3. *See generally id.* at 1 (discussing the foreseeable impacts of 3D printing on manufacturing and design).

4. *Id.* at 2.

5. *Id.* at 9 (explaining that mass customization of goods could be produced for little to no additional cost).

6. *See id.* at 4 (discussing the use of 3D printing to create custom orthodontics and hearing aids).

7. *Id.* at 11 (“The transportation and manufacturing carbon footprint of many products could be reduced as designs, rather than products, are ‘shipped’ around the world.”).

8. *See id.* at 12 (discussing the challenges posed by 3D printing, including software piracy and loss of jobs).

9. *Click, Print, Shoot: Guns Made on 3D Printers*, FOXNEWS.COM (Dec. 21, 2012), <http://www.foxnews.com/tech/2012/12/21/click-print-shoot-guns-made-on-3-d-printers-not-as-farfetched-idea-as-it-sounds/> [hereinafter *Click, Print, Shoot*].

10. Peter Jensen-Haxel, Comment, *3D Printers, Obsolete Firearm Supply Controls, and the Right to Build Self-Defense Weapons Under Heller*, 42 GOLDEN GATE U. L. REV. 447, 448 (2012). Currently, any person with the capable software can search online for 3D gun designs, download the desired design, and print the parts of the gun without a background check. *See Click, Print, Shoot, supra* note 9. While the United States government has attempted to regulate the distribution of digital gun designs, such as by demanding the removal of blueprints for a 3D-printable gun that had been downloaded over 100,000 times, it is difficult to prevent further access to these blueprints since links to the blueprints can be found in multiple online sharing sites. *US Government Orders Removal of Defcad 3D-Gun Designs*, BBC NEWS TECH. (May 10, 2013, 5:18 AM), <http://www.bbc.co.uk/news/technology-22478310> [hereinafter *US Government Orders Removal of Defcad*].

objects are virtually nonexistent.¹¹ Two industries that have already been forced to deal with the regulation of digital files on the Internet are the music industry¹² and the e-book industry.¹³ Just as copyright owners in the music industry have struggled to regulate piracy enabled by peer-to-peer sharing networks,¹⁴ owners of 3D-printable files available online will also have to face the challenges presented by online sharing networks, making regulation of 3D-printable weapon design files imperative.¹⁵ Since the regulation of online piracy of music files has largely been achieved through the Digital Millennium Copyright Act (DMCA), the DMCA is an appropriate model for the creation of a law that regulates online sharing of 3D-printable gun designs.¹⁶ With a law that regulates the sharing of 3D-printable gun designs online, the government can better protect the public from individuals who would print weapons for unlawful use.¹⁷

This Note focuses on the applicability of the DMCA to the regulation of 3D-printable gun designs that can be manufactured via 3D printers. Part I examines how 3D printing works, how the technology has progressed, and what can be expected of 3D printing in the future. Part II discusses threats posed to the public by 3D printing and the shortcomings of current gun laws to regulate the 3D printing of weapons. Part III discusses the application of copyright law to 3D printing. Part IV sets forth a proposed law—the Digital Gun Act—modeled after the DMCA to create a system that regulates the sharing of 3D-printable gun files.

I. 3D-PRINTING TECHNOLOGY

3D printing is a relatively new technology that has the capability of altering the world as we know it.¹⁸ According to the

11. See *infra* Subsections II.B.2-3.

12. See Steven A. Hetcher, *The Music Industry's Failed Attempt to Influence File Sharing Norms*, 7 VAND. J. ENT. L. & PRAC. 10, 10 (2004).

13. See Eduardo Porter, *The Perpetual War: Pirates and Creators*, N.Y. TIMES, Feb. 5, 2012, at SR10.

14. Hetcher, *supra* note 12, at 10 (“In the post-*Napster* era, music industry norm entrepreneurs battle especially against the proliferation of online networks that utilize peer-to-peer software.”).

15. See Jensen-Haxel, *supra* note 10, at 448 (stating that “3D printers will render current firearm regulations obsolete by allowing individuals to easily produce firearms”).

16. See *infra* Sections IV.A-B.

17. See *infra* Section IV.C.

18. See CAMPBELL ET AL., *supra* note 2, at 5.

Atlantic Council's *Strategic Foresight Report*, 3D printing will have "geopolitical, economic, social, demographic, environmental, and security implications."¹⁹ To better understand these implications, it is first necessary to lay a basic foundation about how 3D printers manufacture objects and to acknowledge the many opportunities made possible by 3D printers.²⁰ Further, recognition of the increased accessibility of 3D printers to the general public will shed light on the impending risk that 3D printing places on the public.²¹

A. The Advancement of 3D Printing

3D printing has undergone great advancement in the last decade, enabling it to reach the hands of at-home consumers.²² In 1984, Charles Hull invented stereolithography, a technology that made printing a 3D object from digital data possible.²³ Though first challenged to overcome issues with the imaging technology,²⁴ 3D printers now manufacture a variety of objects from birdhouses, plant pots, hand rakes,²⁵ intricately designed edible chocolate,²⁶ and artwork²⁷ to human body parts, including an ear and liver tissue.²⁸ Further, 3D printing is being applied across many fields from the

19. *Id.* at 1.

20. *See infra* Sections I.A-B.

21. *See infra* Section II.A.

22. Ashlee Vance, *The Era of Retail 3D Printing Begins*, BUSINESSWEEK (Sept. 21, 2012), www.businessweek.com/printer/articles/72726-the-area-of-retail-3d-printing-begins.

23. T. ROWE PRICE, A BRIEF HISTORY OF 3D PRINTING (2012), *available at* http://individual.troweprice.com/staticFiles/Retail/Shared/PDFs/3D_Printing_Infographic_FINAL.pdf.

24. *The Journey of a Lifetime*, 3D SYSTEMS, <http://www.3dsystems.com/news/25th-anniversary> (last visited Feb. 21, 2014).

25. Ramon Gonzalez, *10 Tools You Can 3D Print for Your Garden*, TREEHUGGER (Sept. 10, 2012), <http://www.treehugger.com/lawn-garden/garden-3d-10-things-you-can-3d-print-your-garden.html>.

26. Katia Moskvitch, *Printer Produces Personalized 3D Chocolate*, BBC NEWS TECH. (July 5, 2011, 10:08 AM), <http://www.bbc.co.uk/news/technology-14030720>.

27. John Biehler, *Ditto 3D Printer and See North America's Largest 3D Printed Object*, JOHN BIEHLER.COM (July 20, 2012), <http://johnbiehler.com/2012/07/20/ditto-3d-printer-and-see-north-americas-largest-3d-printed-object/>.

28. Yannick LeJacq, *3-D Printed Livers Offer Glimpse into the Future of Biomedical Research*, NBC NEWS TECH. (Dec. 27, 2013, 6:24 PM), <http://www.nbcnews.com/technology/3-d-printed-livers-offer-glimpse-future-biomedical-research-2D11812708>.

aerospace industry to orthodontics,²⁹ and in 2012, 3D printing generated \$2.2 billion in sales worldwide.³⁰

The response of a person learning about the existence of 3D printing for the first time is usually one of disbelief, pointing out that it sounds too futuristic or space age.³¹ In reality, technology has made the process quite simple.³² Computer engineers simply use computer-aided design (CAD) software to create a design of a 3D object as a CAD file that can then be printed in its three-dimensional form.³³ CAD files can be created in two ways.³⁴ First, CAD files can be “created from scratch.”³⁵ Second, CAD files can be created through scanning a 3D object into a computer and converting it into a CAD file.³⁶

The 3D-printing process is similar to that of inkjet printers, except that in 3D printing, “digital slices” of the design are sent to the 3D printer, which then prints layer upon layer of material until the 3D object is formed.³⁷ The types of materials 3D printers use to

29. JUSTIN SCOTT ET AL., SCI. & TECH. POLICY INST., ADDITIVE MANUFACTURING: STATUS AND OPPORTUNITIES 1 (2012), *available at* https://www.ida.org/stpi/occasionalpapers/papers/AM3D_33012_Final.pdf.

30. *3D Printing Scales Up*, THE ECONOMIST (Sept. 7, 2013), <http://www.economist.com/news/technology-quarterly/21584447-digital-manufacturing-there-lot-hype-around-3d-printing-it-fast>.

31. *See generally Definition of: 3D Printer*, PCMAG.COM, http://www.pcmag.com/encyclopedia_term/0,1237,t=3D+printer&i=37076,00.asp (last visited Feb. 21, 2014) (“Although 3D printing is maturing and gaining enormous ground, it never ceases to amaze people that objects . . . can be created a layer at a time.”).

32. John Biggs, *3D-Printing Pen, the 3Doodler, Reaches Kickstarter Funding Goal in Hours*, TECHCRUNCH, <http://techcrunch.com/2013/02/19/3d-printing-pen-the-3doodler-reaches-kickstarter-funding-goal-in-hours/> (last visited Feb. 21, 2014) (“3D printing can be complex or . . . wildly simple.”).

33. William R. Thornewell II, Note, *Patent Infringement Prevention and the Advancement of Technology: Application of 35 U.S.C. § 271(f) to Software and “Virtual Components,”* 73 FORDHAM L. REV. 2815, 2824 (2005).

34. *See* Brian Rideout, Note, *Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing*, 5 J. BUS. ENTREPRENEURSHIP & L. 161, 174 (2011).

35. *Id.* at 163 (“3D printing relies on computer-aided design (‘CAD’) files either created from scratch or drawn from a 3D scan of an object that are later used to create 3D objects anywhere at anytime by using a 3D printer.”).

36. *Id.*

37. *Layer by Layer: How 3D Printers Work*, THE ECONOMIST (Apr. 21, 2012), <http://www.economist.com/node/21552903>.

In 3D printing, however, the software takes a series of digital slices through a computer-aided design and sends descriptions of those slices to the 3D printer, which adds successive thin layers until a solid object

print objects include plastics, metals, ceramics, and rubber-like materials.³⁸ A variety of 3D printers enable users to create objects made of a combination of materials, allowing for the formation of objects that are flexible in some areas, while rigid in others.³⁹ Further, some 3D printers, called bio-printers, even use cells as the material and print living tissues.⁴⁰ It is anticipated that one day in the not-so-distant future, bio-printers will be able to use individuals' stem cells to print human organs, making rejection of organs in transplant patients less likely.⁴¹

While there are limitations to 3D printing, such as the types of materials 3D printers have successfully been able to use to print objects,⁴² the process has turned many "impossibles" to "possibles," including the ability to print 3D objects in shapes that previously were not feasible.⁴³ Since objects are manufactured "layer by layer," with each layer being subsequently bound to the previously laid layer through heat or chemicals, 3D printing enables the fabrication of objects into geometries never previously possible.⁴⁴ Thus, while it is apparent that 3D technology is still developing, it is also apparent that 3D technology has opened the door to possibilities never before imagined.⁴⁵

B. Desktop 3D Printers

The accessibility of 3D printers to individuals is also increasing.⁴⁶ As the price to buy 3D printers decreases, 3D printers

emerges. The big difference is that the "ink" a 3D printer uses is a material.

Id.

38. *Id.*

39. *Id.* (explaining that a variety of machines have the capability to use different materials, "making an object rigid at one end and soft at the other").

40. *Id.*

41. *Id.*

42. CAMPBELL ET AL., *supra* note 2, at 11 ("Another limitation is the capability of the printer to use particular materials . . . required for the product.").

43. EXONE DIGITAL PART MATERIALIZATION, WHAT IS ADDITIVE MANUFACTURING? 1 (last visited Feb. 21, 2014), *available at* http://exone.com/sites/default/files/media/ExOne_What_is_AM.pdf.

44. *Id.*

45. *See supra* Part I.

46. Vance, *supra* note 22.

are beginning to be seen in homes, schools, and businesses.⁴⁷ The decrease in price⁴⁸ and the manageable size of 3D printers⁴⁹ increase accessibility and have the ultimate potential of “transforming [homes and businesses] into micro ‘factories.’”⁵⁰ In fact, in 2012, 3D printers expanded into the retail market when MakerBot, a leading 3D-printer company, opened its first retail location in Manhattan.⁵¹ Beyond selling items printed by Makerbot’s 3D printers, the store also offers for sale the Replicator 2, a desktop printer sold for \$2,199.⁵²

Making 3D printing even more accessible to everyday consumers is Shapeways, described as a marketplace similar to Amazon.com.⁵³ The company’s website explains through a series of pictures that anyone who can come up with an idea, design the idea on computer software, and upload it onto Shapeways, can have the desired object printed by Shapeways and shipped anywhere in the world.⁵⁴ After uploading a design, the consumer only needs to choose

47. Matt Ratto & Robert Ree, *Materializing Information: 3D Printing and Social Change*, 17 FIRST MONDAY (2012), available at <http://firstmonday.org/ojs/index.php/fm/article/view/3968/>.

48. On airwolf3d.com, a site that sells do-it-yourself kits enabling buyers to build their own 3D printers and sells pre-assembled 3D printers, the prices for do-it-yourself kits range from \$1,295.00 to \$1,895.00. *Products*, AIRWOLF3D, <http://airwolf3d.com/store/products/> (last visited Feb. 21, 2014). The prices for pre-assembled printers range from \$1,695.00 to \$2,295.00. *3D Printer Price Comparison Chart*, AIRWOLF3D, <http://airwolf3d.com/3d-printer-price-comparison/> (last visited Feb. 21, 2014).

49. *3D Printing Emerging as Must-Have Technology, Digital Trends Says*, 3DSCANNINGSERVICES.NET (Nov. 24, 2011), <http://www.3dscanningservices.net/News/3D%20printing%20emerging%20as%20must-have%20technology,%20Digital%20Trends%20says>.

50. Ratto & Ree, *supra* note 47.

51. Vance, *supra* note 22. MakerBot now has three retail locations located in New York, New York; Greenwich, Connecticut; and Boston, Massachusetts. *MakerBot Store*, MAKERBOT, <http://www.makerbot.com/retail-store/> (last visited Feb. 21, 2014).

52. *MakerBot Replicator 2*, MAKERBOT, <http://store.makerbot.com/replicator2> (last visited Feb. 21, 2014).

53. Vance, *supra* note 22.

54. *How Shapeways 3D Printing Works*, SHAPEWAYS, http://www.shapeways.com/about/how_does_it_work (last visited Feb. 21, 2014). It is important to note that individuals who use CAD software are not average laypeople, but rather trained professionals. Jon Hembrey, *How Exactly Does 3D Printing Work?: Used to Make Everything from Figurines to Violins, 3D Printing Is Exciting but Little-Understood*, CBC NEWS (Jan. 28, 2013, 5:39 AM), <http://www.cbc.ca/news/technology/story/2013/01/23/f-3d-printing.html>. Individuals in need of a simple piece, such as a hinge to fix a cabinet, are more

the desired material and order it.⁵⁵ The materials that consumers currently can choose from on Shapeways include plastics with a variety of properties, steel, sterling silver, full color sandstone, ceramics, brass, and bronze.⁵⁶ The Shapeways marketplace thus allows for individuals who cannot afford or simply do not own a 3D printer to not only purchase 3D objects online, but also to design and order 3D objects customized to the consumer's tastes.⁵⁷

Whether individuals use 3D printers at home or through a marketplace like Shapeways, 3D printing allows consumers to take a "do-it-yourself approach," and urges individuals to share their designs through open-source communities.⁵⁸ One of the strengths of 3D printing is the speed in which CAD files can be shared through open-source communities.⁵⁹ In open-source communities, ownership of copyrights of CAD files vests in the first individual to author the design and fix it in a "tangible medium of expression."⁶⁰ However, "ownership and control over designs is spread over all individuals who contribute to the development and implementation of the designs."⁶¹

Although open-source communities enable many individuals to participate in the development of a design, this can only be done through the use of a General Public License (GPL).⁶² When the owner of a CAD file grants a GPL, any individual has the opportunity to modify that design to meet his or her own

likely to go to the store to buy it than try to figure out how to create the CAD file and determine what material should be used to print. *See id.*

55. *How Shapeways 3D Printing Works*, *supra* note 54.

56. *Material Portfolio*, SHAPEWAYS, <http://www.shapeways.com/materials> (last visited Feb. 21, 2014).

57. *See How Shapeways 3D Printing Works*, *supra* note 54.

58. Ronaldo Lemos, *Educate and Innovate*, in Shannon O'Neil et al., *How Busted Is Brazil?: Growth After the Commodities Boom*, FOREIGN AFF., July-Aug. 2012, at 159, 163-64.

59. *See generally* Rideout, *supra* note 34, at 163-64.

60. *Id.* at 163.

61. *Id.* For example, Thingiverse, an online digital design share site, enables uploaders of designs to choose the desired designation of the copyright license for their work, and one of the options is General Public License (GPL). *Id.* at 163, 165. Under this system, uploaders of digital design files can specify how they want third parties to be able to use their copyrighted design. *Id.* at 165. If a GPL is granted, a user can download the design and further customize it to the user's needs. *See id.*

62. *Id.* at 163-64 (explaining that when an "owner of open source designs grants to the world a [GPL] anyone is free to tinker with the designs [and] modify them for his or her own convenience").

preferences.⁶³ However, users who make changes to the CAD file do so with the knowledge that all changes to the design will also be available for use by the public.⁶⁴ The GPL prohibits any commercial use to be made of the original CAD file or any derivatives.⁶⁵ Despite the fact that no commercial use may be made of those CAD files for which the author has granted a GPL, it is important to note the ease with which files are shared, changed, and improved at zero cost, making it extremely easy for anyone anywhere to get their hands on a CAD file that could create a dangerous weapon.⁶⁶ Empowering the consumer even more is the widespread use of CAD software.⁶⁷ All a consumer needs is the know-how to use CAD software, a desktop computer, and a 3D printer, and within hours of the first inkling of an idea in the consumer's mind, the idea can transform from the intangible into a physical object.⁶⁸

II. 3D PRINTING MAKES ILLEGAL PROLIFERATION OF GUNS CONCEIVABLE

The accessibility of 3D printers to the general public is increasing.⁶⁹ Owning a 3D printer is as easy as walking into a store in Manhattan⁷⁰ or searching for a sales representative online.⁷¹ While the benefits of owning a 3D printer are tremendous,⁷² a 3D printer's

63. *Id.*

64. *Id.* at 164 (discussing that individuals can “use the designs and its modifications under the requirements that all improvements be similarly dedicated to the public”).

65. *Id.*

66. *See id.* (“This flexibility supports innovation and development as designs can be modified and developed to suit the evolving needs of 3D hobbyists.”).

67. MICHAEL WEINBERG, PUB. KNOWLEDGE, IT WILL BE AWESOME IF THEY DON'T SCREW IT UP: 3D PRINTING, INTELLECTUAL PROPERTY, AND THE FIGHT OVER THE NEXT GREAT DISRUPTIVE TECHNOLOGY 2 (2010), *available at* <http://www.publicknowledge.org/files/docs/3DPrintingPaperPublicKnowledge.pdf>.

68. *See id.*

69. *See Vance, supra* note 22.

70. *See id.*

71. *Find a Reseller: Connect with 3D Printing Experts*, STRATASYS, <http://www.stratasys.com/contact-us/find-a-reseller> (last visited Feb. 21, 2014).

72. Daniel Tamarjan, *9 Benefits of 3D Printing*, AUGMENTED TOMORROW (June 26, 2012), <http://augmentedtomorrow.com/9-benefits-3d-printing/>. When used for bulk production, 3D manufacturing can save up to 70% of costs due to decreased shipping and packaging costs and less human resources involved in the manufacturing process. *Id.* However, at-home 3D printing also has its benefits. *Id.* Further, 3D printing is quick and less wasteful of material. *Id.* Additionally, the

ability to easily convert a CAD file into a dangerous object, such as a weapon, makes accessibility of printers to the general public, including those with criminal intentions, a risk to the nation as a whole.⁷³

A. Printing Guns

“[I]t is foreseen that by 2020 every household in the U.S. will have a 3D printing machine.”⁷⁴ With the real possibility of 3D printers gaining widespread use in the near future, the creation of regulations to deal with the technology before significant problems arise is necessary and time sensitive.⁷⁵ This urgency exists because even groundbreaking technology will not be fully commercialized or reach its full value if regulatory or legal barriers stand in the way.⁷⁶ For instance, stem cell technology has been available for some time, but its use has not advanced, as there are legal barriers in many jurisdictions that prevent stem cell experimentation.⁷⁷

Applied to the world of 3D printers, there are serious risks posed to society by the introduction of desktop printers to the at-home consumer—regulations to prevent the sharing of 3D-printable firearm designs online for the purpose of printing at home do not exist.⁷⁸ Further, it has been predicted, “3D printing will be used to purposely circumvent laws in various ways.”⁷⁹ One concern is that digital files can easily be transported from jurisdiction to jurisdiction,

quality of objects produced is high due to a highly controlled 3D-printing process.
Id.

73. CAITLIN E. WERRELL & FRANCESCO FEMIA, CTR. FOR CLIMATE & SEC., *THE 3D PRINTING REVOLUTION, CLIMATE CHANGE AND NATIONAL SECURITY: AN OPPORTUNITY FOR U.S. LEADERSHIP* 8 (2012), available at <http://climateandsecurity.files.wordpress.com/2012/04/the-3d-printing-revolution-climate-change-and-national-security-an-opportunity-for-u-s-leadership1.pdf>.

74. Luca Escoffier, *Reinterpreting Patent Valuation and Evaluation: The Tricky World of Nanotechnology*, 2011 EUR. J. RISK REG. 67, 73.

75. *See id.*

76. *Id.* at 72 (“[A] technology might well be groundbreaking and have the potential to improve the consumer’s quality of life, but if there are regulatory and legal barriers that do not or only partly allow its commercialization, the technology’s value will be much lower than expected.”).

77. *Id.* (explaining that many jurisdictions prohibit experimentation on stem cells).

78. *See infra* Part II.

79. Ratto & Ree, *supra* note 47.

as the digital files are online, making efforts to prevent unwanted products from infiltrating a jurisdiction easily bypassed.⁸⁰

While the production of metal gun parts via 3D printers is presently too expensive, the at-home manufacture of guns via the use of plastic materials has become a viable option.⁸¹ In fact, various features of firearms, from grips and handles to magazines, triggers, and receivers, are often composed of plastic.⁸² In July 2012, Michael Guslick,⁸³ an amateur gunsmith, reported having constructed a .22 caliber pistol from plastic parts produced at home by his 3D printer.⁸⁴ The blueprints that the gun parts were modeled after were downloaded off the Internet.⁸⁵ The gun consisted of a 3D-printed lower receiver, the main body of the gun, combined with a commercial metal upper receiver.⁸⁶ The material used to 3D print the lower receiver only cost about thirty dollars.⁸⁷ Guslick shot 200 rounds from his 3D-printed pistol.⁸⁸ On his blog he stated, “‘To be honest, it was acting more reliably than a number of other .22 pistols I’ve shot.’”⁸⁹ He then adapted the pistol into a semiautomatic rifle—

80. *Id.*

81. Jensen-Haxel, *supra* note 10, at 455.

82. *Id.*

83. Michael Guslick is a gun enthusiast who “‘printed’ and fired the world’s first home-made, 3D-impressed gun.” Charlie Wells, *Exclusive: Man Who Printed a Gun in His Own Home Says It ‘Wasn’t That Difficult,’* N.Y. DAILY NEWS (Aug. 1, 2012, 1:29 PM), <http://www.nydailynews.com/news/national/exclusive-man-printed-gun-home-wasn-difficult-article-1.1126583>. Guslick purchased a 3D printer for \$1,000. *Id.* He then found digital gun blueprints online, modified the blueprints, and printed the gun base in a period of thirty hours. *Id.* Wells stated, “[A]nyone with some technological knowledge could probably do what Guslick did.” *Id.*

84. Dominique Mosbergen, *Michael Guslick, Amateur Gunsmith, Claims to Have Used 3D Printer to Make Functional Semiautomatic AR-15 Rifle at Home*, HUFFINGTON POST (Aug. 8, 2012, 2:03 PM), http://www.huffingtonpost.com/2012/08/08/man-3d-printer-rifle_n_1753513.html.

85. *Id.*

86. *Id.* A lower receiver is the central part of the gun to which other pieces of the gun are attached. Henry Fountain, *Tools of Modern Gunmaking: Plastic and a 3-D Printer*, N.Y. TIMES (Jan. 29, 2013), http://www.nytimes.com/2013/01/30/science/surprising-tools-of-modern-gunmaking-plastic-and-a-3-d-printer.html?_r=0. The lower receiver is such a major component of a gun that it is the only part that requires filing of federal paperwork when bought. *Id.* However, Guslick printed his gun at home instead of buying it, meaning there was no required paperwork to be filed. *See id.*

87. Mark Gibbs, *The End of Gun Control?*, FORBES (July 28, 2012, 4:24 PM), <http://www.forbes.com/sites/markgibbs/2012/07/28/the-end-of-gun-control/>.

88. Mosbergen, *supra* note 84.

89. *Id.*

an AR-15.⁹⁰ Guslick has 3D printed at least two deadly weapons on his own.⁹¹ It is easy to imagine how many other Americans who own 3D printers are doing the same thing with no regulation.⁹²

B. Current Firearm Regulation Laws

According to the National Institute of Justice, in 2008, firearm violence resulted in the death of 10,869 persons.⁹³ Further, in 2008, firearms were used against 371,289 persons in the commission of a crime.⁹⁴ In 2011, firearms were used in 68% of murders, 41% of robberies, and 21% of aggravated assaults in the United States.⁹⁵ As demonstrated by these statistics, the use of firearms in the commission of crimes in the United States is prevalent.

Despite the commission of crimes with firearms, the Second Amendment of the United States Constitution states, “A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.”⁹⁶ The interpretation of the Second Amendment has been highly debated by the legal community for years.⁹⁷ In 2008, in *District of Columbia v. Heller*, the United States Supreme Court’s interpretation of the Second Amendment narrowly held that certain types of gun regulations violate the Second Amendment, leaving unclear what types of gun regulations are constitutional and what types of gun regulations are unconstitutional.⁹⁸

90. *Id.*

91. *Id.*

92. Cody Wilson, using 3D-printing technology, manufactured an AR-15, “the civilian version of the military M16 rifle” and successfully fired over 600 rounds. Cyrus Farivar, “Download This Gun”: 3D-Printed Semi-Automatic Fires over 600 Rounds, *ARS TECHNICA* (Mar. 1, 2013, 9:00 AM), <http://arstechnica.com/tech-policy/2013/03/download-this-gun-3d-printed-semi-automatic-fires-over-600-rounds/>.

93. *Gun Violence*, NAT’L INST. JUST., <http://nij.gov/topics/crime/gun-violence/Pages/welcome.aspx> (last updated Apr. 4, 2013).

94. *Id.*

95. *Id.*

96. U.S. CONST. amend. II.

97. *See generally* *District of Columbia v. Heller*, 554 U.S. 570, 577 (2008) (discussing that the parties to the suit and the Supreme Court Justices interpret the meaning of the Second Amendment very differently).

98. *Id.*; Jensen-Haxel, *supra* note 10, at 471 (explaining that “[t]he scope of this right remains unclear” because “it is not certain which weapons or activities will be initially considered for protection by a heightened level of judicial scrutiny,” and “once a weapon or activity is deemed to be within the scope of the Amendment, no level of scrutiny was articulated to analyze a given restriction”).

1. *The Supreme Court's Interpretation of the Second Amendment*

In June 2008, the United States Supreme Court interpreted the language of the Second Amendment in *District of Columbia v. Heller*.⁹⁹ The issue before the Court was whether the District of Columbia's statutes generally prohibiting the possession of handguns were constitutional.¹⁰⁰ Specifically, the District of Columbia made the carrying of unregistered firearms a crime and also prohibited the registration of handguns.¹⁰¹ Further, the laws of the District of Columbia required that residents' lawfully owned firearms be "unloaded and disassembled or bound by a trigger lock or similar device' unless they are located in a place of business or are being used for lawful recreational activities."¹⁰² The plaintiff in the case, Dick Heller, a D.C. police officer who is legally certified to carry a handgun on duty, desired to keep a handgun at home and applied to receive a registration certificate.¹⁰³ The District of Columbia denied his application.¹⁰⁴ Heller filed a lawsuit against the District of Columbia on grounds that the District of Columbia's gun laws did not pass Second Amendment constitutional muster.¹⁰⁵

Through its interpretation of the Second Amendment, the Court ruled that "the people" refers to every individual American, not only the collective militia.¹⁰⁶ The Court further found that "keep and bear arms" refers to the right to carry weapons for the purpose of confrontation.¹⁰⁷ Assembling the meaning of all the textual elements in the Second Amendment, the Court ruled that the Second Amendment "guarantee[s] the individual right to possess and carry

99. See generally *Heller*, 554 U.S. at 576-636. In *Heller*, the Court extensively interpreted the Second Amendment by interpreting the meaning of "right of the people," "keep and bear arms," "well-regulated militia," and "security of a free state." *Id.* at 579, 581, 595, 597.

100. *Id.* at 573.

101. *Id.* at 574-75 (citing D.C. CODE §§ 7-2501.01(12), -2502.01(a), -502.02(a)(4) (2001)).

102. *Id.* at 575 (quoting D.C. CODE § 7-2507.02).

103. *Id.*

104. *Id.*

105. *Id.* at 575-76. Heller sought "to enjoin the city from enforcing the bar on the registration of handguns, the licensing requirement insofar as it prohibits the carrying of a firearm in the home without a license, and the trigger-lock requirement insofar as it prohibits the use of 'functional firearms within the home.'" *Id.* (citation omitted).

106. *Id.* at 580-81.

107. *Id.* at 583-84.

weapons in case of confrontation.”¹⁰⁸ While the Court recognized the problem of violence propagated by handguns in the United States, the Court sided with *Heller*, stating, “[T]he enshrinement of constitutional rights necessarily takes certain policy choices off the table. These include the absolute prohibition of handguns held and used for self-defense in the home.”¹⁰⁹

In addition to granting individuals the right to own guns, the Court in *Heller* also stated that the protection of the Second Amendment extends beyond those types of firearms existing during the framing of the Constitution to modern firearms.¹¹⁰ In fact, in the Court’s opinion, Justice Scalia stated, “Just as the First Amendment protects modern forms of communications, and the Fourth Amendment applies to modern forms of search, the Second Amendment extends, *prima facie*, to all instruments that constitute bearable arms, even to those that were not in existence at the time of the founding.”¹¹¹ Following the precedent set by the Court in *Heller*, it would seem that the individual’s right to keep and carry guns for protection under the Second Amendment applies to 3D-printed guns.¹¹² Though 3D-printed guns were not in existence when the Second Amendment was written, the right to keep and carry guns extends to 3D-printed guns since 3D-printed guns can be carried and used for confrontation.¹¹³ While the effectiveness of gun laws is highly debated,¹¹⁴ even if there was absolute evidence of violence

108. *Id.* at 592.

109. *Id.* at 636 (explaining that the Court recognized the danger posed by handgun violence and understood why individuals would propose to prohibit handgun ownership, but that the prohibition of gun ownership is one of the policy choices the Constitution takes “off the table”).

110. *Id.* at 582 (citing *Reno v. ACLU*, 521 U.S. 844, 849 (1997); *Kyllo v. United States*, 533 U.S. 27, 35-36 (2001)) (holding that the Second Amendment applies to modern firearms just as the First Amendment applies to modern communications and the Fourth Amendment applies to modern searches).

111. *Id.* (internal citations omitted).

112. Jensen-Haxel, *supra* note 10, at 485-88 (discussing that if protections under the Second Amendment as interpreted by *Heller* are interpreted broadly, as long as 3D-printed guns are not capable of semiautomatic fire and meet the description of a rifle, ownership of 3D-printed guns will receive Second Amendment protection).

113. *See id.* at 468 (“An all-plastic gun could easily meet the needs of brief confrontation . . .”).

114. *See* Donald Braman & Dan Kahan, *Overcoming the Fear of Guns, the Fear of Gun Control, and the Fear of Cultural Politics: Constructing a Better Gun Debate*, 55 EMORY L.J. 569, 570 (2006). Typically, individuals in support of stringent gun regulation believe that easy access to guns puts public safety at risk by enabling criminals to commit crimes and increasing the risk of accidental shootings.

perpetrated by firearms, demonstrated by clear-cut statistics showing firearm use in assault, robberies, and murders, the government cannot prohibit the ownership and use of all guns without violating individual rights under the Second Amendment.¹¹⁵ Therefore, it is unlikely the Court will uphold any complete prohibition of use or registration of 3D-printed guns.¹¹⁶

2. *Arising Legal Issues Beyond the Scope of the Second Amendment*

While the Supreme Court made clear that the right to bear arms applies to individuals, it is unclear how that right applies to the manufacture of guns at home, particularly through the use of 3D printers.¹¹⁷ As the use of 3D printers becomes more affordable and more prevalent, the more individuals will test the law through 3D printing to see just how stringent or lax the government is going to be in regulating 3D printing—this includes both the sharing of files created on CAD software and the actual physical printing of 3D objects.¹¹⁸

A present-day example of this type of testing of governmental regulation can be seen in an unfolding of events with Stratasys Inc.¹¹⁹ Stratasys invented and patented its own 3D-printing technology in 1988.¹²⁰ Since then, the company has developed and marketed 3D printers and services worldwide.¹²¹ When Stratasys discovered that one of its leased 3D printers was the major component of a project headed by the group Defense Distributed to manufacture a gun at home without a license, Stratasys seized the printer.¹²² Defense Distributed raised \$20,000 to initiate its project called Wiki

Id. Conversely, individuals in opposition of stringent gun regulation believe that access to guns enables the public to protect itself against acts of violence. *Id.*

115. See generally *Heller*, 554 U.S. at 636 (holding that despite valid policy reasons to prohibit the ownership of guns, the Second Amendment of the U.S. Constitution eliminates any choice to strictly prohibit gun ownership).

116. See *supra* Subsection II.B.1.

117. See *infra* Subsection II.B.3.a.

118. See *supra* text accompanying notes 83-91.

119. See *About Stratasys*, STRATASYS, <http://www.stratasys.com/Corporate/About-Stratasys.aspx> (last visited Feb. 21, 2014).

120. *Id.*; See *STRATASYS 3D PRINTERS*, SOLID XPERTS, <http://www.solidxperts.com/product/3d-printers> (last visited March 4, 2014).

121. *Id.*

122. *Plans to Print a Gun Halted as 3D Printer Is Seized*, BBC NEWS TECH. (Oct. 3, 2012, 5:56 AM), <http://www.bbc.co.uk/news/technology-19813382?print=true>.

Weapon,¹²³ with the sole purpose to produce and publish a file for a completely printable gun.¹²⁴ However, once Stratasys heard about Defense Distributed's plan, Stratasys sent a letter notifying Defense Distributed that the lease of the 3D printer was being terminated because Defense Distributed had illegal purposes for using the 3D printer.¹²⁵ According to Defense Distributed's webpage, the ultimate goal of the project is to "test and share . . . designs through file sharing services . . . not to print guns for people."¹²⁶

Defense Distributed's project was halted until another 3D printer was acquired from another company.¹²⁷ It is important to note that the regulation of Defense Distributed's use of the printer was through Stratasys, the actual company lending the 3D printer, based on its own company values and mission statement that "[i]t is the policy of Stratasys not to knowingly allow its printers to be used for

123. *Id.*

124. *DD History*, DEFENSE DISTRIBUTED, <http://defdist.org/dd-history/> (last visited Feb. 21, 2014) ("On May 5, 2013, DD released the files for the Liberator pistol—the culmination of the Wiki Weapon Project. This release was met by a flurry of US governmental censures and investigations, and DD is still involved in a conflict with the US State Department over whether there is a requirement to seek government approval before releasing privately generated gun files into the public domain.").

125. *Plans to Print a Gun Halted as 3D Printer Is Seized*, *supra* note 122. Defense Distributed posted the letter sent by Stratasys to its blog. WIKIWEAP DEVBLOG, <http://defdist.tumblr.com/> (last visited Feb. 21, 2014). The letter states:

I am in receipt of your email dated September 26, 2012 in which you state your opinion that your intended use of the Stratasys uPrint SE will not be in violation of federal firearms laws. You have also made it clear that you do not have a federal firearms manufacturers license. Based upon your lack of a license and your public statements regarding your intentions in using our printer, Stratasys disagrees with your opinion. . . .

It is the policy of Stratasys not to knowingly allow its printers to be used for illegal purposes. Therefore, please be advised that your lease of the Stratasys uPrint SE is cancelled at this time and Stratasys is making arrangements to pick up the printer.

Id.

126. Maureen Chowdhury, *Maker of 3-D Printer Guns Now Has Federal Firearms License*, NPR (Mar. 18, 2013, 5:44 PM), <http://www.npr.org/blogs/alltechconsidered/2013/03/18/174672419/maker-of-3-d-printer-guns-now-has-federal-firearms-license> (quoting the language once posted on Defense Distributed's website).

127. Robert Beckhusen, *With 'Safe Haven,' Desktop Weaponers Resume Work on 3D-Printed Guns*, WIRED.COM (Oct. 25, 2012, 6:30 AM), <http://www.wired.com/dangerroom/2012/10/wiki-weapon/>.

illegal purposes.”¹²⁸ Defense Distributed’s project to build a gun at home without a license was *not* terminated by governmental regulation¹²⁹ although the publicity for the project was widespread.¹³⁰ Therefore, two major issues emerging from 3D-printing technology are: (1) whether current gun laws are sufficient to regulate the 3D printing of guns at home; and (2) whether there are laws in place that can be used or fine-tuned to regulate the sharing of CAD weapon designs on file-sharing services that enable individuals with 3D printers to print firearms without a license.

3. *The Regulation of Homemade Guns*

As public awareness of 3D printing has greatly increased in the past several years, it is unlikely that Defense Distributed is the only group with plans to share designs of dangerous products online, printable through at-home 3D printers.¹³¹ Thus, it is essential to determine how the sharing of dangerous designs can be regulated. A starting point is to determine how the United States’ current gun laws regulate the manufacture of guns at home.

128. *Plans to Print a Gun Halted as 3D Printer Is Seized*, *supra* note 122. Defense Distributed posted the letter sent by Stratasys to its blog. WIKIWEP DEVBLOG, *supra* note 125. Stratasys stated that since Defense Distributed had not received a federal firearms manufacturers license, Defense Distributed’s actions were illegal. Seth Colaner, *Design a 3D-Printable Gun, Lose Your 3D Printer*, HOTHARDWARE (Oct. 2, 2012), <http://hothardware.com/News/Design-a-3DPrintable-Gun-Lose-Your-3D-Printer/>. Defense Distributed was not going to sell or distribute the 3D-printed guns, so, technically, its actions were not illegal. *Id.* Nevertheless, Defense Distributed was freely sharing the developed CAD files for the printing of guns. *Id.*

129. Deane Barker, *Defense Distributed Loses Their Printer*, GADGETOPIA.COM (Oct. 2, 2012), <http://gadgetopia.com/post/8120>. The government has since attempted to regulate Defense Distributed and 3D printing of guns through International Traffic in Arms Regulations, but the government’s attempt is likely to prove ineffective. *See infra* text accompanying notes 173-87.

130. A simple Google search of “Defense Distributed” reveals numerous articles recounting Defense Distributed’s goals to 3D print a gun. Kimber Streams, *3D Printed Gun Project Halts After Stratasys Confiscates Rented Printer*, THE VERGE (Oct. 1, 2012), <http://www.theverge.com/2012/10/1/3439496/wiki-weapon-project-defense-distributed-stratasys>; *Plans to Print a Gun Halted as 3D Printer Is Seized*, *supra* note 122.

131. *See supra* text accompanying notes 58-66 for a description of the ease at which individuals can make digital files accessible to each other through open-source communities and build on one another’s digital products.

a. Current Gun Laws

Title 18 of the United States Code governs the manufacture and distribution of firearms.¹³² It states:

- (a) It shall be unlawful—
 - (1) for any person—
 - (A) except a licensed importer, licensed manufacturer, or licensed dealer, to engage in the business of importing, manufacturing, or dealing in firearms, or in the course of such business to ship, transport, or receive any firearm in interstate or foreign commerce.”¹³³

At first glance, it seems that Title 18 prohibits individuals who are not licensed importers, manufacturers, or dealers to manufacture guns.¹³⁴ However, it is important to note in the language of the statute the words “to engage in the business of.”¹³⁵ If an individual is simply manufacturing a gun for his or her own use and not to further any business purpose, it is argued that this regulation does not apply to the at-home manufacturer producing guns simply for one’s own use.¹³⁶

According to the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), “[A] firearm may be made by a non-licensee provided it is not for sale and the maker is not prohibited from possessing firearms.”¹³⁷ However, if an individual desires to manufacture a NFA firearm, a firearm regulated by the National Firearm Act,¹³⁸ the individual must make a tax payment and the ATF

132. See generally 18 U.S.C. § 922 (2012).

133. *Id.* § 922(a).

134. A quick read of the statute’s language makes the statute appear to be a strict prohibition of manufacture and distribution of firearms by anyone who is not a licensed importer, licensed manufacturer, or licensed dealer. See *id.* However, a closer look reveals that this prohibition of manufacture and distribution applies only to individuals who are manufacturing and distributing for a business purpose. *Id.*

135. *Id.* § 922(a)(1).

136. See Jensen-Haxel, *supra* note 10, at 479 (discussing how at-home manufacture of guns does not fall into Congress’s definition of “a firearm ‘manufacturer’ as one who operates for ‘the principal objective of livelihood and profit.’” (quoting 18 U.S.C. § 921(a)(21)(A))).

137. *General Questions*, BUREAU ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES, <http://www.atf.gov/firearms/faq/general.html> (last visited Feb. 21, 2014).

138. See *id.*; see National Firearms Act, 26 U.S.C. 53 § 5845 for a list of NFA regulated weapons.

must approve the making of the gun.¹³⁹ Further, individuals are “prohibited from assembling a non-sporting semi-automatic rifle or non-sporting shotgun from imported parts.”¹⁴⁰ Thus, current gun regulations for the manufacture of guns for nonbusiness purposes only apply to specific types of weapons that are unusually dangerous.¹⁴¹ Manufacturers of handguns that do not fall into the ATF category are not required to make a tax payment or get ATF approval to manufacture a gun, making regulation of certain types of firearms that could be manufactured at home non-existent.¹⁴²

b. Breaking Gun Laws Is Easy with 3D Printers

While there are laws in place to regulate the production of homemade guns—such as requiring the payment of a tax and the approval of manufacturing certain kinds of guns—printers make it incredibly easy to break the law.¹⁴³ This is particularly true for individuals who do not care about breaking the law as long as they can get their hands on a gun. While it is true that even without 3D printers individuals can buy the parts and assemble a gun at home, 3D printers make it unbelievably simple to do so because there are not laws that prevent the ability of individuals to “freely distribute[] digital file[s] that would allow anyone with the right hardware and know-how to print their own firearm.”¹⁴⁴ This totally unregulated ability to create firearms at home poses extreme risks.¹⁴⁵ A gun manufactured by a person with ill intent can result in deadly consequences.¹⁴⁶

139. National Firearms Act, 26 U.S.C. 53.

140. *Id.*

141. *See supra* text accompanying notes 137-40.

142. *See supra* text accompanying note 139.

143. *See supra* text accompanying notes 83-91 for a depiction of how easily an individual can arm himself with a dangerous weapon.

144. Clay Dillow, *FYI: Is It Legal to 3-D Print a Handgun?*, POPULAR SCI. (Oct. 4, 2012, 2:00 PM), <http://www.popsoci.com/technology/article/2012-10/fyi-it-legal-3-d-print-handgun>.

145. *See infra* Subsection II.B.3.c for an illustration of the level of atrocity that can occur when a gun gets into the hands of an ill-intentioned person.

146. *See generally infra* Subsection II.B.3.c.

c. Existing Proposals for Gun Regulation Are Insufficient for Regulation of Digital Gun Files

On December 14, 2012, twenty-year-old Adam Lanza grabbed a Bushmaster semiautomatic AR-15 assault rifle, a Glock pistol, and a Sig Sauer pistol from his home, killed his mother, and set off for Sandy Hook Elementary School, where 700 students attended school.¹⁴⁷ A newly installed security system did not prevent Lanza from entering the school.¹⁴⁸ Instead, Lanza fired an assault weapon at the building to create an entrance.¹⁴⁹ After killing Sandy Hook Elementary School's principal and psychologist, Lanza then moved on to two classrooms—a kindergarten classroom and a first-grade classroom.¹⁵⁰ Lanza took the lives of twenty six- and seven-year-olds, six adults, and then shot and killed himself.¹⁵¹ The tragedy at Sandy Hook Elementary School has caused many individuals to question to what extent the right to bear arms is afforded to individuals under the Second Amendment of the United States Constitution.¹⁵² Despite 38% of Americans being dissatisfied with current gun laws, up 13% from the prior year, it is important to note that a majority of Americans believe that current gun laws are appropriate.¹⁵³

In a speech given in the aftermath of the Sandy Hook tragedy, President Obama asserted that action must be taken to prevent similar tragedies from taking place.¹⁵⁴ While debates over gun

147. *Sandy Hook Shooting: What Happened?*, CNN, <http://www.cnn.com/interactive/2012/12/us/sandy-hook-timeline/index.html> (last visited Feb. 21, 2014).

148. *Id.*

149. *Id.*

150. *Id.*

151. *Id.*

152. David Ariosto & Susan Candiotti, *Newtown Searches for Answers a Month Later*, CNN (Jan. 14, 2013, 10:08 PM), http://www.cnn.com/2013/01/14/us/connecticut-newtown-one-month-on/?hpt=hp_t2.

153. Lydia Saad, *In U.S., 38% Dissatisfied and Want Stricter Gun Laws*, GALLUP (Jan. 14, 2013), <http://www.gallup.com/poll/159824/americans-dissatisfaction-gun-laws-spikes.aspx>. A Gallup poll performed on a random sample of 1,011 adults in January 2013 demonstrated that 38% of Americans want stricter gun laws, a 13% increase from a similar Gallup poll performed a year earlier. *Id.* However, 43% of those polled were satisfied with current gun laws, and 5% thought that gun regulations “should be loosened.” *Id.*

154. *President Obama's Address to the Nation After Sandy Hook Elementary School Mass Shooting in Newtown, Conn.*, N.Y. DAILY NEWS (Dec. 14, 2012, 4:04

regulation can be heated, after the tragedy at Sandy Hook Elementary School, some feel that it “makes no sense to blame every factor but guns.”¹⁵⁵ Thus, current gun laws are being reevaluated.¹⁵⁶ Given the recent atrocity at Sandy Hook, it is not hard to imagine a 3D gun being printed and similar tragedies occurring. Vice President Joe Biden met with the National Rifle Association (NRA) and provided President Obama with various gun control recommendations.¹⁵⁷ On January 16, 2013, President Obama released a gun-control proposal that included more stringent background checks, such as requiring background checks for all gun sales and creating incentives for states to share information regarding “criminal history records and records of persons prohibited from having guns for mental health reasons.”¹⁵⁸ Further, President Obama proposed prohibiting the sale of military-style assault weapons and high-capacity magazines.¹⁵⁹ However, in April 2013, the expansion on background checks and the assault weapon and high-capacity gun magazine ban proposals all failed to receive the required sixty votes to pass through the Senate.¹⁶⁰

PM), <http://www.nydailynews.com/news/politics/full-text-president-obama-address-school-shooting-horror-article-1.1220466>. President Obama stated:

As a country, we have been through this too many times. Whether it’s an elementary school in Newtown, or a shopping mall in Oregon, or a temple in Wisconsin, or a movie theater in Aurora, or a street corner in Chicago—these neighborhoods are our neighborhoods, and these children are our children. And we’re going to have to come together and take meaningful action to prevent more tragedies like this, regardless of the politics.

Id.

155. Michael Pearson, *Obama Says Gun Lobby Stokes Fear of Federal Action*, CNN (Jan. 15, 2013, 9:51 AM), <http://www.cnn.com/2013/01/14/politics/gun-laws-battle/index.html>.

156. *Id.*

157. Arlette Saenz, *NRA Blasts Biden After Meeting on Guns*, ABC NEWS (Jan. 10, 2013), <http://abcnews.go.com/Politics/OTUS/sandy-hook-elementary-biden-includes-nra-wal-mart-background-checks/story?id=18174779>.

158. WHITE HOUSE, NOW IS THE TIME: THE PRESIDENT’S PLAN TO PROTECT OUR CHILDREN AND OUR COMMUNITIES BY REDUCING GUN VIOLENCE 3, 4 (2013), *available at* http://www.whitehouse.gov/sites/default/files/docs/wh_now_is_the_time_full.pdf.

159. *Id.* at 5. Other actions President Obama proposed include ending Congress’s ban on gun violence research that prevents agencies such as Centers for Disease Control from “using funds to ‘advocate or promote gun control,’” giving schools more resources to prevent school crime, and improving mental health services. *Id.* at 8, 11, 13.

160. Jonathan Weisman, *Senate Blocks Drive for Gun Control*, N.Y. TIMES (Apr. 17, 2013), <http://www.nytimes.com/2013/04/18/us/politics/senate-obama-gun-control.html?pagewanted=all>.

One existing law suggested to have the ability to aid in the regulation of 3D-printed guns is the Undetectable Firearms Act of 1988.¹⁶¹ Under the Undetectable Firearms Act of 1988:

(2)(p)(1) It shall be unlawful for any person to manufacture, import, sell, ship, deliver, possess, transfer, or receive any firearm—

- (A) that, after removal of grips, stocks, and magazines, is not as detectable as the Security Exemplar, by walk-through metal detectors calibrated and operated to detect the Security Exemplar; or
- (B) any major component of which, when subjected to inspection by the types of x-ray machines commonly used at airports, does not generate an image that accurately depicts the shape of the component. Barium sulfate or other compounds may be used in the fabrication of the component.¹⁶²

After the Act expired, President George W. Bush renewed the Act in 2003.¹⁶³ In December 2012, Representative Steve Israel advised politicians to renew the Undetectable Firearms Act.¹⁶⁴ After catching wind of the capability of 3D printers to print gun parts out of nonmetal material, Representative Israel stated:

“It is just a matter of time before these three-dimensional printers will be able to replicate an entire gun. . . . And that firearm will be able to be brought through th[e] security line, through the metal detector, and because there will be no metal to be detected, firearms will be brought on planes without anyone’s knowledge.”¹⁶⁵

Ultimately, the Act makes completely plastic guns illegal.¹⁶⁶ Congress voted to renew the Act again in December 2013, extending it for another ten years.¹⁶⁷

161. Undetectable Firearms Act of 1988, Pub. L. No. 100-649, 102 Stat. 3816 (codified as amended at 18 U.S.C. § 922(p)(1) (2012)); see *Rep. Steve Israel Urges Congress to Renew ‘Wiki Weapon’ Ban*, MEET 112TH (Dec. 8, 2012), <http://www.meetthe112th.com/latest-news/rep-steve-israel-urges-congress-to-renew-wiki-weapon-ban/> [hereinafter *Rep. Steve Israel*].

162. 18 U.S.C. § 922(p)(1); Reauthorization on the Ban of Undetectable Firearms, Pub. L. No. 108-174, 117 Stat. 2481 (2003) (codified at 18 U.S.C. § 922(p)).

163. *Rep. Steve Israel*, *supra* note 161.

164. *Id.*

165. *Id.*

166. *Rep. Israel Announces Legislation to Renew Ban on Plastic Guns*, STEVE ISRAEL REPRESENTING 3D DISTRICT N.Y. (Dec. 7, 2012), <http://israel.house.gov/media-center/press-releases/rep-israel-announces-legislation-to-renew-ban-on-plastic-guns>.

167. Extension of Undetectable Firearms Act of 1988, Pub. L. No. 113-57, 127 Stat. 656 (2013).

Cody Wilson, the leader of a project called “Wiki Weapons,” recognizes that obstacles still remain to 3D printing a complete gun.¹⁶⁸ Paul Saffo, a Silicon Valley technology forecaster, states that “technology exists now for a highly motivated group to make a plastic gun on a 3D printer that could avoid airport scanners. But the equipment is still too expensive for most people.”¹⁶⁹ Thus, while renewal of the Undetectable Firearms Act aids in regulation of completely plastic guns, the Act does not aid in regulation of most 3D-printed guns, as some parts of guns are still causing obstacles in 3D printing, meaning 3D-printed guns still have x-ray detectable parts.¹⁷⁰ An additional weakness of this Act is the fact that it makes “undetectable” guns illegal.¹⁷¹ Once technology supports efficient, inexpensive 3D printing of entirely plastic guns, many undetectable guns will be accessible to the public. Despite whether or not an Act makes wholly plastic guns illegal, the truth of the matter is that the guns are undetectable, making it difficult to uncover the use of such weapons before any damage is done. If it is decided that the printing of 3D guns should be regulated, instead of merely aiming to regulate the physical printing of guns, policymakers should aim to regulate the sharing of free gun CAD files online to prevent just anyone from being able to print a 3D gun in the privacy of their home.¹⁷²

Recently, the United States government attempted to take the approach of regulating the sharing of online digital gun blueprints through International Traffic in Arms Regulations (ITAR).¹⁷³ In May 2013, Cody Wilson, founder of Defense Distributed, shared

168. See *Click, Print, Shoot*, *supra* note 9.

169. *Id.*

170. See Jensen-Haxel, *supra* note 10, at 455-56 (“It might therefore be some time before printers available to consumers can produce complete, high-quality firearms of the variety currently available from the gun industry.”).

171. See 18 U.S.C. § 922(p)(1). The Undetectable Firearms Act makes the printing of an all-plastic gun illegal. See Fountain, *supra* note 86. Currently, there are many remaining challenges in creating an entirely plastic gun because the pressure of a firing bullet causes the plastic to deform and crack. *Id.* However, once the problem with deforming plastic is solved, the Undetectable Firearms Act will make the production of plastic guns illegal, but will not aid in actually detecting plastic guns.

172. See *infra* Part IV.

173. International Traffic in Arms Regulations, 22 C.F.R. §§ 120-130 (2013); Jon Terbush, *The Obama Administration Takes Aim at 3D-Printed Guns*, THE WEEK (May 9, 2013), <http://theweek.com/article/index/244019/the-obama-administration-takes-aim-at-3d-printed-guns>.

instructions to the first entirely 3D-printable handgun,¹⁷⁴ called the Liberator, on Defense Distributed's website.¹⁷⁵ In the first two days the design was shared online, the file was downloaded 100,000 times.¹⁷⁶ In response, the State Department Office of Defense Trade Controls Compliance sent a letter to Cody Wilson demanding that not only the 3D-printable designs for the Liberator, but also nine other 3D-printable gun components, be removed from Defense Distributed's website.¹⁷⁷

The government claims the files may violate ITAR since the uploaded 3D-printable files can be downloaded abroad.¹⁷⁸ ITAR regulates the export of defense articles outside of the United States.¹⁷⁹ Under ITAR, exporting a defense article includes, "[d]isclosing (including oral or visual disclosure) or transferring in the United States any defense article to an embassy, any agency or subdivision of a foreign government," as well as "[d]isclosing (including oral or visual disclosure) or transferring technical data to a foreign person."¹⁸⁰ Despite the fact that Defense Distributed has complied with the demanded takedown of the files until the government decides the fate of designs under ITAR, it is argued that ITAR will not be an effective regulation of 3D-printable gun designs.¹⁸¹ For example, in the past, the U.S. government attempted to use ITAR to regulate the export of specific types of cryptographic tools.¹⁸² However, courts found the cryptographic tools software to

174. 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/>; Andy Greenberg, *State Department Demands Takedown of 3D-Printable Gun Files for Possible Export Control Violations*, FORBES (May 9, 2013, 2:36 PM), <http://www.forbes.com/sites/andygreenberg/2013/05/09/state-department-demands-takedown-of-3d-printable-gun-for-possible-export-control-violation/> [hereinafter Greenberg, *State Department Demands Takedown*].

175. Greenberg, *State Department Demands Takedown*, *supra* note 174.

176. *Id.*

177. *Id.*

178. *Id.*

179. 22 C.F.R. §§ 120.1-.39 (2013).

180. *Id.* § 120.17

181. DANIEL CASTRO, INFO. TECH. & INNOVATION FOUND., SHOULD GOVERNMENT REGULATE ILLICIT USES OF 3D PRINTING? 2 (2013), available at <http://www2.itif.org/2013-regulate-illicit-3d-printing.pdf>.

182. *Id.*

be protected by the First Amendment.¹⁸³ Further, the use of ITAR to regulate the software was highly ineffective due to the ease of which the cryptographic tools could be shared online—nearly an identical problem the U.S. government will face with using ITAR to regulate 3D-printable gun files.¹⁸⁴ For example, the digital Liberator blueprints can now be found on numerous other websites, such as The Pirate Bay.¹⁸⁵ Further, simply applying a “geo-location restriction[.]” so that the files are only shared in the United States would likely prevent ITAR from applying.¹⁸⁶ Thus, ITAR will likely be insufficient to regulate the sharing of dangerous 3D designs.¹⁸⁷

With gun laws insufficient to regulate the sharing of dangerous CAD files online, Thingiverse, one of several websites that enables individuals to share digital designs printable via 3D printers, decided to take the issue into its own hands.¹⁸⁸ On the Makerbot Thingiverse “Terms of Use” webpage, the company states, “You agree not to use the Site or Services to collect, upload, transmit, display, or distribute any User Content . . . that . . . promotes illegal activities or contributes to the creation of weapons, illegal materials or is otherwise objectionable.”¹⁸⁹ Despite usually lax enforcement of its ban on weapon designs, Thingiverse decided to delete many weapon blueprints shared on its website after the Sandy Hook shooting

183. *Id.* (citing *Bernstein v. U.S. Dep’t of Justice*, 176 F.3d 1132 (9th Cir. 1999), *vacated*, 192 F.3d 1308 (9th Cir. 1999)).

184. *Id.*

185. *Id.*

186. *Id.*

187. *Id.*

188. *What Is Thingiverse?*, MAKERBOT THINGIVERSE, <http://www.thingiverse.com/about> (last visited Feb. 21, 2014); *see also Frequently Asked Questions*, SHAPEWAYS, <http://www.shapeways.com/> (last visited Feb. 21, 2014) (“We enable anyone to make, buy, and sell products with 3D printing.”); CUBIFY, <http://cubify.com/blog> (last visited Feb. 21, 2014).

189. *Makerbot Terms of Use*, MAKERBOT THINGIVERSE, <http://www.thingiverse.com/legal> (last updated Dec. 18, 2013).

tragedy in December 2012.¹⁹⁰ Nevertheless, this has not stopped individuals from finding 3D-printable gun designs online.¹⁹¹

III. USING COPYRIGHT LAW AS A MODEL TO REGULATE 3D PRINTING

It is important to recognize that the use of the Internet to upload and share 3D blueprints for guns opens the door to the possibility of regulating the proliferation of 3D-printed guns through a different means than traditional gun laws.¹⁹² The inability of current gun laws to regulate 3D-printable designs,¹⁹³ and the ability of copyright law to regulate the sharing of digital files on the Internet, suggests that copyright law can serve as a useful model to create a law that does not regulate physical guns, but guns in digital form.

Battles regarding how intellectual property rights should be applied to 3D printing are predicted to erupt as 3D printers become more accessible.¹⁹⁴ The “charged debate around intellectual property (IP) and ‘fair use’ as it pertains to 3D printing is already taking shape With emerging desktop digital fabrication and 3D scanning technologies, designs for physical things will be increasingly duplicated, reverse engineered, shared and distributed by users—lawfully or otherwise.”¹⁹⁵ However, as stated by the United States District Court for the Eastern District of Pennsylvania in *ACLU v. Reno*:

The absence of governmental regulation of Internet content has unquestionably produced a kind of chaos, but as one of plaintiffs’ experts put it with such resonance at the hearing: “What achieved success was the

190. Andy Greenberg, *3D-Printing Firm Makerbot Cracks Downs on Printable Gun Designs*, FORBES (Dec. 19, 2012, 4:30 PM), <http://www.forbes.com/sites/andygreenberg/2012/12/19/3d-printing-startup-makerbot-cracks-down-on-printable-gun-designs/>. Prior to the take down of weapon designs, browsers could download and print the receiver of gun, order other necessary parts to complete the assembly of the gun, and ultimately create a lethal weapon without any legal obstacles. *Id.* However, in response to the takedown of weapon designs, a website has been created specifically for the purpose of sharing gun designs. *See supra* note 10.

191. *See US Government Orders Removal of Defcad*, *supra* note 10.

192. *See infra* Sections IV.A-B.

193. *See supra* Subsection II.B.3.

194. Steve Henn, *As 3-D Printing Becomes More Accessible, Copyright Questions Arise*, NPR (Feb. 19, 2013, 3:01 AM), <http://www.npr.org/blogs/alltechconsidered/2013/02/19/171912826/as-3-d-printing-become-more-accessible-copyright-questions-arise>.

195. Ratto & Ree, *supra* note 47.

very chaos that the Internet is. The strength of the Internet is that chaos.” Just as the strength of the Internet is chaos, so the strength of our liberty depends upon the chaos and cacophony of the unfettered speech the First Amendment protects.¹⁹⁶

The same is true for the absence of governmental regulation of sharing of CAD files for 3D printing—the success of 3D printing will be achieved by the chaos.¹⁹⁷ The technology of 3D printing opens the door to a multitude of possibilities, which rightly creates a sense of fear for many.¹⁹⁸ However, the creation of regulations for the sharing of CAD files for 3D printing needs to be done carefully, keeping in mind that the right balance needs to be struck.¹⁹⁹ Too much regulation that is overly restrictive will hamper the development of technology that “has potential to spark a new industrial revolution,”²⁰⁰ while loose regulation could leave too much in the hands of the general public and put the entire nation’s security at risk.²⁰¹

The ways in which regulation of CAD file sharing could take shape can be demonstrated by the chaos that took place in the music industry with file sharing.²⁰² As stated by an engineer when discussing CAD file sharing with Forbes magazine, ““We don’t want to see what happened in music and film play out in the area of

196. 929 F. Supp. 824, 883 (E.D. Pa. 1996) (footnote omitted) (holding that provisions in the Communications Decency Act of 1996, restricting types of communications over computer networks, violated the First Amendment).

197. See WEINBERG, *supra* note 67, at 1.

The next great technological disruption is brewing just out of sight. In small workshops, and faceless office parks, and garages, and basements, revolutionaries are tinkering with machines that can turn digital bits into physical atoms. The machines can download plans for a wrench from the Internet and print out a real, working wrench.

..... One of the goals of this whitepaper is to prepare the 3D printing community, and the public at large, *before* incumbents try to cripple 3D printing with restrictive intellectual property laws.

Id.

198. See *supra* Part II.

199. Rideout, *supra* note 34, at 177. It is imperative that legislators recognize that too much regulation could thwart the development of what has the ability to be a revolutionary technology, while also keeping in mind that the negative impacts of 3D printing could impact many individuals. *Id.*

200. *Id.*

201. See *supra* Section II.A.

202. *Difference Engine: The PC All Over Again?*, THE ECONOMIST (Sept. 9, 2012, 7:31 AM), <http://www.economist.com/blogs/babbage/2012/09/3d-printing>.

shapes.”²⁰³ The engineer discussed shapes in reference to the printing of objects through the use of CAD files.²⁰⁴ An advocate of innovation, the engineer was concerned that the DMCA would be used to regulate the sharing of CAD files on the Internet the same way that it was used to regulate the sharing of music and film.²⁰⁵

However, it is hard to argue against a law that punishes the willful infringement of copyrights.²⁰⁶ This willful infringement has been made possible through the increase in ownership of personal computers and the ease at which individuals can copy songs, movies, and books from the Internet at little cost.²⁰⁷ Just as individuals download MP3 files and listen to music, it is foreseen that consumers will be able to peruse the Internet, download a desired product, and print it out at home.²⁰⁸ Further, while the sharing of CAD files could cause infringement of intellectual property rights as the sharing of files over the Internet did in the music industry, the sharing of CAD files has the potential to be much more dangerous.²⁰⁹ Instead of online piracy of artists’ tunes, there would be online piracy of CAD files sharing the blueprints of dangerous weapons that are transformed into a material reality by simply pressing “PRINT.”²¹⁰ Thus, copyright law, specifically the DMCA, can be used as a model to create a law that regulates the sharing of dangerous 3D-printable designs.²¹¹

203. *Id.*

204. *See id.*

205. *Id.*

206. *Id.*

207. Rideout, *supra* note 34, at 161-62.

208. *Id.* at 162.

209. *See supra* Section II.A.

210. The chaos that took place on the Internet when digital music files became accessible on the Internet has been analogized to the chaos that is now taking place on the Internet as 3D printing is being introduced to the world. *See supra* text accompanying note 211.

211. Doherty, *supra* note 1, at 373 (advocating for the government to learn from the challenges posed when digital music was first introduced to the public and write legislation based off of what has been learned).

Recent history has seen intellectual property law outpaced by the rapid progress in digital technology. With copyright law, the response was chaotic—uncertainty over the future of digital music, extensive litigation, the eventual rise and fall of companies like Napster and Grokster—with consumers forced to wait for the dust to settle. In spite of its flaws, the legislative response finally brought some certainty to the field, and allowed for the rise of YouTube, the Apple App Store, Facebook, and other services that have reshaped the way that consumers use the Internet. Our experience in solving the digital copyright crisis should serve as a

IV. REGULATING 3D PRINTING OF WEAPONS WITH HELP FROM THE DMCA

With gun laws currently insufficient to regulate the sharing of gun CAD files on the Internet, the DMCA should be used as a model to aid in the regulation of 3D-printed guns by regulating the sharing of CAD files that enable the printing of 3D guns.²¹² It has been argued that copyright law on its own is presently able to deal with the sharing of CAD files,²¹³ but this argument is shortsighted.²¹⁴

Copyright law protects “original works of authorship fixed in a tangible medium of expression,” including: “(1) literary works; (2) musical works, including any accompanying words; (3) dramatic works, including any accompanying music; (4) pantomimes and choreographic works; (5) pictorial, graphic, and sculptural works; (6) motion pictures and other audiovisual works; (7) sound recordings; and (8) architectural works.”²¹⁵ Therefore, CAD files that are “original works of authorship” would seem to be protected by copyright law as CAD files are “fixed in a[] tangible medium of expression”²¹⁶ and most likely fall into the category of “pictorial, graphic, and sculptural works.”²¹⁷ However, copyright protection is time limited, protecting a copyrighted work for the life of the right holder plus seventy years after the right holder’s death.²¹⁸ If the sharing of CAD files were to simply be regulated with copyright law, weapon CAD files would continue to be uploaded onto the Internet

lesson in addressing the coming 3D printing revolution: the problems that will arise are foreseeable, and the potential solutions have already been tested. Rather than letting history repeat itself, we should take this rare opportunity to proactively fix the system.

Id.

212. See *infra* Sections IV.A-B.

213. MICHAEL WEINBERG, INST. FOR EMERGING INNOVATION, WHAT’S THE DEAL WITH COPYRIGHT AND 3D PRINTING? (2013), available at <http://publicknowledge.org/Copyright-3DPrinting> (stating “online copyright rules do not need to be rewritten just to accommodate the appearance of 3D printing on the scene”).

214. See *infra* Section IV.A (explaining that beyond basic copyright law, Congress has enacted further legislation—the DMCA—to strike an appropriate balance between protecting copyright owners from online piracy and protecting the public access to online information and content, which is an issue applicable to the sharing of CAD files).

215. 17 U.S.C. § 102 (2012).

216. *Id.*

217. Rideout, *supra* note 34, at 168.

218. WEINBERG, *supra* note 213, at 2.

as digital designs lost copyright protection.²¹⁹ Further, copyright law only protects works that are not “useful article[s].”²²⁰ Useful articles are defined as an article having “an intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information.”²²¹ When a CAD file is largely functional and not artistic, the CAD file is not protectable by copyright.²²² While some artistic CAD files are copyrightable, a gun CAD file, which may have some incorporated artistic elements, would still be largely functional and would not gain copyright protection.²²³ However, a more artistic CAD file, like a CAD file coding for a bust of Yoda from Star Wars, would be highly artistic and have copyright protection.²²⁴ As many CAD files are highly functional, like a gun, copyright licensing would not regulate the sharing of a large percentage of gun CAD files.²²⁵ Additionally, many CAD file owners use GPL schemes, which make copyright material open to use by the public.²²⁶

Nevertheless, a lot can be learned from the manner in which copyright law has faced the challenge of regulating shared copyrighted digital files.²²⁷ In the last fifteen years, websites that enable users to upload copyright-protected content have become popular.²²⁸ To deal with the uploading and copying of copyright-protected content on websites, such as YouTube, the DMCA was created.²²⁹ Thus, as a tested law for regulating digital files online, the DMCA is an appropriate model for the writing of a law to regulate the sharing of gun CAD files online.²³⁰

219. See generally text accompanying note 218.

220. 17 U.S.C. § 1301 (2012).

221. *Id.*

222. See WEINBERG, *supra* note 213, at 2.

223. See generally *id.*

224. Henn, *supra* note 194 (explaining that many of the digital designs being copied and printed on Thingiverse, a CAD file share site, are copyright protected—including a bust of Yoda).

225. However, it can be expected that manufacturers will lobby to expand copyright law “to cover functional objects that contain elements of design.” *Difference Engine: The PC All Over Again?*, *supra* note 202.

226. See discussion *supra* Section I.B.

227. Doherty, *supra* note 1, at 373 (“Our experience in solving the digital copyright crisis should serve as a lesson in addressing the coming 3D printing revolution: the problems that will arise are foreseeable, and the potential solutions have already been tested.”).

228. Cf. WEINBERG, *supra* note 213, at 5.

229. *Id.*

230. See *infra* Sections IV.A-B.

A. Digital Millennium Copyright Act

In October 1998, President Bill Clinton signed the DMCA²³¹ into law.²³² The purpose of the Act is to implement the WIPO Copyright Treaty (WCT) of 1996 and the WIPO Performances and Phonograms Treaty (WPPT) of 1996.²³³ The DMCA consists of five titles: WIPO Copyright and Performances and Phonograms Treaties Implementation Act of 1998, Online Copyright Infringement Liability Limitation Act, Computer Maintenance Competition Assurance Act, Miscellaneous Provisions, and Vessel Hull Design Protection Act.²³⁴

In general, the DMCA mandates that hosting websites must communicate between uploaders of copyrighted content and copyright holders.²³⁵ While the DMCA serves to protect content providers by increasing enforcement of copyrights, the DMCA also limits liability of Internet service providers.²³⁶ Essentially, the DMCA is implemented through a trade-off of sorts—safe harbors under the DMCA protect service providers from copyright liability as long as Internet service providers assist copyright owners in resolving copyright infringement disputes.²³⁷ Section 1201(a)(1)(A) of the DMCA is the general prohibition of “[c]ircumvention of [t]echnological [m]easures” and states, “No person shall circumvent a technological measure that effectively controls access to a work protected under this title.”²³⁸ The meaning of this provision is that individuals who attempt to access a protected work by finding ways

231. Digital Millennium Copyright Act, Pub. L. No. 105-304, 112 Stat. 2860 (1998) (codified as amended in scattered sections of 17 U.S.C. (2012)).

232. U.S. COPYRIGHT OFFICE, THE DIGITAL MILLENNIUM COPYRIGHT ACT OF 1998: U.S. COPYRIGHT OFFICE SUMMARY 1 (1998), available at <http://www.copyright.gov/legislation/dmca.pdf>.

233. *Id.*

234. Digital Millennium Copyright Act §§ 2, 101, 201, 301, 501.

235. WEINBERG, *supra* note 213, at 5.

236. See 17 U.S.C. § 512. Service providers include “entit[ies] offering the transmission, routing, or providing of connections for digital online communications, between or among points specified by a user, of material of the user’s choosing, without modification to the content of the material as sent or received.” *Id.*

237. Annemarie Bridy, *Is Online Copyright Enforcement Scalable?*, 13 VAND. J. ENT. & TECH. L. 695, 712 (2011).

238. 17 U.S.C. § 1201(a)(1)(A).

to get around antipiracy measures or other protection measures are behaving illegally.²³⁹

Two provisions of the DMCA that copyright owners depend upon to enforce their rights are Sections 512(c) and 512(h).²⁴⁰ Section 512(c) lays out a notice-and-takedown framework that requires service providers to notify copyright owners when infringement occurs and to “respond[] expeditiously to remove, or disable access to, the material that is claimed to be infringing or to be the subject of infringing activity.”²⁴¹ Section 512(h) authorizes copyright owners to subpoena a service provider regarding the identification of infringers.²⁴² Congress wrote the DMCA with the intent to strike the appropriate balance between protecting copyright owners from online piracy and protecting the public access to online information and content.²⁴³

B. The Proposal: The Digital Gun Act

The Digital Gun Act would use what has been learned from copyright law to create a DMCA-like law for gun CAD files.²⁴⁴ However, the Digital Gun Act would not depend on intellectual property rights for the law to be enforceable.²⁴⁵ The necessary analogy that must be drawn to create a DMCA-like model for the regulation of guns is the following: a copyright is to the DMCA what a CAD file coding for a gun is to the Digital Gun Act.²⁴⁶ Further

239. Steve P. Calandrillo & Ewa M. Davison, *The Dangers of the Digital Millennium Copyright Act: Much Ado About Nothing?*, 50 WM. & MARY L. REV. 349, 361 (2008).

240. Bridy, *supra* note 237, at 712.

241. 17 U.S.C. § 512(c).

242. *Id.* § 512(h)(1) (“A copyright owner or a person authorized to act on the owner’s behalf may request the clerk of any United States district court to issue a subpoena to a service provider for identification of an alleged infringer in accordance with this subsection.”).

243. Calandrillo & Davison, *supra* note 239, at 355.

244. While most gun laws are state laws, the Bureau of Alcohol, Tobacco, Firearms and Explosives regulates some gun laws at a federal level. *See About ATF, BUREAU OF ALCOHOL, TOBACCO, FIREARMS & EXPLOSIVES*, <http://www.atf.gov/content/About> (last visited Feb. 21, 2014). The Digital Gun Act would similarly be regulated at a federal level. The purpose of the ATF is to “protect[] our communities from violent criminals, criminal organizations, the illegal use and trafficking of firearms.” *Id.* The sole distinction between the purpose of the ATF and the Digital Gun Act is that the Digital Gun Act would protect communities from violence through the illegal trafficking of *digital* firearm files.

245. *See infra* Subsection IV.B.1.

246. *See infra* Subsections IV.B.1-2.

explained, this means that as a valid copyright enables notice and takedown of infringing material to occur under the DMCA, a CAD file coding for a gun would enable takedown of the digital gun file to occur under the Digital Gun Act.²⁴⁷ The Digital Gun Act implements a system that allows interested buyers of digital gun files to use authorized, licensed digital gun dealer websites for digital gun design purchases.²⁴⁸ The Digital Gun Act requires buyers to meet background requirements and to provide proof of a gun license.²⁴⁹ Further, the Digital Gun Act makes circumvention of technological measures taken to control access to digital gun files illegal, and it necessitates that unlicensed 3D-printing share sites take measures to police their sites and prevent unauthorized uploading of gun CAD files.²⁵⁰

1. *Licensed Digital Gun Dealer Websites*

Under the Digital Gun Act, the uploading of CAD files that code for guns would only be legal on share sites that have been granted a license to deal guns by an agency that would be titled the Bureau of Digital Gun Management.²⁵¹ Once a website is granted a license to sell gun CAD files, individuals may upload gun CAD files onto the site. However, before users are enabled to view and download the shared CAD files, the users must meet the following necessary requirements.²⁵² First, interested buyers will be required to provide the website with their full name, social security number, birthdate, and permanent address. The buyer will then be subject to a screening.²⁵³ The consumer's purchasing history of other CAD

247. See *infra* Subsections IV.B.1-2.

248. See *infra* Subsection IV.B.1.

249. See *infra* Subsection IV.B.1.

250. See *infra* Subsections IV.B.1-2.

251. The Bureau of Digital Gun Management would be an agency that would be established through the Digital Gun Act—it is not currently in existence today.

252. Ultimately, the buyer would have to meet the same requirements as required by the ATF and federal gun laws. See *supra* Subsection II.B.3.a.

253. Some states have wait periods that “require that a specified number of days elapse between the time a firearm is purchased and it is physically transferred to the purchaser.” Law Ctr. to Prevent Gun Violence, *Waiting Periods Policy Summary*, SMARTGUNLAWS.ORG (May 21, 2012), smartgunlaws.org/waiting-periods-policy-summary/. The purpose of a waiting period is to: “(1) give law enforcement officials sufficient time to perform a background check; and (2) provide a ‘cooling off’ period to help guard against impulsive acts of violence.” *Id.* Since Congress would be responsible for determining all of the intricacies of the Digital Gun Act, Congress would benefit from taking each state's wait period law into consideration

licenses will be scrutinized, and a criminal history check will be performed.²⁵⁴ Lastly, individuals will have to meet ordinary gun law requirements by showing proof of a license for the gun, requiring application and approval through the ATF prior to purchasing the license.²⁵⁵ Ultimately, the Digital Gun Act would take gun laws from “physical” to “digital” by regulating access to gun CAD files through screening, background checks, and approval for a gun license.²⁵⁶

From this regulation standpoint, the Digital Gun Act would require a section similar to § 1201(a)(1)(A) of the DMCA, which is the general prohibition of “[c]ircumvention of [t]echnological [m]easures.”²⁵⁷ While the DMCA states, “No person shall circumvent a technological measure that effectively controls access to a work protected under [copyright law],”²⁵⁸ the Digital Gun Act would prohibit circumvention of technological measures that control access not to copyrighted works, but access to CAD files coding for guns.²⁵⁹ Thus, individuals who attempt to access a gun CAD file by finding ways to get around protection measures taken by the website would be behaving illegally and could be criminally charged.²⁶⁰

to create a compromise among all of the states that best meets the needs of the Digital Gun Act. A further consideration in determining the appropriate wait period is a recognition of the differences between buying a gun in a store and purchasing a gun CAD file online that can immediately be printed from home. It might be deemed necessary to have a longer wait period in the case of 3D printing guns because 3D printing otherwise enables a gun to be placed immediately within the buyer’s hands upon purchase of the gun.

254. The screening and background check aligns with the background check system used by Federal Firearms Licensees (FFLs). See *National Instant Criminal Background Check System*, FBI, www.fbi.gov/about-us/cjis/nics (last visited Feb. 21, 2014). FFLs use the National Instant Criminal Background Check System (NICS), which requires cashiers, before ringing up a sale, to call NICS and ensure that the buyer does not have a criminal record or is not ineligible to purchase a gun for any other reason. *Id.* Similarly, licensed digital gun websites would be required to contact NICS for approval of a sale.

255. This requirement falls in line with the gun control laws discussed above. See discussion *supra* Subsection II.B.3.a.

256. For an example of how the Digital Gun Act would take gun laws from “physical” to “digital,” see *infra* Section IV.C.

257. 17 U.S.C. § 1201(a) (2012).

258. *Id.*

259. The Digital Gun Act would mandate, “No person shall circumvent a technological measure that effectively controls access to a CAD file coding for a gun.”

260. See Calandrillo & Davison, *supra* note 239, at 361. Criminal prosecution is consistent with the penalties outlined in the DMCA. See 17 U.S.C. § 1204(a). While the DMCA requires willful violation of § 1201 of the DMCA for commercial advantage or private financial gain, the Digital Gun Act would solely

2. *Unlicensed 3D-Printing Share Sites*

The Digital Gun Act will likely garner negative feedback from CAD file designers since the 3D-printing movement has largely gained momentum by individuals sharing CAD files with the public and encouraging other individuals to tweak and improve shared CAD designs.²⁶¹ Further, one predictable challenge to the Digital Gun Act is how the law will prevent websites like Thingiverse that depend on the sharing of design files²⁶² from allowing individuals to freely upload their gun CAD files for sharing despite the website not being a licensed gun seller.

The portion of the DMCA that provides the greatest insight into how to regulate websites that are not licensed to sell guns is § 512(c) of the DMCA.²⁶³ This section lays out a notice-and-takedown framework that requires copyright owners to notify service providers when infringement occurs, and then upon notice, the service provider is required to “respond[] expeditiously to remove, or disable access to, the material that is claimed to be infringing or to be the subject of infringing activity.”²⁶⁴ Since the Digital Gun Act would regulate gun CAD files, not copyrighted works, and since the law will play a large role in implementing measures taken to ensure national security, the Digital Gun Act has several essential differences. First, all share sites that are not licensed to sell digital gun designs will have to

require willful violation due to the great risk posed to the public if gun CAD files are obtained illegally. Further, while it is easy to deem an act of circumvention as illegal, it is difficult to ensure that individuals will take it seriously and not break the law. Thus, as a safeguard against those who take steps to circumvent protection measures taken by the website to prevent hackers from receiving access to the gun CAD files, the use of Digital Rights Management (DRM) should be required on all digital gun seller websites. DRM is a technology that describes the user, content, and usage rights, as well as the relationship between all three. Julia Layton, *How Digital Rights Management Works*, HOWSTUFFWORKS.COM, <http://computer.howstuffworks.com/drm.htm> (last visited Feb. 21, 2014). For example, one described relationship could be that each user only gets one print of a gun. Or, DRM could prevent the printing of a gun unless each user’s social security number, name, credit card number, and address are first supplied and a background check is complete. Layton’s piece provides an in-depth description of how DRM software can be used. *Id.* While DRM is a technology that should certainly be further investigated for the regulation of 3D digital gun files, it goes beyond the scope of this Note.

261. See *supra* Subsections II.B.1-2.

262. See WEINBERG, *supra* note 213, at 6.

263. See 17 U.S.C. § 512(c).

264. *Id.* § 512(c)(1)(C).

implement a software system that identifies all uploaded CAD files that code for guns, making the immediate removal of those files possible. Unlicensed websites would be required to “respond[] expeditiously to remove, or disable access to”²⁶⁵ gun CAD files because unlike the DMCA, which limits liability of share sites, under the Digital Gun Act share sites will be fully responsible for policing their sites for unauthorized CAD files and removing unauthorized CAD files as soon as those files are uploaded. Additionally, the Bureau of Digital Gun Management would diligently police all share sites to ensure that gun CAD files are not being shared on unauthorized sites and would prosecute sites that do not follow the Digital Gun Act requirements.²⁶⁶

C. Application of the Digital Gun Act

The effect of the Digital Gun Act in various situations can be demonstrated by applying the Digital Gun Act to the two hypotheticals introduced in the Introduction.²⁶⁷ In the case of John, a deer hunter, the Digital Gun Act would not prevent John from printing a new gun. Since John bought his original gun from a licensed dealer, meaning he passed all requirements under current gun laws to acquire his gun, John would not have a problem meeting the Digital Gun Act’s requirements to download a gun CAD file from an authorized site. John would log on to a licensed digital gun dealer website, type in his name, social security number, birthdate, and permanent address.²⁶⁸ John would also have to provide proof of a license for the desired gun, obtainable only through approval by ATF.²⁶⁹ Next, John would be subject to a screening, including investigation of his purchasing history of other gun CAD files and a

265. *Id.*

266. Even if laws are modeled after copyright licensing and the DMCA to regulate the sharing of CAD files containing blueprints of dangerous weapons, it is necessary to point out that the printing of 3D weapons is still a very real possibility. While the regulation of sharing of CAD files that contain weapon designs will help decrease the printing of weapons by individuals who do not meet the requirements in the proposed licensing law, the printing of 3D weapons by individuals with the technological know-how to create CAD files is difficult to prevent. For example, using scans of actual objects to create CAD files that can then print the identical object scanned is a possibility and may need to be addressed to prevent the further spread of dangerous CAD files.

267. *See supra* Introduction.

268. *See discussion supra* Subsection IV.B.1.

269. *See discussion supra* Subsection IV.B.1.

criminal history check.²⁷⁰ Of course, it is difficult to determine whether or not John would pass the screening check in time to print his gun for the opening day of deer season, but considering that the entire process takes place online, it is a definite possibility that he would pass the screening check in time.²⁷¹ John would not have to spend the extra time of driving to the dealer, waiting for the dealer to look at his gun, and waiting for the dealer to send off for extra parts and fix his gun. Instead, after John passed the screening requirement, he would be able to download and print his desired gun.²⁷²

On the other hand, Chris, the drug dealer, would have a much more difficult time acquiring access to a gun CAD file. When Chris would log on to a licensed digital gun dealer website and type in his name, social security, birthdate, and permanent address, his criminal history and lack of an approved ATF license would prevent him from being authorized to purchase and download a gun CAD file.²⁷³ Further, the Digital Gun Act would make any acts of Chris to circumvent protections of the gun CAD files on the website illegal.²⁷⁴ In the scenarios of *both* John and Chris, it would now be *crisis averted*.²⁷⁵ John is able to print his gun and join his father on opening day of deer hunting season, and Chris's effort to obtain a gun through 3D printing to participate in a possibly fatal drug deal has been thwarted.

The Digital Gun Act is a viable option to aid in the regulation of CAD files coding for guns and can aid in ensuring that digital gun files only get into the hands of law-abiding people. The Digital Gun Act would solely affect CADs that code for weapons. The law would enable the normal buying and selling of gun design files by individuals deemed safe to buy a gun, while preventing the spread of CADs that code for weapons to individuals who have not gone through the proper licensing application or who have a criminal history.

270. See discussion *supra* Subsection IV.B.1.

271. See discussion *supra* Subsection IV.B.1; see also *supra* note 253 and accompanying text.

272. See discussion *supra* Subsection IV.B.1.

273. See discussion *supra* Subsection IV.B.1.

274. See discussion *supra* Subsection IV.B.1.

275. Unlike the hypotheticals in the Introduction, where the crisis was averted when John printed his gun and joined his father for opening day of deer season and where the crisis was created because Chris printed a gun to use in a drug deal, a crisis is now averted in both situations.

CONCLUSION

The use of 3D desktop printers at home is becoming more widespread as the technology becomes more affordable.²⁷⁶ While the technology provides individuals with the ability to turn ideas into solid objects without ever stepping out of the house, it also provides individuals with insurmountable power to manufacture dangerous weapons without any regulation whatsoever.²⁷⁷ As the use of 3D desktop printers begins to grow, regulations to prevent misuse of the technology need to be put in place.²⁷⁸ Copyright laws, specifically the DMCA, should be used as a model to create new regulations adapted to 3D-printing technology to prevent 3D-printable gun designs from getting into the hands of a dangerous person.²⁷⁹

276. See discussion *supra* Section I.B.

277. See discussion *supra* Section II.A.

278. See discussion *supra* Part IV.

279. See discussion *supra* Section IV.B.