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LIABILITY ISSUE OF DOMESTIC DRONES

Vivek Sehrawat[†]

Drones are much debated as weapons of war and due to privacy issues. Drones are also now under development for package delivery. This paper examines the potential liability associated with the domestic use of drone aircrafts and offers solutions for drone liability. This paper also examines potential drone liability through the lens of existing trespass causes of action and other applicable laws such as nuisance and negligence. Furthermore, this paper analyzes the legality of shooting down a drone for self-defense and discusses the minimum insurance requirements for drones.

Contents

INTRODUCTION.....	111
I. TYPES OF DOMESTIC DRONES	113
II. COMMERCIAL DRONES IN THE U.S.....	114
III. EXCEPTIONS FOR COMMERCIAL USE.....	115
IV. DRONE LIABILITY	116
V. TYPES OF LIABILITIES CAUSED BY DRONES	117
A. <i>Bodily injury</i>	117
B. <i>Property damage</i>	117
C. <i>Personal injury</i>	118
D. <i>Third-party liability</i>	119
VI. APPLICABLE LAW FOR DRONE LIABILITY	119
A. <i>FAA</i>	120
B. <i>State laws</i>	121
C. <i>Trespass law</i>	122
D. <i>Nuisance law</i>	125
E. <i>Negligence law</i>	126
VII. LEGALITY OF SHOOTING DOWN A DRONE.....	127
VIII. RIGHT TO SELF-DEFENSE IN RESPONSE TO INTRUSION ON SECLUSION	130
IX. MINIMUM INSURANCE REQUIREMENTS	130

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X. SOLUTIONS FOR DRONE LIABILITY	131
A. <i>Technical solution</i>	131
B. <i>Legal solutions</i>	132
CONCLUSION	133

INTRODUCTION

Low-cost high-performance drones have begun to take to the sky to gather and transmit data, deliver goods, and more.¹ These types of drones have become more prevalent and serve a multitude of purposes, from residential real estate photography to filmmaking.² Drones are a truly transformative technology with enormous potential to increase efficiency and produce large financial returns. As the use of drones becomes safer and more reliable, their use will become even more widespread, increasing productivity, reducing operating costs, and increasing work safety.³

There are numerous civil applications for drones, and the number of possible commercial applications will continue to grow as the technology develops and becomes commercially viable.⁴ In response to this growth in commercial drone use, the Federal Aviation Administration (FAA), a division of the Department of Transportation, tasked with licensing drones for domestic use, increased regulation and oversight of drone operation for both commercial operators and recreational users.⁵

However, misuse of new beneficial technology is almost guaranteed.⁶ Drones are no exceptions as concerns over drones snooping, spying, and crashing materialized over the last few years.⁷ Various news stories have already reported people observing drones invading people's privacy by flying by their windows, hovering over their backyards, and recording their likeness at parks, beaches, and

¹ Jonathan S. Ziss, *Drone Regulation Would Create Need for Liability Insurance*, BUS. INS. (November 23, 2014), <http://www.businessinsurance.com/article/00010101/STORY/311239999/Drone-regulation-would-create-need-for-liability-insurance>.

² *Id.*

³ *Autonomous and Unmanned Systems*, LOCKHEED MARTIN, <http://www.lockheedmartin.com/us/what-we-do/aerospace-defense/unmanned-systems.html> (last visited July 15, 2018).

⁴ Hillary Farber, *Keep Out! The Efficacy of Trespass Nuisance and Privacy Torts as Applied to Drones*, 33 GA. ST. U. L. REV. 360 (2017).

⁵ *Id.*

⁶ *Id.* at 361.

⁷ *Id.*

sporting events.⁸ Further, there have been reports of drones falling from the sky, injuring people and damaging property.⁹

The increased use of commercial drones correlates with an increase in the potential exposure to property damage, bodily injury and other liability losses.¹⁰ Drones can crash into structures, vehicles, and people resulting in damage to property and/or injury to a person.¹¹ For example, a drone can interfere with the takeoff or landing of a large commercial aircraft.¹² Other scenarios could include causing large traffic accidents.¹³ While malicious acts may be the cause of often contemplated worst-case scenarios, accidental or careless acts could also cause substantial damage.¹⁴ Regulations are being written to avoid these scenarios, but these regulations are not likely to eliminate the entire range of possible accidents.¹⁵ Furthermore, regulations are likely to create issues for early adopters.

For example, the FAA recently mandated that commercial drones were no longer allowed to fly over groups of people.¹⁶ Such a restriction may not be an issue for aerial real estate photography, but it may pose a big challenge for wedding and event photographers who choose to use drones.¹⁷ As drone technology becomes cheaper, it will find its way into the hands of more private individuals who may find some of their intended uses made illegal.¹⁸

FAA regulations lack protections for liability caused by drones. For example, there is no regulation regarding whether a drone pilot, a commercial company on whose behalf the drone pilot is operating or the drone manufacturing company is liable when a drone crashes because of a manufacturing default. Additionally, there is no regulation

⁸ *Id.*

⁹ *Id.* at 363.

¹⁰ *Before Using a Drone in Your Business, Understand FAA Regulation*, THE HARTFORD, https://www.thehartford.com/sites/the_hartford/files/drones-liability.pdf (last visited on May 5, 2017).

¹¹ *Id.*

¹² Carl X. Ashenbrenner & Thomas A. Ryan, *Drones: Emerging Commercial Potential, Emerging Liabilities*, MILLIMAN (June 15, 2015) <http://us.milliman.com/insight/2015/Drones-Emerging-commercial-potential--emerging-liabilities/>.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ Hillary Grigonis, *What Aerial Photographers Need to Know About FAA's New Drone Laws*, DIGITAL TRENDS (August 29, 2016, 10:32 AM) <http://www.digitaltrends.com/photography/what-do-fas-regulations-mean-for-drone-photographers/>.

¹⁷ *Id.*

¹⁸ Well C. Bennett, *Civilian Drones, Privacy, and the Federal-State Balance*, BROOKINGS INST., Sept. 2015, at 3.

on how a drone owner can recover damages that occur during a crash or when someone misuses drones while flying through another person's backyard. Also, there is little guidance as to what law should be applied to the different liability scenarios.

This paper examines potential liability associated with the private use of drone aircrafts. The paper discusses different types of drones, commercial uses of drones, and exceptions for commercial uses of drones. This chapter discusses the types of liability caused by drones. This paper examines potential drone liability through the lens of existing trespass causes of action and other applicable laws. Further, this paper analyzes whether it will ever be legal to shoot down a drone for self-defense. The paper also discusses the minimum insurance requirements for drones. Finally, this paper provides possible solutions for drone liability.

I. TYPES OF DOMESTIC DRONES

The FAA has identified three types of drone operations: public, civil, and recreational, each has its own set of requirements.¹⁹ Civil operation is drone use by any entity other than a public entity or for a recreational or hobbyist purpose.²⁰ A realtor's use of drones to collect aerial images of a house listing would be considered civil operation as it is neither by a public entity, nor is the operation for recreational or hobbyist motives.²¹

- a. **Public use:** The FAA has authorized 36 public agencies—whose missions include firefighting, disaster relief, search and rescue, law enforcement, border security and military training—to operate unmanned aircrafts.²² The most prevalent use has been undertaken by the Customs and Border Protection (CBP) Office of Air and Marine Operations for the purpose of border patrol.²³ CBP possesses the largest U.S. nonmilitary drone fleet.²⁴

¹⁹ Paul Beckwith & Gladys Miller, *FAA's New Part 107 Eases Challenges Faced by Commercial UAS Operators*, EARTH IMAGING J. (Dec. 13, 2016), <http://ejournal.com/print/column/faas-new-part-107-rules-ease-some-of-the-challenges-faced-by-commercial-uas-operators>.

²⁰ *Id.*

²¹ *Id.*

²² David Young, *Government's Domestic Use of Drones*, IAPP (April 22, 2014), <https://iapp.org/news/a/governments-domestic-use-of-drones-poses-privacy-questions-for-congress-and/>.

²³ *Id.*

²⁴ *Id.*

- b. **Recreational use:** The FAA currently permits recreational use of drones. Drones must weigh less than 55 pounds and cannot fly higher than 400 feet above the ground or interfere with manned aircraft traffic.²⁵ If the drone is operated within five miles of an airport, the operator must contact airport personnel.²⁶
- c. **Commercial use:** Demand for drones in the commercial arena is expanding.²⁷ The industries seeking permission from the FAA to use drones for commercial activities include agriculture, oil and gas, engineering, real estate, journalism, and filmmaking.²⁸ Several universities, such as Emory-Riddle Aeronautics University, Kansas State University, and the University of North Dakota, have begun to offer academic programs and degrees in the field of drones.²⁹

II. COMMERCIAL DRONES IN THE U.S.

Commercial drone use is virtually limitless.³⁰ Drones have a wide variety of applications that touch almost every industry: border surveillance, pipe and power line surveillance, suspect tracking, agricultural applications, traffic monitoring, communications, broadcast, news, disaster response, relief, movie production, damage assessment, tunnel investigation, atmospheric, weather research, mail, freight transport, critical infrastructure monitoring, flood mapping, damage surveying, real estate mapping, aerial photography, mining, sporting events coverage, and wildlife monitoring.³¹

In the U.S. real estate and photography businesses use drones frequently.³² The construction market also sees expansive uses for drones.³³ However, policy makers are still debating whether to allow a sweeping expansion in drone use for activities like deliveries

²⁵ Gerard Cavaluzzi, Anthony Terranova & Newton Marshall, *Liability Issues Related to the Use of Drones in Engineering*, at 91 (December 2015) <http://dri.org/docs/default-source/dri-online/course-materials/2015/professional-liability/12-liability-issues-related-to-the-use-of-drones-in-engineering.pdf?sfvrsn=4>.

²⁶ *Id.*

²⁷ Farber, *supra* note 4 at 367.

²⁸ *Id.*

²⁹ *Id.*

³⁰ Cavaluzzi, Terranova & Marshall, *supra* note 25 at 94.

³¹ *Id.*

³² Bart Jansen, *Why It's a Big Deal That Commercial Drones Flew Around the Atlanta Airport*, USA TODAY (February 14, 2017), <https://www.usatoday.com/story/news/2017/02/14/drone-flight-atlanta-airport-commercial-use/97748194/>.

³³ *Id.*

where an aircraft would fly beyond the sight of an operator.³⁴ In August 29, 2016, the FAA put new rules into effect regulating the commercial use of drones.³⁵ The increase comes after the Obama administration in 2016 implemented new rules that opened the skies to use of low-level small drones for education, research and routine commercial use.³⁶

Instead of having to acquire a traditional pilot's license and get a special case-by-case permission from regulators, drone operators now need to pass a new certification test and abide by various flying restrictions.³⁷ For example, the rules apply to drones that weigh up to 55 pounds and that are being used for business purposes, whether that is scientific research, education, media, or inspection and surveying of land, traffic, prisons, stadiums or anything else.³⁸ However, the original rules promulgated by the FAA do not cover traditional model airplanes nor drone delivery operations.³⁹ Instead, the rules govern tasks such as surveying, real estate photography, and site inspections.⁴⁰ While these uses may not be revolutionary, they represent cornerstones necessary to building a robust drone industry through sample use cases.⁴¹ Regulations for drone-based delivery will have to wait.⁴²

III. EXCEPTIONS FOR COMMERCIAL USE

As of 2018, the commercial use of drones is prohibited; however, the FAA provides certain exemptions if other requirements are met, such as the requirement for operators to obtain a private pilot's license.⁴³ In addition, the FAA has granted more than 300 waivers for

³⁴ David Shepardson, *U.S. Commercial Drone Use to Expand Tenfold by 2021*, REUTERS (March 22, 2017), <http://www.reuters.com/article/us-usa-drones-idUSKBN16S2NM>.

³⁵ Lora Kolodny, *New Rules for Commercial Drone Use Take Effect Today in the U.S.* *Tech Crunch*, (August 29, 2016) <https://techcrunch.com/2016/08/29/new-rules-for-commercial-drone-use-take-effect-today-in-the-u-s/>.

³⁶ Shepardson, *supra* note 34.

³⁷ Alina Selyukh, *FAA Expects 600,000 Commercial Drones In The Air Within A Year*, NPR KANSAS PUBLIC RADIO (August 29, 2016), <http://www.npr.org/sections/thetwo-way/2016/08/29/491818988/faa-expects-600-000-commercial-drones-in-the-air-within-a-year>.

³⁸ Kolodny, *supra* note 35.

³⁹ James Vincent, *FAA Regulations for Commercial Drones Are Now in Effect*, THE VERGE (Aug. 30, 2016), <http://www.theverge.com/2016/8/30/12707502/drone-regulations-legality-us-faa> (That's because these are based on using autonomous technology guiding the drones, rather than human pilots).

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ Nishith Desai Associates, *Unravelling the Future Game of Drones*, (April, 2016) at http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Unravelling_The_Future_Game_of_Drones.pdf?pdf=Research_Papers.

commercial drone flights since the regulations took effect.⁴⁴ For example, CNN has obtained special permission from the FAA to experiment with flights over groups people for news gathering purposes.⁴⁵ Similarly, BNSF Railway obtained permission from the FAA to inspect tracks further from where than the drone pilot can see.⁴⁶

The FAA has laid down a procedure under which people can obtain exemptions under S.333 of the FAA Modernization and Reform Act of 2012 in order to fly a drone commercially.⁴⁷ This exemption is granted to certain Federal Aviation Regulations if i) they demonstrably burden the applicant, ii) the applicant adheres to the minimum standard of safety set by the regulations, and iii) it is in the interest of the public.⁴⁸

The FAA has authority under existing aviation regulations to ban commercial drone operations that do not have exemptions.⁴⁹ The FAA has used this authority to impose fines for unapproved drone use.⁵⁰ As an example, see the National Transportation Safety Board's decision in *Huerta v. Parker*, NTSB Docket CP-217 (Nov. 17, 2014).⁵¹ The FAA also has issued subpoenas in other cases involving commercial drones – most notably to realtors who have used drones to take aerial photographs of property.

IV. DRONE LIABILITY

The issue of liability is important to drone manufacturers, operators, regulators, and legislatures. The following example clearly summarizes the potential liability issue:

A real estate agent purchases a drone with a camera to take photographs of the homes he or she is selling. The agent turns it on, it flies over the home and takes some photos. But something goes awry, and the drone falls and crashes through the windshield of a car in the neighbor's driveway.⁵²

⁴⁴ Jansen, *supra* note 32.

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ Nishith Desai Associates, *supra* note 43.

⁴⁸ *Id.*

⁴⁹ Cavaluzzi, Terranova & Marshall, *supra* note 25 at 91.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Beth Miller, *Drones: Wave of the future or nuisance?* WASH. U. IN ST. LOUIS: ENGINEERING MOMENTUM, (May 24, 2017), <https://engineering.wustl.edu/ourschool/leadership/offices/marketingcommunications/magazine/Pages/drones-wave-of-the-future-or-nuisance.aspx> .

The hypothetical above raises all the salient liability issues that might arise with an unclear regime for drone liability.⁵³

The following section describes the types of liability implicated by drone use in greater detail.

V. TYPES OF LIABILITIES CAUSED BY DRONES

Drones have the capacity for creating a large amount of damage and thus create various liabilities previously not observed. This section discusses the different types of liability potentially created by large scale adoption and use of drones.

A. Bodily injury

Bodily injury is defined as harm to a person's body and can occur directly when a drone injures a person through direct collision, or indirectly, such as when a drone causes a car accident or collision.⁵⁴

B. Property damage

Property damage is defined as damage caused by a drone directly or by an event triggered by the drone.⁵⁵ Direct damage would be property damage caused by a drone directly, such as when a drone accidentally flies through a window.⁵⁶ On the other hand, a drone hitting a powerline causing a brush fire that burned down houses would be an example of damage caused by an event triggered by a drone.⁵⁷ Property damage would also encompass property damage exacerbated by a drone, such as when a drone interferes with firefighting personnel and hinders the rescue efforts resulting in additional property damage.⁵⁸ Such an incident occurred in 2015, when fire crews were forced to ground a water-dropping aircraft because of the presence of drones in the same airspace.⁵⁹ The grounded aircraft was targeting the flames that ended up burning 36,000 acres of Southern California.⁶⁰ These property-related concerns arise because

⁵³ *Id.*

⁵⁴ Sharon Kauls, *Drones and Personal Liability* WORTH (Dec. 9, 2015), <http://www.worth.com/drones-and-personal-liability-what-do-i-need-to-know/>.

⁵⁵ *Id.*

⁵⁶ Ashenbrenner & Ryan, *supra* note 12.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

civilian drones fly at lower altitudes than manned aircrafts potentially interfering with lower altitude emergency operations.⁶¹

Many low altitude drone operations are conducted to collect data, which is then sold to utility companies or other entities that might find land survey data valuable. This survey data market is projected to grow.⁶² But as it grows, so does the risk of low altitude drones interfering with essential governmental functions or necessary rescue operations.⁶³ Furthermore, conflicts between land owners and drone operators are bound to arise due to the ambiguity in ownership of airspace above the landowner's property.⁶⁴

C. *Personal Injury*

Personal injury, in addition to physical bodily injury, includes the invasion of privacy, such as when a drone photographs someone in the privacy of their home, or the unauthorized use of photographs taken of people, buildings, or trade-protected images.⁶⁵ Of these concerns, the chief concern is the invasion of personal privacy.⁶⁶ The drone's size, versatility, and maneuverability makes it different from other aircrafts or even satellites.⁶⁷ When property laws were changed to accommodate high altitude commercial aircrafts, the risks to privacy were considered minimal and inconsequential compared to the need for air travel.⁶⁸ However, drones fly in low altitude environments, thereby posing a greater privacy risk where the need for drones or drone operation is more dubious.⁶⁹ Exacerbating concerns, drones have the capability to collect massive amounts of personal imagery data.⁷⁰ To then mitigate any privacy threats, it would be critical that the regulating body understands and secures the process used by drones for collecting, storing, and deleting data it collects to properly protect personal privacy.⁷¹

Legislatures are already reacting to these risks to personal privacy. For instance, in 2015, the Florida legislature proposed legislation

⁶¹ Ananth Padmanabhan, *Let the Drone Industry Take Off*, CARNEGIE INDIA (Feb. 28, 2017), <http://carnegieindia.org/2017/02/28/let-drone-industry-take-off-pub-68147>.

⁶² *Id.*

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ Kauls, *supra* note 56.

⁶⁶ Ashenbrenner & Ryan, *supra* note 12.

⁶⁷ Farber, *supra* note 4, at 409.

⁶⁸ *Id.*

⁶⁹ *Id.*

⁷⁰ Ashenbrenner & Ryan, *supra* note 12.

⁷¹ *Id.*

restricting drone usage for photographing or recording images of people or their property without their permission.⁷² The legislation does not create a criminal penalty, but does create state recognized civil liability.⁷³

Commercial drones will likely be employed for narrow purposes such as, inspecting wind turbines for cracks or roadways for storm damage.⁷⁴ However, drones will capture and send back anything in their view.⁷⁵ This raises privacy concerns and issues even if the drones were used for legitimate unrelated business purposes.⁷⁶ Similarly, accidental or deliberate surveillance of employees via drones in the above circumstance could have serious labor law implications.⁷⁷

D. Third-Party Liability

Companies contracting for services from drone providers need to look at the contracts they enter to assess the liability they will face.⁷⁸ In most cases, this situation is similar to third-party liability situations, meaning the service provider would be liable.⁷⁹

VI. APPLICABLE LAW FOR DRONE LIABILITY

Existing federal law does not address liability for breaches in drone operations.⁸⁰ There are several areas of law implicated, such as data protection, privacy, personal liability, insurance, commercial export, and intellectual property laws, as well as nuisance and trespass law.⁸¹

A strong legal and regulatory framework for drones must necessarily contain a strong liability framework for drones as well.⁸² For instance, an accident caused by a drone should give rise to liability for the damages to persons or property caused by the drone.⁸³ Damage

⁷² *Id.*

⁷³ *Id.*

⁷⁴ Steve Doyle, *New Eyes in the Skies-and New Risks to Manage*, WILLIS TV (Sept. 26, 2014), <http://blog.willis.com/2014/09/new-eyes-in-the-skies-and-new-risks-to-manage/>.

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ Joseph J. Vacek, *The Next Frontier in Drone Law: Liability for Cybersecurity Negligence and Data Breaches for UAS Operators*, 39 CAMPBELL L. REV. 135, 164 (2017).

⁸¹ Clare Feikert-Ahalt, *Regulation of Drones: United Kingdom*, LIBRARY OF CONGRESS (Apr. 2016), <https://www.loc.gov/law/help/regulation-of-drones/united-kingdom.php>.

⁸² Ridha Aditya Nugraha, Deepika Jeyakodi & Thitipon Mahem, *Urgency for Legal Framework on Drones: Lessons for Indonesia, India, and Thailand*, 6 INDON. L. REV. 138, 150 (2016).

⁸³ *Id.*

to property, collisions, cyber-attacks, violations of privacy, and tortious acts should all give rise to liability.⁸⁴ This rise in liability then leads to questions of applicable law, determination of the liable party, and limitations on liability.⁸⁵ National laws, tort laws, or even cyber laws may be applied to answer some of these issues.⁸⁶

In general, the existing aviation laws only concern civil and criminal cases of manned aircraft, not unmanned drones.⁸⁷ This suggests that existing aviation law is unlikely to apply to drones. At the same time, state and local governments define the scope of a landowners' property interest by balancing the interests of drone development with the interests of land owners, and potentially fill the gap left by aviation regulations by regulating the airspace above the land a drone passes over.⁸⁸

To test this theory, people may turn to the courts for relief raising the issue about how existing tort laws should apply to drones.⁸⁹ The shortcomings of existing tort doctrines will likely pave the way for the passage of new laws or precedent specific to drones, designed to clarify where a property owner's rights to airspace begin and end.⁹⁰

New rules governing small commercial drones could drastically increase the number of drones in our skies.⁹¹ While shortcomings in existing torts will likely direct future legislation,⁹² laws that favor property owners and give property owners express rights to exclude drones from the navigable airspace could ameliorate some of the deficiencies in how our existing tort law is being applied to drones.⁹³ The following section discusses some of the applicable laws.

A. FAA

In the U.S., the FAA is responsible for licensing drones for domestic use.⁹⁴ The FAA promulgates minimum standards for air safety within all of the U.S. air space.⁹⁵ The FAA provides the standard

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ Farber, *supra* note 4, at 409.

⁸⁹ *Id.*

⁹⁰ *Id.*

⁹¹ *Id.*

⁹² *Id.*

⁹³ *Id.*

⁹⁴ *Domestic Unmanned Aerial Vehicles (UAVs) and Drones*, ELECTRONIC PRIVACY INFO. CTR., <https://epic.org/privacy/drones/> (accessed Aug. 2, 2016).

⁹⁵ *Id.*

requirements for drone users.⁹⁶ For example, on June 28, 2016, the FAA issued new rules for the operation of commercial drones weighing less than fifty-five pounds.⁹⁷ The new rules simplify the licensing process for commercial drones flying at altitudes below four hundred feet.⁹⁸ Previously, commercial users could not operate drones without a Certificate of Authorization from the FAA.⁹⁹ Now, private universities and companies fly surveillance-capable aircrafts without the need for a specific certificate from the FAA.¹⁰⁰ However, while a certificate from the FAA is no longer required, personal liability is likely to increase significantly when a drone is being operated in violation of FAA regulations.¹⁰¹

On the other hand, many laws created by the FAA leave considerable room for interpretation and are difficult to be enforced.¹⁰² An example of this is the FAA rule stating that drones for commercial use cannot fly over people that are not involved in the use of the drone.¹⁰³ This could be interpreted as not allowing drones to be flown over citizens, but could allow flights over citizen's property like cars and houses.^{104,105} These rules can be interpreted in different ways, causing confusion over compliant drone operation in the U.S. Drones will likely be used more often as people figure out ways around the rules.¹⁰⁶ Currently, the FAA does not have any laws governing the liability that may result from the operation of drones.

B. State laws

While national regulations may allow the flying of commercial drones; local regulations could be an entirely different story.¹⁰⁷ In 2013

⁹⁶ *Summary of Small Unmanned Aircraft Rule (part107)*, FAA NEWS (June 21, 2016), https://www.faa.gov/uas/media/Part_107_Summary.pdf.

⁹⁷ Farber, *supra* note 4, at 360.

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ Bennett, *supra* note 18, at 2.

¹⁰¹ THE HARTFORD, *supra* note 10.

¹⁰² Scott Foden, *Rules and regulations on commercial use of drones in the United States*, DRONE AND SOCIETY (Dec. 16, 2017), <http://www.dronesandsociety.org/2016/12/16/rules-and-regulations-on-commercial-use-of-drones-in-the-united-states/>.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *The Rise of Drones: Best Practices for UAV Liability*, AIG (Aug. 2016), <http://www.aig.com/content/dam/aig/america-canada/us/documents/business/specialty/ers-rc-aero-business-uav-liability-revised-final-locked.pdf>.

¹⁰⁶ Foden, *supra* note 104.

¹⁰⁷ Jesse Young, *Current Rules for Flying Drones and Drone Photography*, DRONE GURU, (updated March 26, 2017) <http://www.droneguru.net/current-rules-for-flying-drones-and-drone-photography/>.

for example, 30 states tried to pass regulations against the commercial use of drones.¹⁰⁸ However, states laws do not cover the liability issue. Thus, it is important to take a look at the state regulations prior to the commercial use of a drone.¹⁰⁹

C. *Trespass law*

Trespass law can protect individuals from the use of drones on personal property. A “trespasser” is one who enters or remains upon land in the possession of another without consent.¹¹⁰ To state a claim for trespass, the claimant must show both that he has a right of possession or ownership of the real property the alleged trespass occurred on and that the trespasser intentionally entered the property.¹¹¹ Technically, a person can go over the fence line, and if intentionally done so on foot, that person would have nominally been guilty of trespassing. However, it is unclear if it is trespass if someone flies a drone above a property without physically entering the property. The Restatement Second of Torts clearly distinguishes between real property and airspace above said real property.¹¹² The elements for physical trespass to land are established in Section 1588 of the Restatement of Torts.¹¹³ For trespass to have occurred, the defendant must have: (1) entered the land without authorization, or "caused a thing or a third person to do so (2) remain[ed] on the land; or (3) failed to remove from the land a thing which he has a duty to remove."¹¹⁴ A person who intentionally invades another’s possessory property interest may be liable even if the person did not cause any actual property damage.¹¹⁵ For instance, the Supreme Court of North Carolina since 1835 has recognized that every intentional unauthorized entry onto someone else's land is a trespass regardless of whether actual physical damage occurred.¹¹⁶ The court reasoned that every unauthorized entry results in some damage to the property interest of the possessor, whether actual or inferred.¹¹⁷

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ *Hey, that’s my air! Trespass by delivery drone*, STROUD WILLINK & HOWARD LLC (Jan. 6, 2014), <http://www.stroudlaw.com/hey-thats-my-air-trespass-by-delivery-drone/>.

¹¹¹ *Id.*

¹¹² Farber, *supra* note 4, at 380-81.

¹¹³ *Id.*

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ *Id.*

A plaintiff who can establish the three elements above would be entitled to nominal damages, punitive damages, and injunctive relief, without the need to prove actual damage to the property.¹¹⁸ Establishing the elements of nominal trespass is not difficult if the drone lands or falls on the landowner's property.¹¹⁹ The harder question is at what altitude does flight over a piece of land constitute a trespass.¹²⁰ Most reported trespass cases discuss how high above the ground a property owner's rights extend.¹²¹ Those cases discussing airspace trespass suggest that above the designated height of 500 feet in the case of drones, trespass liability is preempted by FAA regulation.¹²²

Flight by an aircraft in the air space above the land of another is trespass if (1) "[the aircraft] enters into the immediate reaches of the air space next to the land, and (2) [it] interferes substantially with the other's use and enjoyment of the land."¹²³ For example, on August 13, 2015, a drone was spotted hovering near Montague Street and Court Street in Brooklyn Heights, New York, raising concerns amongst locals.¹²⁴ Similarly, around 7:45 a.m. on June 22, 2014, a Seattle woman, while getting dressed, spotted a drone outside the window of her 26th floor apartment.¹²⁵

In the U.S., state trespass laws can be different from state to state. For example, Wisconsin common law recognizes that a trespass may be committed *on, beneath, or above* the surface of the earth.¹²⁶ Because a physical injury to real property, as defined by Wis. Stat. § 844.01(2), includes unprivileged intrusions to the "surface, subsurface or suprasurface"¹²⁷, a trespass may occur in airspace.¹²⁸ Therefore, a drone flying into the airspace of an owner would constitute trespass and impact the landowner's rights.¹²⁹

¹¹⁸ Henry Perritt Jr., and Eliot Sprague, *Law Abiding Drones*, 16 COLUM. SCI. & TECH. L. REV. 385, 439 (2015).

¹¹⁹ *Id.* at 439-40.

¹²⁰ *Id.* at 440.

¹²¹ *Id.*

¹²² *Id.*

¹²³ Farber, *supra* note 4, at 381.

¹²⁴ Carolina Leid, *Brooklyn residents concerned after drone spotted looking into windows*, ABC 7 (Aug. 16, 2015), <http://abc7chicago.com/news/residents-concerned-after-drone-spotted-looking-into-windows/932819/>.

¹²⁵ Christina Sterbenz, *Should We Freak Out About Drones Looking in Our Windows?* BUSINESS INSIDER (Sept. 24, 2014), <http://www.businessinsider.com/privacy-issues-with-commercial-drones-2014-9>.

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ *Id.*

The U.S. Supreme Court in 1946 limited the basis for finding a trespass of private property in *United States v. Causby*.¹³⁰ In *Causby*, a chicken farmer outside of Greensboro, North Carolina, sued the U.S. government arguing that¹³¹ frequent, flights of military aircrafts on the adjacent runway scared his birds and damaged his livelihood.¹³² The Supreme Court rejected the man's contention.¹³³ The Court further ruled that an owner's right to a piece of private property would only extend¹³⁴ the owner's property rights 83 feet up into the air.¹³⁵

The upward boundaries of private property may be changing.¹³⁶ However, drones equipped with advanced technology of high definition cameras and zoom-in capability cannot be identified from long distances away by their physical presence alone.¹³⁷ For example, a person can fly a drone in his own backyard while taking pictures of neighbor's backyard using rotational cameras without the neighbor's knowledge. Consequently, drone technology combined with HD video challenges what is right.¹³⁸ The availability of advanced drone technology carries issues of rights of privacy because such rights are always connected with the reasonable expectation of privacy.¹³⁹

Drones -- as flying, seeing objects -- scramble the sense of property boundaries making privacy issues more complex.¹⁴⁰ Ryan Calo, a University of Washington law professor and former research director of Stanford's Center for Internet and Society said, "What [property] rights you have beyond what you can physically touch has always been difficult for the law to grapple with."¹⁴¹ Drones used for

¹³⁰ *United States v. Causby*, 328 U.S. 256 (1946); see also, Michael Frank, *Drone Privacy: Is Anyone in Charge?* CONSUMER REPORTS (Feb. 10, 2016), <http://www.consumerreports.org/electronics/drone-privacy-is-anyone-in-charge/>.

¹³¹ *United States v. Causby*, 328 U.S. 256 (1946); see also, Michael Frank, *Drone Privacy: Is Anyone in Charge?* CONSUMER REPORTS (Feb. 10, 2016), <http://www.consumerreports.org/electronics/drone-privacy-is-anyone-in-charge/>.

¹³² *United States v. Causby*, 328 U.S. 256 (1946).

¹³³ *Id.*

¹³⁴ Michael Frank, *Drone Privacy: Is Anyone in Charge?* CONSUMER REPORTS, (February Feb. 10, 2016), <http://www.consumerreports.org/electronics/drone-privacy-is-anyone-in-charge/>.

¹³⁵ *Id.*

¹³⁶ Brian Palmer, *How much of the airspace above your home do you own?* SLATE, (July 11, 2013), http://www.slate.com/articles/news_and_politics/explainer/2013/07/photographer_george_stein_metz_arrest_how_much_airspace_do_you_own.html.

¹³⁷ *Id.*

¹³⁸ Alexis Madrigal, *If I fly a UAV over my neighbor's house, is it trespassing?* THE ATLANTIC (Oct. 10, 2012), <http://www.theatlantic.com/technology/archive/2012/10/if-i-fly-a-uav-over-my-neighbors-house-is-it-trespassing/263431/>.

¹³⁹ *Id.*

¹⁴⁰ *Id.*

¹⁴¹ *Id.*

for governmental purposes are the most controversial, but drone use by private individuals is also getting media attention.¹⁴² That is because those privately-held drones can be used by paparazzi, media organizations, or whoever wants to look at a piece of private land.¹⁴³

D. Nuisance law

Under nuisance law, a plaintiff who has an interest in land is able to recover damages and obtain injunctive relief if a defendant's unreasonable conduct on other land injures the plaintiff's use of their land.¹⁴⁴ Traditionally, the plaintiff was entitled to at least injunctive relief and liability was found if the injury crossed an "unreasonableness" line; there were no balancing of interests.¹⁴⁵ A defendant can be charged with committing two types of nuisance, private and public.¹⁴⁶ To establish liability for a private nuisance, it requires unreasonable interference with the use and enjoyment of one's land.¹⁴⁷ In contrast, liability for public nuisance requires that the harm affect at least one individual, that is the harm must be a "public harm," negatively affecting public health or safety.¹⁴⁸ In a law suit for private nuisance, a plaintiff need not be the property owner so long as they are a lawful occupant or user of the property.¹⁴⁹ In both private nuisance and public nuisance cases, a plaintiff bears the burden to prove a defendant's intentional interference with a reasonable expectation of privacy or that the interference is due to the defendant's negligence.¹⁵⁰

Examples of such interference can be that the defendant's conduct creates a condition such as a noise, vibration, odor, or light that unreasonably interferes with the plaintiffs use and enjoyment of his land.¹⁵¹ Additionally, the plaintiff may also pursue a nuisance claim which involves disturbance of peace of mind.¹⁵² *In 1916 Dean v. Southern Rwy.* the court expressed what might be called the "noises of progress" principle when dismissing a property owner's nuisance claim against a railroad: "A material amount of noise is produced [...] by

¹⁴² Palmer, *supra* note 139.

¹⁴³ *Id.*

¹⁴⁴ Perritt and Sprague, *supra* note 120, at 441.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.* at 392.

¹⁴⁷ *Id.*

¹⁴⁸ *Id.* at 393.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.* at 393.

¹⁵² *Id.*

modern civilization."¹⁵³ In *Thoenebe v. Mosby*, the court refused to enjoin a business from staying open late and attracting traffic, pointing out that the recent appearance of automobiles on the roads, including at night, had become normal "but would some years ago have been considered a nuisance."¹⁵⁴ From the above cases, it can be inferred that courts may be willing to accept nuisances caused by drones as a "noise of progress" in the early 21st century just as they have accepted trains and automobiles in the early 20th century.¹⁵⁵ However, nuisance lawsuits would still be actionable against individual drone owners just as nuisance law suits are still possible against individual automobile owners, as long as the injury in the nuisance law suit is "real, material, and substantial".¹⁵⁶

E. Negligence law

Even though a drone may be structurally perfect, improper operation of a drone may result in a negligence cause of action if the improper operation causes personal injury or property damage.¹⁵⁷ Because drones, like aircraft and automobiles, are heavily dependent on how users operate them, causes of action involving improper operation of drones would include simple negligence and statutory negligence.¹⁵⁸ Even though ordinary principles of negligence law offer deterrence against risky conduct and a means for compensating the plaintiffs,¹⁵⁹ drone operation will not enjoy any immunity from these basic principles.¹⁶⁰

Moreover, classic elements of breach of duty, actual and proximate cause, and damages under negligence law apply when a drone is improperly operated and causes an accident.¹⁶¹ For example, under the law of negligence, everyone has a duty to avoid foreseeable risks of harm.¹⁶² If a person breaches this duty and his conduct is the proximate cause of another's injuries, that person could be found liable for those indirectly caused injuries.¹⁶³ Some common examples of a

¹⁵³ Robert L. Ellis, *Drones and the Law: What You Need to Know*, Ohio St. Bar Ass'n. (Jan. 2016).

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

¹⁵⁷ Michael Spanel, *Liability and Allocation of Liability in Drone Accidents*, AVIATION LAW SEMINAR CHICAGO-KENT COLLEGE OF LAW, Spring 2015, at 7.

¹⁵⁸ *Id.* at 7-8.

¹⁵⁹ Perritt and Sprague, *supra* note 120, at 442.

¹⁶⁰ *Id.*

¹⁶¹ Spanel, *supra* note 168, at 8.

¹⁶² Perritt and Sprague, *supra* note 120, at 442.

¹⁶³ *Id.*

breach of duty include failure to safely operate the drone and failure to properly maintain the drone.¹⁶⁴ Nevertheless, it is difficult to actually define what constitutes these failures as the finding of liability in a negligence cause of action is highly fact-specific.¹⁶⁵ Given the fact that if a drone operator launches a drone and the drone crashes on someone's luxury automobile due to a damaged rotor, the drone operator will be found guilty of negligence for improperly operating the drone in this hypothetical.¹⁶⁶

Liability for negligence is not limited to just the drone operator.¹⁶⁷ Other people and entities may be liable as well.¹⁶⁸ The liability for damages by drones would fall within standard liability issues for negligent operation of aircrafts unless there are specific statutes governing it.

VII. LEGALITY OF SHOOTING DOWN A DRONE

Hobby drone usage is on the rise and its privacy implications are causing discomfort.¹⁶⁹ Drones are beginning to appear everywhere, raising more questions and unique challenges. Some respond by suggesting that drones be shot down in self-defense. Pandering to this sentiment, an ammunition company has even started to market a shotgun shell specifically made to shoot nosy camera-equipped drones down out of the sky.¹⁷⁰ Even lawmakers are starting to respond to controversies and national debates regarding rights to privacy, property and self-defense, due to the increased use of drones in neighborhoods (even for pizza delivery).¹⁷¹

Shooting down an aircraft is technically a federal crime.¹⁷² Drones may be considered an aircraft under federal law, and on top of that, shooters could be charged for endangering bystanders with gunfire, or causing the drone to fall.¹⁷³ According to an aviation attorney who

¹⁶⁴ Spanel, *supra* note 160, at 8.

¹⁶⁵ *Id.*

¹⁶⁶ Perritt and Sprague, *supra* note 120, at 442-43.

¹⁶⁷ Spanel, *supra* note 160, at 11.

¹⁶⁸ *Id.*

¹⁶⁹ *Man vs. Machine: New Shotgun Shell Being Marketed for Shooting Down Drones*, RT (Aug. 22, 2015), <https://www.rt.com/usa/313081-shotgun-shell-drone-shooting/>.

¹⁷⁰ *Id.*

¹⁷¹ John Seibler, *Is It Legal to Shoot Down a Drone Hovering Over Your Property*, NEWSWEEK (Aug. 15, 2018), <http://www.newsweek.com/it-legal-shoot-down-drone-hovering-over-your-property-362878>.

¹⁷² Eric Limer, *People Just Keep Shooting Down Their Neighbors' Drones*, POPULAR MECHANICS (May 27, 2016), <http://www.popularmechanics.com/flight/drones/a21072/people-just-keep-shooting-down-drones/>.

¹⁷³ *Id.*

teaches Drone Law at Vaughn College of Aeronautics and Technology, the statute against destruction of aircraft prohibits interfering with anyone “engaged in the authorized operation of such aircraft” and carries a penalty of up to 20 years in prison.¹⁷⁴ Threatening a drone or a drone operator would also be a federal crime subject to five years in prison under this same statute.

The statute does not define “act of violence”, but shooting down a drone or its user would clearly constitute such act.¹⁷⁵ Current law supports federal criminal liabilities in addition to civil charges.¹⁷⁶ Law professor Michael Froomkin offers an alternate theory for self-defense.¹⁷⁷ He argues that shooting down drones for self-defense should be permissible because people generally do not know the capabilities of a drone.¹⁷⁸ If people have mounted guns on drones, they could pose a threat to life by operating those drones.¹⁷⁹ Nevertheless, Professor Froomkin’s legal theory has not been tested in court.¹⁸⁰

There are many cases involving drone shootings. In October 2015 William Merideth, a Kentucky man who shot down a neighbor's drone as it flew over his property, was arrested and charged with first degree criminal mischief and first degree wanton endangerment.¹⁸¹ Merideth’s 16-year-old daughter who was laying out at pool at the time of the shooting, commented that a drone hovering with a camera was creepy and weird.¹⁸² She stated that, "I just think you should have privacy in your own backyard."¹⁸³ Merideth went to see the drone and saw the drone was down by the neighbor’s house, about 10 feet off the ground, looking under their canopy that they’ve got in their back yard. She went and got her shotgun and said, ‘I’m not going to do anything unless it’s directly over my property.’¹⁸⁴ Merideth was ultimately cleared of all charges, but others were not so lucky.¹⁸⁵ In an another example, a man had been arrested after he shot down a drone flying over his property.¹⁸⁶

¹⁷⁴ Sean O’Bryan, *Can You Shoot Down a Drone?* O’BRYAN LAW FIRM PLC (Oct. 21, 2016), <https://www.cnn.com/2015/09/09/opinions/schneier-shoot-down-drones/index.html>.

¹⁷⁵ *Id.*

¹⁷⁶ Limer, *supra* note 175.

¹⁷⁷ Bruce Schneier, *Is It OK to Shoot Down a Drone Over Your Backyard*, CNN (Sept. 09, 2015), <https://www.cnn.com/2015/09/09/opinions/schneier-shoot-down-drones/index.html>.

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

¹⁸⁰ *Id.*

¹⁸¹ *Id.*

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ Limer, *supra* note 175.

¹⁸⁶ *Hillview Man Arrested for Shooting Down Drone; Cites Right to Privacy*, WDRB, (July 31,

Looking at it from the drone user's perspective, a Nashville drone shooting occurred when the drone's owner was flying the drone with his son to look at their property.¹⁸⁷ They noticed an unfamiliar vehicle nearby and the owner operated the drone to fly over the front of the property, at about 85 feet in the air. A man in an 18-wheeler shot the drone three times with his shotgun. The drone was damaged, but it landed later."¹⁸⁸

Responding to the dozen or so shootings, the FAA confirmed that shooting down a drone is a federal crime citing the *Aircraft Sabotage Act*, 18 USC 32.¹⁸⁹ The Aircraft Sabotage Act made it a felony to damage or destroy any aircraft.¹⁹⁰

Regardless of whether the act of shooting down a drone is a federal criminal offense, the shot drone could still cause actual physical danger to anyone nearby, which the shooter may then be liable for. Thus, even if one were legally allowed to shoot a drone that invaded one's privacy, calling the authorities would still be preferable to shooting the drone.¹⁹¹

Any state or local governments seeking to enact regulations regarding drones should have an understanding of the complex mix of federal and state laws that currently apply and be mindful of how the law, at both the federal and state level, is changing in response to the expectations of the public.¹⁹² Under current law, it is illegal to shoot down a drone. Currently, the FAA has made drone registration mandatory.¹⁹³ This will help in tracking drone usage. Mandatory registration shows that the government is taking the use of drones seriously, especially potential security threats, such as drones equipped with guns which threaten life. If a drone is considered weaponized, then self-defense should be permissible.

2015), <http://www.wdrb.com/story/29650818/hillview-man-arrested-for-shooting-down-drone-cites-right-to-privacy>.

¹⁸⁷ Limer, *supra* note 175.

¹⁸⁸ *Id.*

¹⁸⁹ O'Bryan, *supra* note 177.

¹⁹⁰ 18 U.S.C. § 32 (2006).

¹⁹¹ Limer, *supra* note 175.

¹⁹² Robert L. Ellis, *Drones and the Law: What you Need to Know*, S.C. LAWYER, May 2016, at 43.

¹⁹³ *New Requirements for Registering and Marking Small Unmanned Aircraft*, U.S.

DEPARTMENT OF TRANSPORTATION FAA, at 2, December 2015,

https://www.faa.gov/documentLibrary/media/Notice/N_8900.338.pdf

VIII. RIGHT TO SELF-DEFENSE IN RESPONSE TO INTRUSION ON SECLUSION

As noted above, cases have not delineated the extent of the privilege for self-help in the face of an intrusion on seclusion.¹⁹⁴ Tort law suggests that reasonable self-help should be privileged, but uncertainties surrounding the drone's capabilities and intentions make it difficult to determine how much force is reasonable.¹⁹⁵ Without judicial precedent in the short term, that uncertainty likely will engender more self-help efforts. States should provide guidance or else people may shoot first and ask questions later.¹⁹⁶ The states could provide this guidance by enacting drone self-defense legislation.¹⁹⁷ If the state does not provide guidance, it may fall on the courts to provide the necessary guidance.¹⁹⁸ In either case, it might be worth considering a presumption that a drone is monitoring those below it and intruding on the privacy and right to seclusion, unless the drone makes clear that it is not doing so. This presumption is justified by the difficulties of determining a drone's exact capabilities from afar.¹⁹⁹ However, the exact contours to the right to self-defense in response to intrusion on seclusion and privacy remains vague.

IX. MINIMUM INSURANCE REQUIREMENTS

Drones have taken center stage and the property casualty insurance industry is responding to the rise in drone use.²⁰⁰ Private drone users will eventually be required to carry liability insurance coverage since experts see it as inevitable that federal regulation will include minimum drone liability insurance requirements.²⁰¹

Drone insurance products will likely fall into three broad categories: aviation safety, privacy, and cybersecurity.²⁰² In the drone industries' nascent stages there is little data available and thus underwriting commercial drone operations is likely to be quite unorganized.²⁰³ New technology, environments, and capabilities make

¹⁹⁴ A. Michael Froomkin & P. Zak Colangelo, *Self-Defense Against Robots and Drones*, 48 CONN. L. REV. at 56, (2015).

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ Ashenbrenner & Ryan, *supra* note 12.

²⁰¹ Ziss, *supra* note 2.

²⁰² Daniel North, *Private Drones: Regulations and Insurance*, 27 LOY. CONSUMER L. REV. 334, 355 (2015).

²⁰³ Ziss, *supra* note 2.

it challenging for the insurance industry to operate since it must estimate liability without precedent or a clear estimation of risk.²⁰⁴ In addition to insurance for drone owners and operators, there may also be a need for an insurance market for product liability, personal injury, and property damage coverage for the drone manufacturers, distributors, data and avionics analysis companies, and consultants.²⁰⁵

Businesses will need to account for the various risks and liabilities listed above if they decide to utilize drones for commercial reasons.²⁰⁶ To better serve these businesses, insurance providers underwriting such business practices will want to determine the purpose of the operation and the type of data gathered to understand what liability the company is likely to incur.²⁰⁷ To this end, insurance companies will be interested in the knowledge, training and experience of the operators, since these factors mitigate the extent of risk the companies face.²⁰⁸

Finally, there should be minimum insurance requirements for drones by the FAA. When the auto industry started there were no laws to regulate them yet there were automobiles on the streets and government slowly regulated the market by creating rules around their operation and production. Similarly, the auto insurance approach should be adopted by drone insurance law and should be developed around their operation and production. For example, if a drone crash-lands into a car, damage may be covered under the auto insurance or by optional comprehensive insurance which covers damage to a car from fallen objects and other disasters.²⁰⁹

X. SOLUTIONS FOR DRONE LIABILITY

This section discusses the different solutions for the drone liability.

A. *Technical solution*

Manufactures should develop technical solution to avoid collision. Developing the anti-collision solution will reduce drone liability. For example, LiDAR sensor can reliably detect small objects from very far away (typically 40m) and assist in obstacle

²⁰⁴ *Id.*

²⁰⁵ *Id.*

²⁰⁶ North, *supra* note 205, at 352-53.

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ *Drones and Insurance*, INSURANCE INFORMATION INSTITUTE, <https://www.iii.org/article/drones-and-insurance> (last visited Sep. 13, 2018).

avoidance.²¹⁰ By improving obstacle avoidance, LiDAR will minimize the bodily injury and protect against collisions. For example, a drone would have to find its way through a neighborhood, perhaps encounter a moving car in the driveway, hover several seconds to avoid it, fly 15 feet another direction, then hover again until a dog gets off the porch, then move on to its target, the front door.²¹¹

Suman Saripalli co-owner of KalScott Engineering, a firm specializing in developing drones and related technology, said “Collision avoidance is a very, very important problem that needs to be solved before drones can proliferate like the industry is hoping. All of these things have to be taken into account instantaneously. That’s the sort of intelligence that’s required, and that’s not easy to come by. It’s a very, very tough engineering problem to solve.”²¹²

Lei Shi, an electrical engineering doctoral candidate, was working to solve some of the significant problems facing drone usage.²¹³ He is developing tiny on-board radar systems to help keep small commercial drones from crashing into things — one of the biggest safety concerns keeping drones mostly grounded by FAA regulations. Humberto Gonzalez, PhD, assistant professor in the Department of Electrical & Systems Engineering and his team are working to make drones that fly indoors without bumping into walls, the ceiling or people.²¹⁴ The drones are purchased from a toy store or online retailer and reprogrammed with new code the team has written.²¹⁵

Technical solutions will help minimize liability and provide solutions to issues such as bodily injury, property damages, and personal liability caused by crashes.

B. Legal solutions

Despite attempts to ban drones, experts on privacy law, constitutional law, aviation law, and drone law should strive to clarify the application of these fields to drones, because this technology is rapidly developing. Similar personal liability concerns were raised initially when now commonplace technologies like cars, airplanes, and helicopters were developed and commercialized. Drones can be

²¹⁰ Rai Gohalwar, *The Future of Drone Technology-Autonomy, Collision Avoidance and Advanced Sensors*, AZO SENSORS, April 25, 2017, <https://www.azosensors.com/article.aspx?ArticleID=782>.

²¹¹ Sara Shepherd, *KU Engineers Work to Remove Obstacles for Small Commercial Drones-Literally*, LJWORLD (Apr. 5, 2015, 12:00 AM), <http://bit.do/eq92o>.

²¹² *Id.*

²¹³ *See id.*

²¹⁴ Miller, *supra* note 52.

²¹⁵ *Id.*

regulated under the same laws presently regulating these commonplace technologies.

Nevertheless, some scholars argue that there is a need for more reliable laws to address drone liability. There is currently uncertainty in the height at which drones may fly over private property which the judiciary and legislature will have to solve.²¹⁶ The solution may require re-examination of current curtilage standards which concern ownership of land surrounding property.²¹⁷

While property and privacy issues are likely to require federal or judicial intervention, product liability law is likely to be handled by state legislatures.²¹⁸ State law already handles intrastate product liability issues and will likely determine the degree of liability arising from defective drones and what tests the courts should apply.²¹⁹

Humberto Gonzalez states that companies can give you a contract that says, “You can fly this drone within certain conditions — no rain, no wind. If you meet all of those conditions, and the battery is charged, the drone will never crash.”²²⁰ Similar contracts already exist between airlines and airplane manufacturers and mirror the agreement state motor vehicle departments have with drivers prior to issuing a drivers license.²²¹

Legislatures can respond to the issue of drone liability by providing an amendment to the existing laws and adding a separate section for modern technologies such as drones. Scholars from around the country should get together and formulate the liability amendments for modern technologies.

CONCLUSION

Private use of drone aircrafts is clearly part of our technological future as the many beneficial uses of drones have ensured their place in our society.²²² Despite the clear benefits drones provide, they are capable of creating numerous occasions for liability. As drone technology continues to develop and is used more in public and commercial applications, it is important that manufacturers create technical solutions to avoid liability, legislators create clear laws

²¹⁶ Benjamin Mathews, *Potential Tort Liability for Personal Use of Drone Aircraft*, 46 ST. MARY'S L. J. 573, 602 (2015).

²¹⁷ *Id.*

²¹⁸ North, *supra* note 205, at 355.

²¹⁹ *Id.*

²²⁰ Miller, *supra* note 52.

²²¹ *Id.*

²²² Mathews, *supra* note 222, at 601.

governing drone liability, and the FAA set minimum insurance requirements for drone operation.