

NO DRONE ZONES: ASSESSING THE FAA’S ROLE IN IMPLEMENTING GEOFENCING AND THE FUTURE OF DRONE REGULATIONS IN THE UNITED STATES

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I. INTRODUCTION

At 9 P.M. on Wednesday, December 21, 2018, London’s Gatwick Airport was forced to suspend all flights in and out of the airfield.¹ Flights briefly opened up at 3 A.M. Thursday morning but were shut down after forty-five minutes.² This continued until 6:14 A.M. Friday morning, but the airport again shut down

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1. *Idiots with Drones Shut Down the UK’s Second Largest Airport—Again*, VERGE (Dec. 21, 2018), <https://www.theverge.com/2018/12/20/18149819/london-gatwick-airport-drone-shutdown-reports>.

2. *Id.*

at 8:46 P.M. the same day.³ The culprit: an unknown number of consumer drones flying in and out of the airspace.⁴

More than 1,000 flights were delayed, affecting more than 140,000 people.⁵ After nine months of investigation costing £790,000, the police were unable to even identify the culprits behind the shutdowns.⁶ By simply flying into the wrong place, some person using cheap consumer drones was able to shut down the second largest airport in the United Kingdom for upwards of two days.⁷ Merely a month later, a similar incident occurred over Newark Liberty International Airport in New Jersey, temporarily holding flights after drones were spotted hovering over Teterboro Airport.⁸

Commercial drones have skyrocketed in popularity in the past five years.⁹ The number of drones sold between 2015 and 2016 grew 224%.¹⁰ The majority of these were purchased directly from the manufacturer, and most come ready made with onboard cameras and advanced software capabilities.¹¹ As of February of 2022, there were 861,458 unmanned aircraft systems (UAS) registered in the United States, with 263,721 remote pilots certified.¹² By virtue of sharing the sky with other vehicles, their increased presence has caused some apprehension and action amongst Congress and the Federal Aviation Administration (FAA).¹³

First, the FAA implemented a new slate of regulations.¹⁴ Drone pilots are now required to fly below 400 feet in uncontrolled airspace if they fail to obtain certifications or authorization from the FAA.¹⁵ In addition, drone pilots are now required to comply with all airspace restrictions and prohibitions.¹⁶ Furthermore, Congress implemented legislation requiring the Secretary of Transportation to use a risk-based assessment to determine if certain unmanned systems could safely operate in American airspace.¹⁷

3. *Id.*

4. *Id.*

5. Natasha Lomas, *Last Year's Gatwick Drone Attack Involved at Least Two Drones, Say Police*, TECHCRUNCH, (Sept. 27, 2019, 7:32 AM), <https://techcrunch.com/2019/09/27/last-years-gatwick-drone-attack-involved-at-least-two-drones-say-police>.

6. *Gatwick Airport Drone Attack: Police Have 'No Lines of Inquiry'*, BBC NEWS (Sept. 26, 2019), <https://www.bbc.com/news/uk-england-sussex-49846450>.

7. *Idiots with Drones Shut Down the UK's Second Largest Airport—Again*, *supra* note 1.

8. Lori Aratani, *Drone Activity Halts Air Traffic at Newark Liberty International Airport*, WASH. POST (Jan. 22, 2019, 5:54 PM), <https://www.washingtonpost.com/transportation/2019/01/22/drone-activity-halts-air-traffic-newark-liberty-international-airport>.

9. Sally French, *Drone Sales in the U.S. More Than Doubled in the Past Year*, MARKETWATCH (May 28, 2016, 12:16 PM), <https://www.marketwatch.com/story/drone-sales-in-the-us-more-than-doubled-in-the-past-year-2016-05-27>.

10. *Id.*

11. *Id.*

12. *UAS by the Numbers*, FED. AVIATION ADMIN., https://www.faa.gov/uas/resources/by_the_numbers (last visited Feb. 23, 2022).

13. *FAA Highlights Changes for Recreational Drones*, FED. AVIATION ADMIN. (May 16, 2019), <https://www.faa.gov/news/updates/?newsId=93769>; 49 U.S.C. § 44807 (2018).

14. *FAA Highlights Changes for Recreational Drones*, *supra* note 13.

15. *Id.*

16. *Id.*

17. *Id.*

Recently, the FAA's regulations regarding commercial drone usage have come under fire by legal scholars for overregulation.¹⁸ These criticisms stem from the fear that continuing the current regulations will hinder and limit the development of cost-saving technology.¹⁹ These scholars instead propose that the adoption of new geofencing technology will solve the problems created by the introduction of widespread drone usage.²⁰ In particular, this would obviate the need for registration, and for the FAA to place undue restrictions on issuing beyond visual line of sight (BVLOS) permits.²¹

Geofencing may indeed be the future for drone manufacturers. Unlike the current regulatory regime, it solves a myriad of problems posed by drones which are not properly addressed under the current regulatory scheme.²² However, while forward thinking, this proposal assumes that drone manufacturers will conclude that it is within their self-interest to avoid liability by implementing geofencing networks.²³ Current scholarship has not investigated why these firms have not unilaterally implemented geofencing on their end. Furthermore, it has not analyzed whether or not the FAA could or should mandate the industry to implement geofencing.²⁴

This Note will begin with an exploration of how FAA regulations have mirrored increases in the popularity of drones. Part II will give background on the current regulatory scheme and the criticisms it has received. It will then visit the future applications drones will have going forward, as well as explain geofencing technology, and why it serves as a potentially revolutionary solution to the current regulatory conundrum. Part III will analyze two mechanisms for achieving universal geofencing, first via a private consortium, and second by a new slate of regulations by the FAA. Finally, this Note will recommend that the FAA should immediately begin to implement universal geofencing on the back of its recent push for Remote ID.

II. BACKGROUND

A. *Current Regulatory Scheme and its Criticism*

FAA regulation of unmanned aerial vehicles began in the 1980s, corresponding with the rise of radio-controlled aircraft.²⁵ "In 1981, in recognition of the safety issues raised by the operation of model aircraft, the FAA published Advisory Circular (AC) 91-57, Model Aircraft Operating

18. Steve Calandrillo, Jason Oh & Ari Webb, *Deadly Drones? Why FAA Regulations Miss the Mark on Drone Safety*, 23 STAN. TECH. L. REV. 182, 186–87 (2020).

19. *Id.*

20. *Id.* at 250–51.

21. *Id.* at 234.

22. *Id.* at 250–51.

23. *Id.*

24. *Id.*

25. Unmanned Aircraft Operations in the National Airspace System, 14 C.F.R. § 91 (2007); *see also* FED. AVIATION ADMIN., MODEL AIRCRAFT OPERATING STANDARDS, AC NO. 91-57 (1981), https://www.faa.gov/documentlibrary/media/advisory_circular/91-57.pdf (encouraging voluntary compliance with safety standards for model aircraft operators).

Standards for the purpose of providing guidance to persons interested in flying model aircraft as a hobby or for recreational use.”²⁶ After another slate of measures in the late 2000s, Congress decided to limit drone regulations by passing the FAA Modernization and Reform Act of 2012.²⁷

The Act prohibited the FAA from creating new regulations governing model aircraft, which at this point was defined to include drones.²⁸ However, the FAA subsequently published an interpretation of “model aircraft” which limited the term to only aircrafts operated purely for hobby or recreational purposes.²⁹ Then in 2015, the FAA enacted a new set of rules requiring registration for essentially all drone operators.³⁰ Clearly in violation of Congress, the FAA was sued. In *Taylor v. Huerta*, the D.C. Circuit held that no new rules implementing drone regulations were allowed under Section 336 of the FAA Modernization and Reform Act.³¹ This respite from FAA intrusion was short lived however, as Congress passed the National Defense Authorization Act in 2018.³² This Act specifically overturned *Taylor*, and all regulations previously in effect before its holding were subsequently returned to their full effect.³³

The passage of the National Defense Authorization Act, as well as the recent commercial drone boom, sparked a cavalcade of new regulations handed down from the FAA.³⁴ The FAA implemented a so called “visual line-of-sight” requirement (VLOS), mandating that drone pilots be able to see their drone throughout its entire flight.³⁵ Special permits, called beyond visual line of sight permits (BVLOS permits), have been made available for special circumstances including for search and rescue operations.³⁶ In addition to the altitude requirements, the FAA “prohibits drone flights over crowds of people, public events, or stadiums, or near emergency responses to accidents, fires, or hurricanes.”³⁷ There is even a drone speed limit now of 100 miles per hour.³⁸

All drone owners, commercial and recreational, must now register their drones with the federal government.³⁹ The FAA provides registrants with an FAA-issued registration number after they have provided their name, physical and e-mail address, as well as their drone’s make and model.⁴⁰ This registration

26. MODEL AIRCRAFT OPERATING STANDARDS, *supra* note 25.

27. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

28. *Id.* at 77–78.

29. U.S. DEP’T. TRANSP., FED. AVIATION ADMIN., INTERPRETATION OF THE SPECIAL RULE FOR MODEL AIRCRAFT 5 (2014), https://www.faa.gov/uas/educational_users/media/model_aircraft_spec_rule.pdf.

30. 14 C.F.R. § 48.15 (2021).

31. *Taylor v. Huerta*, 856 F.3d 1089, 1091 (D.C. Cir. 2017).

32. National Defense Authorization Act, 2018, Pub. L. No. 115-91, 131 Stat. 1283, 1611.

33. *Id.*

34. FAA Highlights Changes for Recreational Drones, *supra* note 13.

35. 14 C.F.R. § 107.31 (2021).

36. ALLISON FERGUSON, PRECISIONHAWK, OPENING THE SKIES TO BEYOND VISUAL LINE OF SIGHT DRONE OPERATIONS (2018), <https://www.precisionhawk.com/beyond-visual-line-of-sight-bvlos-drone-operations>.

37. Calandrio, Oh & Webb, *supra* note 18, at 194.

38. 14 C.F.R. § 107.51 (2021).

39. 14 C.F.R. § 48.25(b) (2021).

40. *Id.* at §§ 48.25(a), 48.100(d); Register Your Drone, FED. AVIATION ADMIN. (July 11, 2019), https://www.faa.gov/uas/getting_started/register_drone.

number goes on the outside of the drone via an “permanent marker, label, engraving, or other means.”⁴¹

Current FAA regulations distinguish between commercial and recreational drones.⁴² Commercial drones can carry an external load as long as the total weight of the drone does not exceed fifty-five pounds.⁴³ Commercial drone pilots must also obtain, or be supervised by someone who has obtained, a remote pilot certificate with a UAS rating.⁴⁴ Current FAA regulations mirror the international consensus on the issue of drone usage, with most nations taking a cautious approach to allowing drones to share their airspace.⁴⁵

In December, the FAA took another step in integrating drones into the national airspace system by implementing Remote ID requirements.⁴⁶ The FAA describes Remote ID as a sort of “digital license plate” for unmanned aerial vehicles.⁴⁷ Under the regulations, drone users have three options.⁴⁸ First, users can choose to implant a standard Remote ID, which broadcasts radio waves directly from the drone that are readable by standard wireless devices, and detail the drone’s latitude, longitude, and velocity.⁴⁹ Second, users may opt for a Remote ID with a broadcast module which sends out information via Wi-Fi or Bluetooth.⁵⁰ Finally, users can choose not to include a Remote ID, and can instead choose to fly only in FAA-Recognized Identification Areas (FRIAs).⁵¹ Only an enumerated list of establishments may apply for a FRIA permit, the list including community-based organizations recognized by the Administrator, primary and secondary educational institutions, trade schools, colleges, and universities.⁵²

41. *New Requirements for Registering and Marking Small Unmanned Aircraft*, FED. AVIATION ADMIN., (Dec. 22, 2015), https://www.faa.gov/documentlibrary/media/notice/n_8900.338.pdf; *How to Label Your Drone*, FED. AVIATION ADMIN., https://www.faa.gov/uas/getting_started/register_drone/media/UAS_how_to_label_Infographic.pdf (last visited Jan. 31, 2022).

42. *Compare* 14 C.F.R. §§ 107.1, 107.3 (2019), *with* 14 C.F.R. § 48.25(b) (2019) (whereas § 107 does not apply to recreational drone flying and § 48.25 is implied to apply to individuals).

43. 14 C.F.R. § 107.3 (2021).

44. *Id.* at § 107.63.

45. Jose M. Canaura, *Drones Have Arrived with New Opportunities and Challenges: A Comparative Approach to Regulations Governing the Operations of Unmanned Aerial Vehicles in the United States, Italy, Costa Rica, United Arab Emirates, Canada, Nicaragua, Spain, and Saudi Arabia*, 26 ILSA J. INT’L. & COMPAR. L. 401, 442 (2020).

46. *U.S. Department of Transportation Issues Two Much-Anticipated Drone Rules to Advance Safety and Innovation in the United States*, FED. AVIATION ADMIN. (Dec. 28, 2020), https://www.faa.gov/news/press_releases/news_story.cfm?newsId=25541 [hereinafter *Two Drone Rules*].

47. FED. AVIATION ADMIN., EXECUTIVE SUMMARY FINAL RULE ON REMOTE IDENTIFICATION OF UNMANNED AIRCRAFT (PART 89) (2020), https://www.faa.gov/sites/faa.gov/files/2021-08/RemoteID_Executive_Summary.pdf [hereinafter *Final Rule on Remote ID*].

48. *Id.*

49. *Id.*

50. *Id.*

51. *Id.*

52. *Id.*

B. *Current Dangers and Applications of Drone Use*

The Gatwick and Newark incidents both inspired brief public concern regarding the proliferation of consumer drones.⁵³ Legal commentators have already made clear the concerns posed by drones in matters of national security, Fourth Amendment protections, privacy, and trespass.⁵⁴ While these dangers are already here, other legal commentators and the general public still fail to grasp the severity of these concerns.⁵⁵

The most prescient of these concerns is for the planes, helicopters, and buildings with which these drones will share the sky. In 2016, the FAA cited 1,800 reports of unauthorized drones flying near airports or other airplanes.⁵⁶ In 2017, a drone collided with a commercial airliner in Canada, causing minor damage but no casualties.⁵⁷ Although current research is skeptical as to the threat of drone collisions to even small aircraft, little research has been conducted on collisions between helicopters and drones.⁵⁸ Indeed, in 2018, a helicopter pilot swerved to avoid hitting a drone.⁵⁹

Concerns regarding the threat posed by proliferating drone technology to commercial airliners and helicopters are often dismissed by arguing that consumer drones are not large enough to pose a serious threat.⁶⁰ This argument is flawed in two respects. First, drones already pose a serious threat to commercial airliners, as evinced by previous incidents.⁶¹ Second, the argument assumes that commercial and recreational drones will remain relatively small, an assumption already rebuffed by the fact that numerous firms are looking into developing larger commercial drones for transportation purposes.⁶²

A more looming concern, particularly to civil liberties advocates, is the use of drones by law enforcement to conduct surveillance.⁶³ According to Pew Research, one in four Americans said they would be nervous if they saw a drone

53. *Idiots with Drones Shut Down the UK's Second Largest Airport—Again*, *supra* note 1; Aratani, *supra* note 8.

54. Troy A. Rule, *Airspace in an Age of Drones*, 95 B.U.L. REV. 155 (2015).

55. See Calandrillo et al., *supra* note 18, at 187 (arguing the risks posed by drones are greatly outweighed by their benefits).

56. *Unmanned Aircraft Systems: Innovation, Integration, Successes, and Challenges: Hearing Before the S. Committee on Commerce, Sci., & Transp.*, 115th Cong. (2017) (statement of Earl Lawrence, Director of Unmanned Aircraft Systems, Federal Aviation Administration).

57. Travis Andrews, *A Commercial Airplane Collided with a Drone in Canada, a First in North America*, WASH. POST (Oct. 16, 2017), <https://www.washingtonpost.com/news/morning-mix/wp/2017/10/16/a-commercial-airplane-collided-with-a-drone-in-canada-a-first-in-north-america>.

58. Pamela Gregg, *Risk in the Sky?*, U. DAYTON RSCH. INST. (Sept. 13, 2018), <https://udayton.edu/udri/news/18-09-13-risk-in-the-sky.php>.

59. Alan Levin, *What May Be U.S.'s First Drone-Linked Aircraft Crash Is Being Investigated*, BLOOMBERG BUS. (Feb. 16, 2018), <https://www.bloomberg.com/news/articles/2018-02-16/what-may-be-first-drone-linked-copter-crash-being-investigated>.

60. Gregg, *supra* note 58.

61. Andrews, *supra* note 57.

62. Jesus Diaz, *The World's Biggest Octocopter Drone Is Basically a Flying Truck*, FAST CO. (Jan. 18, 2018), <https://www.fastcompany.com/90157147/the-worlds-biggest-octocopter-drone-is-basically-a-flying-truck>.

63. ACLU, PROTECTING PRIVACY FROM AERIAL SURVEILLANCE: RECOMMENDATIONS FOR GOVERNMENT USE OF DRONE AIRCRAFT 6 (2011).

flying close to where they live.⁶⁴ A more recent survey revealed that Americans, while not in favor of drones flying over private property in general, were most concerned with drones operated by the police.⁶⁵

While drones present new Fourth Amendment questions for law enforcement,⁶⁶ homeland security must take actions to respond to the increased threat posed by drones when used for terrorism. These concerns were raised to the forefront in 2015, when a drone crashed on the White House lawn.⁶⁷ In 2019, a climate change activist group, Extinction Rebellion, threatened to shut down an international airport by using drones.⁶⁸ As commercial drones become more common, public outcry will increase.

Despite all of this, the positive benefits of, and indeed the profit incentive for, the proliferation of commercial and recreational drones will spur their increased development and usage. Drones have been used for everything recently, from carrying urgent medical supplies, to documenting ecological changes, to search and rescue in the wake of disasters.⁶⁹ Building on their current shipping network, Amazon seeks to implement a fleet of delivery drones.⁷⁰ Both Amazon and UPS got FAA approval allowing their delivery drones to operate beyond visual line of sight range just this year.⁷¹ However, Amazon executives have been highly critical of the relative lack of progress made by the FAA.⁷²

C. Geofencing and its Current Applications

Within the past few years, geofencing technology has come into increasing popularity as a mechanism for everything from national security, to advertising,

64. Paul Hitlin, *8% of Americans Say They Own a Drone, While More than Half Have Seen One in Operation*, PEW RSCH. CTR. (Dec. 19, 2017), <https://www.pewresearch.org/fact-tank/2017/12/19/8-of-americans-say-they-own-a-drone-while-more-than-half-have-seen-one-in-operation/>.

65. Stephen Rice, *Eyes in the Sky: The Public Has Privacy Concerns About Drones*, FORBES (Feb. 4, 2019, 10:00 AM), <https://www.forbes.com/sites/stephenrice1/2019/02/04/eyes-in-the-sky-the-public-has-privacy-concerns-about-drones>.

66. *7 Pros and Cons of Drones and Unmanned Aerial Vehicles*, OHIO U. (May 11, 2021), <https://onlinemasters.ohio.edu/blog/the-pros-and-cons-of-unmanned-aerial-vehicles-uavs>.

67. Michael S. Schmidt & Michael D. Shear, *A Drone, Too Small for Radar to Detect, Rattles the White House*, N.Y. TIMES (Jan. 26, 2015), <https://www.nytimes.com/2015/01/27/us/white-house-drone.html>.

68. Sanjana Varghese, *Extinction Rebellion's Heathrow Drone Protest is Tearing it in Two*, WIRED (June 10, 2019, 6:00 AM), <https://www.wired.co.uk/article/extinction-rebellion-heathrow-airport-drones>.

69. Jon Porter, *Zipline's Drones are Delivering Medical Supplies and PPE in North Carolina*, THE VERGE (May 27, 2020, 1:00 AM), <https://www.theverge.com/2020/5/27/21270351/zipline-drones-novant-health-medical-center-hospital-supplies-ppe>; Madysen McLain, *WSU Researchers Produce Technology to Monitor Ecology*, DAILY EVERGREEN (Mar. 4, 2021), <https://dailyevergreen.com/101885/research-research-2/wsu-researchers-produce-technology-to-monitor-ecology/>; Michelle Hampson, *Search-and-Rescue Drone Locates Victims by Homing in on Their Phones*, IEEE SPECTRUM (Feb. 23, 2021), <https://spectrum.ieee.org/tech-talk/robotics/drones/searchandrescue-drone-locates-victims-by-homing-in-on-their-phones>.

70. Ryan Mac, *Amazon Hammers FAA for Lack of 'Impetus' Over Drone Policy*, FORBES (Mar. 24, 2015, 5:05 PM), <https://www.forbes.com/sites/ryanmac/2015/03/24/amazon-hammers-faa-for-lack-of-impetus-over-progressive-drone-policy>.

71. Sean Hollister, *The FAA Is Opening the Door a Crack for Self-flying Drones like Skydio to Reach Their Potential*, THE VERGE (Oct. 6, 2020, 8:37 PM), <https://www.theverge.com/2020/10/6/21505064/faa-visual-line-of-sight-skydio-2-waiver-ncdot-chula-vista>.

72. Mac, *supra* note 70.

to mobile games like Pokémon Go.⁷³ Geofencing uses Global Positioning System (GPS) software to mark a certain geographical space which can be read by any device with the requisite GPS software.⁷⁴ Developers can create geofences which can be read by any device containing an onboard GPS system with the requisite software to detect the geofence.⁷⁵ Once triggered, the geofence can be used to serve any number of functions from sending text messages, triggering events in mobile games, or even targeting advertising.⁷⁶

This technology has already been used to solve some of the problems discussed above. Da-Jiang Innovations (DJI), the world's largest drone manufacturer, implemented a polygonal geofence over Gatwick Airport in wake of the 2018 incident.⁷⁷ Now, when its drones near the airport, they will be turned away if they enter within a bowtie shaped set of three-dimensional coordinates above the airport without special authorization.⁷⁸ Legal commentators have already discussed the potential of geofences as a solution to the burgeoning national security, Fourth Amendment, privacy, and trespass issues presented by the proliferation of drones.⁷⁹ The possibility of industry-scale implementation of this technology has raised calls to question the necessity of the FAA's current regulatory scheme.⁸⁰

D. *Relation Between Current Regulations and Dangers Posed by Drones*

Many commentators fear the intrusions by the FAA unnecessarily hinder drone innovation, with no benefit of greater security.⁸¹ Recent changes by the FAA indicate the agency sees a benefit to relaxing some BVLOS (beyond visual line of sight) restrictions.⁸² However, the FAA has still rejected the vast majority

73. Kaveh Wadell, *The Invisible Fence That Keeps Drones Away from the President*, ATLANTIC (Mar. 2, 2017), <https://www.theatlantic.com/technology/archive/2017/03/drones-invisible-fence-president/518361>;

James Brown, *Pokémon Go: Leading the Location Ad Revolution*, GUARDIAN (July 15, 2016, 8:30 AM), <https://www.theguardian.com/media-network/2016/jul/15/pokemon-go-app-leading-location-revolution>;

Charles Mazzini, *The Five W's (and One H) of Geofencing Advertising*, FORBES (Dec. 13, 2019, 6:00 AM), <https://www.forbes.com/sites/forbesagencycouncil/2019/12/13/the-five-ws-and-one-h-of-geofence-marketing>.

74. Sarah K. White, *What is Geofencing? Putting Location to Work*, CIO (Nov. 1, 2017, 12:43 PM), <https://www.cio.com/article/2383123/geofencing-explained.html>.

75. *Id.*

76. *Id.*

77. *See DJI Improves Geofencing to Enhance Protection of European Airports and Facilities*, DJI (Feb. 12, 2019), <https://www.dji.com/newsroom/news/dji-improves-geofencing-to-enhance-protection-of-european-airports-and-facilities> (using diagrams to explain the new restrictions placed on airports).

78. *Id.*

79. Troy A. Rule, *Drone Zoning*, 95 N.C. L. REV. 133, 165–66 (2016).

80. Calandrillo et al., *supra* note 18, at 186–87.

81. Jason Snead & John-Michael Seibler, *How the FAA's War on Drones Is Killing a Popular Pastime*, THE DAILY SIGNAL (Dec. 27, 2016), <https://www.dailysignal.com/2016/12/27/how-the-faas-war-on-drones-is-killing-a-popular-pastime> (“[T]he registry does nothing to deter or prevent bad actors from using drones to commit crimes or acts of terror . . .”); Dave Marcontell & Steve Douglas, *Why the Use of Drones Still Faces Big Regulatory Hurdles*, FORBES (Sept. 10, 2018, 8:08 AM), <https://www.forbes.com/sites/oliverwyman/2018/09/10/why-the-use-of-drones-still-faces-big-regulatory-hurdles>.

82. *FAA Highlights Changes for Recreational Drones*, *supra* note 13; Jonathan Rupprecht, *Feds Make Major Moves to Relax Restrictions on Use of Drones*, FORBES (Jan. 14, 2019, 10:26 PM), <https://www.forbes.com/sites/jonathanrupprecht/2019/01/14/proposed-drone-rules-allow-flying-over-people-and-at-night-without-waivers>.

of all BVLOS applications.⁸³ Therefore, it is worth reexamining the connections, or lack thereof, between the regulations in place and the safety of the general public.

The logic behind visual line of sight regulations is that it is a surefire way to ensure that the drone operator knows where they are going.⁸⁴ As previous commentators have pointed out, this rationale fails as it is at best irrelevant to safety.⁸⁵ Human observation of drones is already less effective than the onboard cameras available out of the box for most drones.⁸⁶ With the proper mount, a drone can have a first person, 360-degree view of the drone's surroundings.⁸⁷

Another argument in favor of BVLOS restrictions is that it hypothetically ensures that the operator is not flying in restricted airspace.⁸⁸ If a drone pilot sets up in permissible airspace and keeps the drone within his sight range, it follows that the drone is less likely to enter restricted airspace. This argument is flawed as it assumes that all users will be setting up in free airspace, which is not always the case. Furthermore, just because one can see where their drone is does not mean they are flying in free airspace.

If we were living in a market that did not have such readily available cameras mounted to most drones, large scale BVLOS restrictions would make more sense. However, as more consumer drone systems begin implementing onboard obstacle detection and avoidance systems, the need for human operators to be within visual range of their drones becomes almost entirely irrelevant.⁸⁹ As long as a properly equipped drone is competently piloted, the fact that it is out of visual range of the user is largely irrelevant. Pilot competency is already covered by existing certification requirements.⁹⁰

The current registration regime has also taken flak for chilling drone ownership while failing to curtail the threats to safety posed by drones.⁹¹ For example, registration marks on the drone itself are justified by virtue of allowing a first responder to identify the owner of the drone without getting near it.⁹² Disregarding the dubious likelihood of a permanent marker engraved identification number surviving a crash, registration requires drone owners make their information public.⁹³ By creating a registry like this, the FAA discourages individuals from owning drones by threatening their privacy.

Furthermore, the FAA has decided to sparingly enforce the registration provision and, when it has enforced it, the FAA has not been nearly as harsh as

83. FERGUSON, *supra* note 36.

84. Operation of Small Unmanned Aircraft Systems Over People, 84 Fed. Reg. 3856-01 (proposed Feb. 13, 2019) (to be codified at 14 C.F.R. pt. 107), 2019 WL 564249.

85. Calandrillo et al., *supra* note 18, at 231.

86. *Id.*

87. *Id.* at 231–32.

88. *Id.* at 186–87.

89. *Id.* at 221.

90. 14 C.F.R. § 107.63 (2019).

91. Calandrillo et al., *supra* note 18, at 186–87.

92. *FAA Makes Major Drone ID Marking Change*, FED. AVIATION ADMIN. (Feb. 13, 2019), <https://www.faa.gov/news/updates/?newsId=93045>.

93. John Goglia, *FAA Finally Admits Names and Home Addresses in Drone Registry Will Be Publicly Available*, FORBES (Dec. 18, 2015, 3:07 PM), <https://www.forbes.com/sites/johngoglia/2015/12/18/faa-finally-admits-names-and-home-addresses-in-drone-registry-will-be-publicly-available>.

it should be.⁹⁴ Most recreational users will not be under threat of the maximum \$27,500 fine.⁹⁵ Many more will probably just receive a warning.⁹⁶ The degree to which this would deter bad actors is menial, and the burdens for compliance fall on the shoulders of recreational users.

While the VLOS and registration regulations have taken flak, other regulations, namely the no-fly zones around airports, play a far more critical role in ensuring public safety.⁹⁷ As drones become more widely adopted, run-ins with airports, public venues, and other sensitive locations will become more and more common.

However, the degree to which similar restrictions around natural disasters and public events serve safety interests is unclear.⁹⁸ At least right now, it does not seem that fleets of drones are otherwise going to fall out of the sky and drop on people's heads.⁹⁹ Perhaps, in a future in which a company like Amazon is operating fleets of delivery drones in major cities, these restrictions would make sense.¹⁰⁰

But even then, current tort law would seem to be a more than efficient mechanism to persuade these companies to implement sufficient safety measures.¹⁰¹ Personal injuries and deaths resulting from careless drone operators can be prosecuted through state laws on battery, murder, and manslaughter.¹⁰² State "peeping Tom" laws would also address the privacy concerns raised by drone operators attempting to spy on private citizens.¹⁰³

Remote ID requirements, in contrast to former registration requirements and BVLOS permits, seem eminently useful.¹⁰⁴ Remote ID allows for the FAA to immediately identify the user of a particular drone,¹⁰⁵ in contrast to its earlier registration scheme, in which a drone's user was only able to be identified after: (1) the FAA recovered the downed drone; and (2) was able to read the identifying tag on the outside of the drone, if the user had followed the regulation at all.¹⁰⁶ Identification provides a tangible safety benefit, in contrast to BVLOS restrictions, whose usefulness seems mooted by increased technological development.¹⁰⁷ Remote ID also shows the FAA's willingness to implement broad requirements on drone users to retrofit their crafts with technology

94. Jason Koebler, *The FAA Gave Us a List of Every Drone Pilot Who Has Ever Been Fined*, VICE (Jun. 1, 2016, 1:20 PM), <https://www.vice.com/en/article/xyga8a/faa-drone-fines>.

95. *See id.* (finding many users received fines as small as \$400).

96. Calandrillo et al., *supra* note 18, at 244.

97. 14 C.F.R. § 107.43 (2019).

98. 14 C.F.R. § 107.39 (2019).

99. *FAA Highlights Changes for Recreational Drones*, *supra* note 13.

100. Jake Kanter, *Google Just Beat Amazon to Launching One of the First Drone Delivery Services*, BUS. INSIDER (Apr. 9, 2019, 4:08 AM), <https://www.businessinsider.com/google-beats-amazon-to-launching-drone-delivery-service-in-australia-2019-4>.

101. Jason Snead & John-Michael Seibler, *The Dangers of Drones Were Regulated Before the FAA Noticed Them*, HERITAGE FOUND. (Mar. 31, 2016), <https://www.heritage.org/crime-and-justice/report/the-dangers-drones-were-regulated-the-faa-noticed-them>.

102. *Id.*

103. *Id.*

104. Final Rule on Remote ID, *supra* note 47.

105. *Id.*

106. *Id.*

107. *Id.*

integrating them into the greater national airspace.¹⁰⁸ However, Remote ID only provides a mechanism for identifying drones which may enter hostile airspace.¹⁰⁹ The goal of the FAA should not only be to provide a way to identify hostile UAVs but also contain an onboard mechanism to force drones away from sensitive areas.

III. ANALYSIS

Recent commentary has recommended the FAA vacate several of its restrictions, allowing private actors to set up geofencing barriers in order to prevent the incursion of drones into sensitive airspace.¹¹⁰ Geofencing offers itself as a practical solution to an otherwise complicated regulatory problem. However, this solution places too much reliance on the proactive nature of private actors and downplays the costs of not acting soon enough.¹¹¹ If it could be guaranteed that every drone registered with the FAA would have a GPS device outfitted with geofencing software, private firms would be able to completely prevent their users from entering restricted airspace. However, the issue of whether or not private firms will choose to implement geofencing has not been previously explored.

Geofencing succeeds where the existing regulatory framework does not. It provides more practicable safety to the general public than BVLOS restrictions.¹¹² It also provides an easier mechanism of identification and terrorism prevention than the current engraving requirements.¹¹³ Finally, it provides a direct defense mechanism for sensitive areas that Remote ID does not.¹¹⁴ This Note is, however, skeptical of the idea that individual firms will rush to implement geofencing right away, if at all.

Absent government compulsion or the threat thereof, private actors might conclude that in their perceived self-interest, there is no benefit to implementing a complex geofencing network.¹¹⁵ Polygonal geofencing (in contrast to simple 2D circular geofencing) is far more difficult and expensive to implement.¹¹⁶ As a result, firms could analyze the costs and benefits of implementing these systems and conclude they are better off not implementing them.¹¹⁷

Relying upon drone manufacturers to prevent the next major airport shutdown or terrorist attack is being gravely optimistic. Being restrictive on drone usage may be more helpful than its critics give it credit for. The potential for terrorism becomes frighteningly real in the absence of a proper regulatory

108. *Id.*

109. *Id.*

110. Calandrillo, *supra* note 18, at 186–87.

111. *Id.*

112. *See supra* Part II.

113. Calandrillo, *supra* note 18, at 243–44.

114. Final Rule on Remote ID, *supra* note 47.

115. *DJI Improves Geofencing to Enhance Protection of European Airports and Facilities*, *supra* note 77 (showing only after the Gatwick Airport incident did DJI feel the need to implement bowtie geofencing around the airport).

116. Ferguson, *supra* note 36.

117. *Id.*

scheme to sort out wanted from unwanted unmanned air traffic. With that vacuum comes a potential overcorrection from the public which may lead to even more regulation than before.¹¹⁸

It is not unthinkable that relatively soon, a collision will occur between a drone and the engine of a passenger jet. Even if everyone survives, this incident could become a major news headline. Massive political pressure will not just be placed on the FAA, but on Congress and the Executive Branch in order to pass reform immediately to curtail the usage of drones.¹¹⁹

This incident could lead to a major setback in terms of drone development and proliferation in the United States. Registration requirements could become even more stringent and invasive than they are today. BVLOS permits could become virtually unobtainable, even in the areas where the FAA has begun to relax them. Additionally, the already existing limits on where drone pilots can fly will be expanded further, causing drastic harm to the prospects of drone delivery and other future developments.

Ultimately, private actors simply may not behave proactively enough to solve the immediate problems posed by drone proliferation. Therefore, it seems that at least some regulation is needed in order to address the problems outlined above. The FAA's place should be to facilitate restrictions curtailing the threats posed by drones while staying out of the way of the economic impact created by their proliferation. On the contrary, however, current regulatory schemes now meaningfully stand in the way of several breakthroughs in commercial drone applications.¹²⁰

Here, I would like to analyze two solutions to achieving universal geofencing protection for airports and other sensitive areas. First, a private consortium between the major drone manufacturers to implement industrywide geofencing. Second, the implementation of new regulations mandating the introduction of GPS technology and the requisite geofencing software into all new drones and forcing all drone manufacturers to implement geofencing in line with current FAA safeguards.

A. *Market Consortium to Achieve Universal Geofencing*

Ideally speaking, the fewer government regulations needed to achieve the safety and privacy goals sought after here, the better. However, individual drone manufacturers may not perceive it to be within their self-interest to take up the cost of implementing geofencing on their drones.¹²¹ Because of this, a separate mechanism is needed if private entities are to implement universal geofencing

118. *E.g.*, Hitlin, *supra* note 64.

119. *See Idiots with Drones Shut Down the UK's Second Largest Airport—Again*, *supra* note 1 (noting the outcry from the U.K. public after the Gatwick airport incident, which placed immediate pressure on the government to take action).

120. Potential regulations could limit advances in scientific research. Renee Cho, *How Drones Are Advancing Scientific Research*, STATE OF THE PLANET (June 16, 2017), <https://blogs.ei.columbia.edu/2017/06/16/how-drones-are-advancing-scientific-research>.

121. *See supra* Part II A.

on their own. A consortium of drone manufacturers would allow for the various manufacturers to socialize the benefits while minimizing the costs.

Recent history has shown consortium agreements between private firms to solve a number of problems previously only reachable through regulation.¹²² These so called “soft-law” solutions seek to create and substantiate rules and principles on an industry without national governments or international organizations passing laws to enforce them.¹²³ The International Gene Synthesis Consortium (IGSC), for example, has allowed gene synthesizing companies to regulate against the proliferation of gene sequences potentially useful for bioterrorism purposes.¹²⁴ The IGSC describes itself as “an industry-led group of gene synthesis companies and organizations formed to design and apply a common protocol to screen both the sequences of synthetic gene orders and the customers who place them.”¹²⁵ The IGSC collaborates with governments and international organizations to make sure its members comply with biosecurity standards.¹²⁶

The IGSC is comprised of the biggest names in gene-synthesis, including Raytheon BBN and Thermo Fischer Scientific.¹²⁷ Its members are prohibited from synthesizing the gene sequences of dangerous viruses like smallpox.¹²⁸ Members require personal information from all potential customers for synthetic genes, those customers are then screened against every relevant national security list required by applicable regulations.¹²⁹ With this agreement, over 80% of the market for gene synthesis is now self-regulating against bioterrorism.¹³⁰

A similar agreement could be reached among the various private drone manufacturers. Drone manufacturers themselves have a self-interest in preventing their customers from violating FAA regulations and potentially endangering the public.¹³¹ These firms could foreseeably reach the conclusion that forming a consortium is in their best interest to avoid the potential wrath of the government in lieu of any drone related disasters.¹³² Furthermore, DJI has a

122. INTERNATIONAL GENE SYNTHESIS CONSORTIUM, <https://genesynthesisconsortium.org> (last visited Jan 31, 2022).

123. Richard L. Williamson, Jr., *Hard Law, Soft Law, and Non-Law in Multilateral Arms Control: Some Compliance Hypotheses*, 4 CHI. J. INT'L L. 59, 63 (2003).

124. *Id.*

125. *International Gene Synthesis Consortium Updates Screening Protocols for Synthetic DNA Products and Services*, CISION PR NEWSWIRE (Jan. 3, 2018, 09:00 ET), <https://www.prnewswire.com/news-releases/international-gene-synthesis-consortium-updates-screening-protocols-for-synthetic-dna-products-and-services-300576867.html> [hereinafter Screening Protocols].

126. *Id.*

127. INTERNATIONAL GENE SYNTHESIS CONSORTIUM, *supra* note 122.

128. *Harmonized Screening Protocol v2.0 Gene Sequence & Customer Screening to Promote Biosecurity*, INT'L. GENE SYNTHESIS CONSORTIUM (Nov. 19, 2017), <https://genesynthesisconsortium.org/wp-content/uploads/IGSCHARmonizedProtocol11-21-17.pdf>.

129. *Id.*

130. *Id.*

131. Calandrillo, Oh & Webb, *supra* note 18, at 183.

132. See Brendan Schulman, *Raising Standards: An Update on DJI's 'Elevating Safety' Drone Safety Plan*, VIEWPOINTS (July 14, 2021), <https://viewpoints.dji.com/blog/raising-standards-an-update-on-djis-elevating-safety-drone-safety-plan> (recognizing that DJI's standards for drone safety have not been achieved by competitors, exposing the industry to potentially dangerous situations).

74% drone production market-share.¹³³ With this, it can flex its muscle and convince the remaining smaller firms to implement the same restrictions it has, including onboard GPS and maintaining a geofence database of sensitive areas.¹³⁴

Consortium agreements provide for educational and cooperation building benefits not available outside of the agreement. Take the IGCS, for example. Its members collaborate to include all gene sequences identified as potentially hazardous to update the group's pathogen database.¹³⁵ The need to develop and enforce the code of conduct itself is also an opportunity for the various firms to open a dialogue on relevant issues, an opportunity which was previously unavailable to them. Without outside influence, it is entirely possible that DJI and the remaining drone manufacturers can come together to produce a consortium agreement out of a mutual realization that the benefits of coordinating and cooperating on the issue of geofencing are simply better than remaining separate.

The best solution from an economics and industry standpoint would be for the adoption of universal geofencing coupled with a targeted dismantling of the current regulatory system. Google and Amazon are investing large sums of money in order to pioneer and develop drones with longer battery life in order to allow them to be able to quickly deliver perishable products.¹³⁶ These tests, however, are being conducted in foreign markets, reflecting the dismay of tech giants in the current regulatory landscape.¹³⁷ This is mainly due to the relative difficulty it is to obtain BVLOS permits in the United States.¹³⁸ The existing FAA regulatory regime is delaying the rollout of services which could dramatically reduce the costs of consumer goods.¹³⁹

This delay in the expansion of the drone market in the United States serves to hinder the growth of an industry projected to have a potential economic impact of \$82.7 billion.¹⁴⁰ Over 100,000 high paying manufacturing jobs are projected to be created by 2025.¹⁴¹ However, with every year the United States delays the integration of drones into the national airspace system (NAS), \$10 billion of economic impact is lost.¹⁴² This is not to mention the myriad of other

133. Sally French, *DJI Market Share: Here's Exactly How Rapidly It Has Grown in Just a Few Years*, DRONE GIRL (July 26, 2020), <https://www.thedronegirl.com/2018/09/18/dji-market-share>.

134. *Id.*

135. Screening Protocols, *supra* note 125.

136. Alex Hem, *Alphabet Tests Project Wing Drones by Delivering Burritos and Medicine*, GUARDIAN (Oct. 17, 2017), <https://www.theguardian.com/technology/2017/oct/17/alphabet-google-tests-project-wing-drone-hybrid-delivering-burritos-rural-australia>; Ed Pilkington, *Amazon Tests Delivery Drones at Secret Canada Site After U.S. Frustration*, GUARDIAN (Mar. 30, 2015), <https://www.theguardian.com/technology/2015/mar/30/amazon-tests-drones-secret-site-canada-us-faa>.

137. Pilkington, *supra* note 136.

138. *Why 99% of BVLOS Part 107 Waivers are Rejected*, PRECISIONHAWK (May 15, 2018), <https://www.precisionhawk.com/blog/media/topic/why-99-of-bvlos-part-107-waivers-are-rejected>.

139. Ferguson, *supra* note 36.

140. DARRYL JENKINS & BIJAN VASIGH, ASS'N FOR UNMANNED VEHICLE SYS. INT'L, *THE ECONOMIC IMPACT OF UNMANNED AIRCRAFT SYSTEMS INTEGRATION IN THE UNITED STATES*, 2 (2013), https://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New_Economic%20Report%202013%20Full.pdf.

141. *Id.*

142. *Id.*

innovations widespread drone technology can produce which are also being hamstrung by the current regulatory scheme.¹⁴³

The strongest argument against the introduction of new regulations is the delay they will inevitably cause in integrating drones into the NAS. Achieving universal geofencing would be a highly invasive and expansive task for the FAA, beyond even its recent announcement regarding Remote ID requirements.¹⁴⁴ Even coupled with a rollback of the outmoded regulatory scheme currently in place, Google and Amazon will not be reassured by the FAA's consistent meddling in the drone market.¹⁴⁵

However, a drone manufacturer consortium is more of a prospective solution at the moment. Pooling assets together with other competitors is not an inherently attractive idea, especially to a firm like DJI which is so far ahead of their competition.¹⁴⁶ The minor public relations boost achieved by being a part of a collection of public health-conscious drone manufacturers may simply not be enough for some firms to join in. It is true that all firms have an interest in preventing the next drone/aircraft collision, as well as preventing drone related terrorism.¹⁴⁷ Specifically, they have an interest in making sure that the federal government does not take further action to regulate their industry.¹⁴⁸

In addition, the enforcement mechanisms in place may not be enough for some firms to fully comply with the terms of the agreement. Non-compliance could remove the privileges associated with the consortium, leaving any firm which breaks the terms of the agreement sorely behind their competition. However, consortiums cannot threaten criminal sanction for non-compliance, no matter how severe. It is unclear whether contractual remedies between firms within the same industry can be as motivating a force as the threat of the federal government.

Furthermore, it is unclear whether one standard or multiple standards will arise out of the push for a uniform code of conduct among drone manufacturers with regard to geofencing. Indeed, this is a problem faced by consortiums, as not all firms will agree on one code of conduct.¹⁴⁹ While DJI is inevitably going to have massive influence in the creation of any such agreement, it is unclear how the entrance of Amazon and Google into the drone market will shift this balance of power. Waiting for the industry to develop soft law to solve this problem could result in the industry developing multiple solutions, which creates a new problem.¹⁵⁰ While this alternative is preferable to no agreement among firms to

143. *Supra* Part II.B.

144. Two Drone Rules, *supra* note 46.

145. Calandrillo, Oh & Webb, *supra* note 18, at 231.

146. See Kaveh Waddell, *Searching for the Next Great American Drone Company*, AXIOS (Nov. 23, 2019), <https://www.axios.com/dji-chinese-drone-ban-vacuum-skydio-9b414ee3-7613-490a-9434-733ef32a6073.html> (recognizing that DJI's dominance of the market creates an "uphill battle for competitors").

147. See Calandrillo, Oh & Webb, *supra* note 18, at 222 (recognizing that the public in general has an interest in drone safety measures).

148. *Id.* at 187.

149. See Markus Fischer & Stephen M. Maurer, *Harmonizing Biosecurity Oversight for Gene Synthesis*, 28 NATURE BIOTECHNOLOGY 20 (2010) (observing that despite the market share of the IGCS, the U.S. Government and the International Association of Synthetic Biology both have rivaling codes of conduct).

150. *Id.*

implement universal geofencing, it reintroduces the chilling effects posed by complex regulatory frameworks which this Note is seeking to avoid.

B. New Regulation to Achieve Universal Geofencing

The FAA could also choose to take matters into its own hands and implement new regulations on commercial and recreational drones. First, in addition to registration and marking requirements, the FAA would need to mandate GPS technology within all new small unmanned aerial vehicles. Second, all existing manufacturers would need to be required to implement and maintain geofencing barriers in compliance with FAA specifications.

Implementing new regulations is a far less precarious option than leaving things to the market. As discussed above, it is a tenuous prediction that the market will be able to effectively regulate itself.¹⁵¹ The exact terms of the agreement will undoubtedly be self-serving to the drone manufacturers themselves.¹⁵² It will be even further self-serving to DJI, whose market share will almost assuredly allow it to play an outsized role in the formation of whatever agreement comes out of this process.¹⁵³ Altogether, there are several reservations the public should have about the formation of a drone manufacturer consortium.

A new round of regulations, on the other hand, will allow the FAA to have direct control in shaping how it wants universal geofencing to be implemented. Rather than relying on drone manufacturers to come to a collective conclusion about their best interests, the FAA can simply go to these firms and demand they act in accordance with their wishes. However, with this system in place, drone manufacturers will undoubtedly lose most of their motivation for forming a consortium.¹⁵⁴ Their best interests on this matter will be served by complying with the FAA rather than creating supplemental standards for their industry.

Further, by mandating geofencing through new regulations, the FAA will assert direct control over which areas are covered by geofencing. As this Note is being written, privacy issues related to drones are currently playing out in court.¹⁵⁵ New “no-go zones” for drones are likely to develop as a result of ongoing court proceedings. In light of this, it is important for geofencing networks to be highly integrated and centrally managed, in order to quickly implement changes resulting from legal proceedings.

Expanding regulations does not mean there is no room left for individual drone manufacturers to add additional geofencing on top of the new mandates. Currently, DJI’s “Fly Safe GEO Zone Map” distinguishes between areas which are flight restricted, areas which might raise flight concerns, and areas where it

151. *Supra* Part II A.

152. Williamson, *supra* note 123, at 64.

153. French, *supra* note 133.

154. *See* Calandrillo, Oh & Webb, *supra* note 18, at 186 (recognizing that current FAA regulations create an “excessive regime” that affects the productive use of drones).

155. *E.g., E.g.*, Beth LeBlanc, *Township Violated Michigan Couple’s Privacy by Using Drone, Court Says*, DETROIT NEWS (Mar. 19, 2021, 12:06 PM), <https://www.detroitnews.com/story/news/local/michigan/2021/03/19/appellate-court-says-township-violated-michigan-couple-privacy-drone-photos/4764083001>.

is safe to fly.¹⁵⁶ To take-off in an area deemed to be a safety or security risk, users must unlock or self-authorize their flights.¹⁵⁷ This system allows for DJI to limit its exposure to liability, as well as to dissuade drone users from flying in unrestricted, but still dangerous airspace.¹⁵⁸ The GEO Zone Map would still be effective after the new FAA regulations; however, the restricted areas would be streamlined between the various manufacturers.¹⁵⁹

As the FAA has already been criticized for overregulation, any new additions to the Federal Register are likely to draw scrutiny.¹⁶⁰ This is especially likely given the challenge these regulations will be to implement. Nevertheless, these new regulations could potentially see positive reception if proposed as part of a broader overhaul of the current regime. One of the more frustrating aspects of flying drones as a hobby is dealing with the various developer restrictions, as well as the federal and state laws restricting where users can and cannot fly their drones. The new geofencing regulations could be sold to the public as helping to streamline the current process of figuring out whether they are flying in restricted airspace. Coupled with relaxing BVLOS restrictions and registration requirements, it is not unlikely that these new regulations will be received positively.

Another concern is that requiring manufacturers to maintain their own geofencing network could price smaller firms out of the market. If implementing a national network of geofences and constantly communicating with the FAA is deemed too costly, some firms will simply go out of business.¹⁶¹ However, unfair competition concerns should not be the immediate priority of the FAA. The FAA's paramount concern should be whether or not mandating uniform geofencing is the best solution for dealing with the safety risks posed by the proliferation of drones.

Furthermore, streamlining the process of sorting out unwanted air-traffic has positive downstream effects on other areas of policy. One solution to dealing with drones which make their way into airport airspace that has been floated in recent years is to delegate authority to the Transportation Security Administration (TSA) to shoot down drones.¹⁶² However, that plan has come under fire for giving too much power to an agency that does not understand the complexities of the NAS.¹⁶³ If, however, uniform geofencing requirements were implemented, the process of identifying hostile drones would become

156. *Fly Safe GEO Zone Map*, DJI, <https://www.dji.com/flysafe/geo-map> (last visited Jan. 30, 2022).

157. *Id.*

158. *See id.* (“The GEO system is advisory only. Each user is responsible for checking official sources and determining what laws or regulations might apply to his or her own flight.”).

159. *See generally Fly Safe*, DJI, <https://www.dji.com/flysafe>, (explaining the technology to be streamline if the suggested regulations are implemented) (last visited Jan. 30, 2022).

160. Calandrillo, Oh & Webb, *supra* note 18, at 186–87.

161. *See* Adam Hayes, *Barriers to Entry*, INVESTOPEDIA (Jan. 8, 2022), <https://www.investopedia.com/terms/b/barrierstoentry.asp> (listing “regulatory hurdles” among the barriers hindering new companies from entering a market).

162. Ian Duncan, *The TSA Is Planning to Shoot Down Drones Near Airports. GOP Congressmen Say That's Dangerous and Probably Illegal*, WASH. POST (Nov. 15, 2019), <https://www.washingtonpost.com/transportation/2019/11/15/tsa-is-planning-shoot-down-drones-near-airports-gop-congressmen-say-thats-dangerous-probably-illegal>.

163. *Id.*

much simpler.¹⁶⁴ This would allow the government to place more trust in the TSA to secure the nation's airports from drone threats.

IV. RECOMMENDATION

In totality, it seems that a restructuring of current FAA regulations is needed. The criticisms of current VLOS and registration regulations are largely correct.¹⁶⁵ Despite doing little to curb the threat of terrorism or protect consumers, they greatly intrude upon the private lives of drone users and stunt innovation within the industry.¹⁶⁶ Therefore, the calls for these restrictions to be scrapped should be well heeded by the FAA. However, technological innovation alone will not alleviate the need for the FAA and Congress to step in.

The future of drone regulation lies in the expansion of geofencing technology. However, simply leaving its expansion to individual private actors is not the appropriate way to go. It cannot be guaranteed that individual drone manufacturers will go out and implement intricate geofencing systems in order to protect the public from potential dangers. Furthermore, a consortium agreement would inevitably be both difficult to organize and highly self-serving of the industry itself.

Hence, this Note proposes that the FAA adopt two new requirements in pursuit of creating safer drone usage:

- (1) mandatory implementation of a GPS system and the requisite geofencing software within all drones, commercial and recreational;
- (2) mandatory development and maintenance of geofencing networks by all drone manufacturers in line with existing FAA restrictions;

In furtherance of these proposals, the FAA should take immediate, sensible, and uniform steps to ensure that all airports are protected by geofencing restrictions. This will ensure airport safety against drone threats, malicious or otherwise, without waiting for the private sector to implement the appropriate infrastructure. It furthermore saves consumers' time. Leaving geofencing restrictions up to individual firms would create more confusion as to where consumers can fly their drones.

It is an open question as to whether or not the FAA has the authorization to step over the current slate of state and local laws on these issues. There is no express federal preemption given to the FAA by Congress on the issue of civilian drone law.¹⁶⁷ While the FAA has been given "exclusive sovereignty of the airspace of the United States", the term airspace has not been effectively defined by Congress to determine where the FAA's authority stops and where state and local authority begins.¹⁶⁸ The most elegant solution to this problem would be for additional legislation either granting full express preemption to the FAA over

164. See Wail Rimouch, *Why Is There a Need for Uniformity?*, ALGERIAN BLACK PEARL (Nov. 29, 2020), <https://abpradio.com/why-is-there-a-need-for-uniformity> (presenting the idea that uniformity has the potential to make things similar).

165. Calandrillo, Oh & Webb, *supra* note 18, at 240–46.

166. *Id.*

167. Rule, *supra* note 79, at 147–48.

168. *Id.* at 150.

civilian drone law so that it can establish a regulatory floor, or to provide a precise definition of “airspace of the United States” so that the agency is not stepping on the toes of state and local governments.¹⁶⁹

The GPS requirement is central as without it the geofences themselves are useless.¹⁷⁰ Therefore, any action by the FAA decoupled from a GPS mandate is doomed to fall short of the safety goals sought by this Note. Implementing this requirement will likely only affect a small number of do-it-yourself (DIY) drone makers who choose not to put GPS in their drones. However, the immediate concern of the FAA should be to protect airports and other sensitive areas from unassuming consumers and the threat of terrorism. Therefore, the FAA should first implement GPS requirements in all drones.

The geofencing software itself will need to be installed on all new drones, and existing drones will need to be updated if they do not currently have such software. Geofencing software is relatively simple to find online, however in order to ensure compliance, the government should make the software freely available for all users to download. The file can be made available via a portal on the FAA website. The biggest hurdle to this will be to make a version of the software that can be read by all possible drivers to not leave any users out of this transition.

The next step for the FAA should be to create a national registry of sensitive areas, so that drone manufacturers can reliably assess where they need to draw the boundaries of their geofencing barriers. This system best allows parties concerned with intrusive drones to properly exclude innocent trespassers. Drones compliant with FAA regulations regarding GPS and geofencing software requirements will need not worry about being shot down for trespassing. The onboard geofencing will exclude them from any area where they would be treated as hostile. If, however they do end up getting shot down, the pilots have some assurance that they were in the right in flying over that airspace as they were in compliance with restrictions made directly by the FAA. Furthermore, it ensures airports and other sensitive areas that if a drone violates their airspace, that they are in the right to shoot it down.

The registry will contain all existing no-fly zones created by the FAA. It can be regularly updated as necessary to account for new developments. Furthermore, it can be maintained in real time to install restriction zones over temporarily sensitive areas like crime-scenes and traffic accidents. Before this framework, such a coordinated solution to these types of problems was not possible. The task of creating this registry is virtually impossible for the FAA alone, given the multitude of other tasks it is currently dealing with. It is possible that DJI and the other drone manufacturers might find the need to create restriction zones in areas which the FAA has not considered yet. State and local government involvement in creating restriction zones is an absolute necessity, as they are in the best position to determine the needs of their communities.

169. *Id.*

170. *Id.*

Therefore, the system should also allow for bottom-up input from manufacturers and local governments to address such concerns.

This new regulatory scheme assumes both sufficient feasibility and practicality of implementing GPS systems within all drones, irrespective of function, maximum altitude, or size. Many drones cannot fly higher than 100 meters and are no bigger than a smartphone. The risks these drones pose to commercial airliners and helicopters are rather minimal. Indeed, in the initial rollout of Remote ID requirements, the FAA implemented special rules for drones weighing less than 0.55 pounds.¹⁷¹ However, these drones still pose the same privacy concerns posed by their larger counterparts, as they can still support high-definition cameras and other recording equipment.¹⁷² Further inquiry is needed to determine whether it is worth it to regulate all drones under fifty-five pounds under the same scheme, as the FAA currently does.

A number of questions arise as to how these regulations will impact DIY drone makers. One question is whether the language of the regulation would require their compliance at all, as it is unclear whether they are merely a consumer or a drone manufacturer. In the likely event the language is written to require their compliance, the next question is how likely a market for third-party geofencing maps is to spring up. If the answer to that question is uncertain or unlikely, then another question is whether it is proper for the FAA to create their own geofencing map to accommodate DIY drone pilots, as well as existing drone manufacturers and new entrants to the market. These questions are beyond the scope of this Note, and therefore further scholarship is needed.

It should not be assumed that granting the FAA the ability to implement no-fly-zones in this manner is an unambiguous good. Drones are becoming a more important aspect of protest coverage and activism. It is likely that giving the FAA such power would limit the power of activists and protesters to hold the government accountable.¹⁷³ Further authorship is needed in order to analyze the tradeoffs between streamlining drone regulations and allowing citizens to hold their government accountable.

Another question arises from the interaction of this network with state and local regulations. Currently, the FAA has “exclusive authority to regulate aviation safety, the efficiency of the navigable airspace, and air traffic control.”¹⁷⁴ States and local municipalities are reserved the right to control where and when drones can take off, as a function of their right to control land and zoning restrictions.¹⁷⁵

171. Final Rule on Remote ID, *supra* note 47 (“For UA weighing .55 lbs or less, remote identification is only required if the UA is operated under rules that require registration.”).

172. Rice, *supra* note 65.

173. Denver Nicks, *FAA Implements No-Fly Zone in Ferguson Amid Unrest Over Killed Teen*, TIME (Aug. 12, 2014, 5:08 PM EDT), <https://time.com/3105035/ferguson-faa-no-fly-zone>.

174. *Press Release – FAA Statement–Federal vs. Local Drone Authority*, FED. AVIATION ADMIN. (July 20, 2018), https://www.faa.gov/news/press_releases/news_story.cfm?newsId=22938.

175. *Id.*

This distinction is sometimes ignored by states and municipalities.¹⁷⁶ As a result, there are a number of state and local laws on the books which are unconstitutionally limiting recreational users' ability to fly their drones.¹⁷⁷ Creating one uniform set of restrictions on drones in the NAS should be the goal of the FAA. However, this does not mean the states do not have a place in regulating drone usage within their jurisdictions. Drone regulations are extremely impactful on local communities, who are in the best position to determine what is best for their interests.¹⁷⁸ Therefore, further exploration is needed into how both of the prospective solutions outlined above fit in with state drone laws. Finally, the FAA should revamp its enforcement policies and mechanisms, in order to fully realize the goals of the restrictions it has already implemented.

V. CONCLUSION

Despite the fact that much of the FAA's current framework surrounding drone regulation is bloated and unnecessary, the FAA should be looking to reform the current regime rather than scale it back. While streamlining of the current regulations is necessary, the best way to satisfactorily regulate drone usage is through geofencing technology. Therefore, FAA regulations should be expanded to achieve universal geofencing protection for the sake of preventing accidental collisions and acts of terrorism.

176. *E.g.*, San Clemente, Cal., Mun. Code § 8.82.030(C) (2017), https://library.municode.com/ca/san_clemente/codes/code_of_ordinances?nodeId=TIT8HESA_CH8.82UNAI5Y ("No person shall takeoff, land, or operate a UA on or over private property without the written or electronic consent of the property owner, if the property owner is a person other than the UA operator.").

177. *Id.*

178. Rule *supra* note 79, at 170 ("State governments are also best positioned to clarify certain questions of state property law that have grown increasingly relevant with the recent proliferation of drone technologies.").