UIC John Marshall Journal of Information Technology & Privacy Law

Volume 33 | Issue 1 | Article 1

Winter 2016

Drone Integration: A Pilot's Solution To A Serious Entertainment Problem, 33 J. Marshall J. Info. Tech. & Privacy L. 1 (2016)

Daniel Shoffet

COMMENTS

DRONE INTEGRATION: A PILOT'S SOLUTION TO A SERIOUS ENTERTAINMENT PROBLEM

DANIEL SHOFFET [1]

As a pilot, one of the first and most important things to do before an aircraft is even started is to ask oneself, "how can I make this flight as safe as possible for my passengers?"

Pilots have been trained to deal with all types of emergencies that can occur in aviation, including anything from an engine failure, to landing with a single flat tire and everything in between. However, most incidents can be prevented before they even occur.

Try to imagine a person on his very first scenic flight. He is sitting in a small private plane, cruising along the coast of Chicago. Out of the window, he notices that the plane is at the same height as some of the buildings and they are close enough to actually see inside the windows, and all that is running through the passengers' minds is how beautiful Navy Pier looks from the sky. Suddenly a loud clunk echoes through the cabin. It sounds similar to the noise made when a large piece of hail hits a car. The plane starts to vibrate as if a car were driving over cobblestone and then the pilots voice comes on over the radio to say what no passenger wants to hear: "We need to declare an emergency. I have lost directional control."

Pilots can take several steps to break the specific chain of events that leads to an incident. However, is there not a duty to act when the accident could have been prevented from occurring in the first place? What if the clunk did not occur because of an alternator failure, or anything else that the pilot might have been able to troubleshoot or notice before takeoff? Instead, a drone, by striking the plane, caused the issue, and that drone was purchased from Amazon by a civilian who was taking a video of the skyline. The drone damaged the aircraft in such a way that the pilot could never have prevented the accident. Air Traffic Control could not have warned the pilot, nor would he have expected the drone to be there.

---

1. Daniel Shoffet is from Long Grove, Illinois, and received a BS from Purdue University in 2013. Daniel is a joint JD/LLM candidate at the John Marshall Law School, expecting to graduate in June 2017. There is no way to adequately express his gratitude for all of the love and support his family has given him through the years. Daniel would also like to thank the Journal of Information Technology & Privacy Law for the guidance and patience during the writing period.

The implementation of certain regulations applicable to the ownership, operation, and maintenance of these vehicles, not only for recreational use, but also for commercial use and future advancements will reduce the possibility of similar accidents from occurring.

In general, drones create an issue since they do not have to follow the same rules and regulations as other aircraft even though they share the same airspace. It is similar to a car on a busy road ignoring red lights, one-ways, and every other motoring regulation designed to keep road users safe, simply because this is a newly designed car with nobody in it. The problem gets slightly more complex when referring to high-speed, high-altitude, commercial drones which can deliver your packages right to your doorstep throughout the city.[2]

The solution remains simple: assimilate drones and their operators in such a way that they are combined into the current framework of aviation regulations to fit the life we already have. The reason this solution solves aviation accidents of the future is because it is just like aviation of today.

This paper will explain the current state regarding the integration of commercial and recreational drones into the United States' airspace with general aviation, as well as identify whether drones and general aviation incidents are common or are likely to occur. This paper will also analyze proposed regulations by the Federal Aviation Administration and any drawbacks that come along with them, as well as other proposed solutions to the current problem with integration of drones. Additionally, this paper will propose a solution which incorporates the use of current aviation technologies to solve the drone integration problem: mandating commercial drone operators to file pinpoint flight plans and regulating the construction of all drones to include ADS-B receivers is the most efficient and effective way to safely integrate UAVs into the National Airspace System.

BACKGROUND

THE FAA IS THE PREDOMINANT REGULATING BODY OF AVIATION

The United States Congress created the Federal Aviation Administration (FAA) to ensure efficient and safe travel through the nation's airspace.[3] The FAA is also responsible for encouraging new development in aviation technology.[4] To accomplish these goals, the FAA continues to create safety regulations while maintaining and developing

---

2. AMAZON INC., https://www.amazon.com/b?node=8037720011 (last visited Oct. 10, 2016).

3. U.S. Department of Transportation, FEDERAL AVIATION REGULATIONS AND AERONAUTICAL INFORMATION MANUAL, RULES AND PROCEDURES FOR AVIATORS 528 (Aviation Supplies & Academics Inc. ed.) (Official Guide to Basic Flight Information) (2016) (Hereafter "FEDERAL AVIATION REGULATIONS").

4. *Id*.

the Air Traffic Control (ATC) system throughout the country.[5]

A "DRONE" OR "UAV" IS AN UNMANNED AERIAL VEHICLE CAPABLE OF SOPHISTICATED FLIGHT

A "drone" is a label that gained popularity through the media following the tragedies of September 11, 2001.[6] The media used this term to describe specific unmanned flying machines that were able to obtain strategic reconnaissance information or attack targets.[7] However, the FAA has stated that these devices shall be defined as "Unmanned Aircraft" (UA) which are, "operated without the possibility of direct human intervention from within or on the aircraft."[8] Moreover, the UA itself would not be able to fly or complete a mission without a pilot or additional support; therefore, the FAA added the definition, an "unmanned aircraft system" (UAS), meaning an unmanned aircraft and accompanying communication and other components required for a pilot to operate and manipulate the flight of an UA.[9] Simply stated, the UA is the flying portion and the UAS is the means by which a pilot can control the aircraft through the national airspace.[10]

AIRSPACE IS WHAT AIRPLANES AND UNMANNED AERIAL VEHICLES (UAVS) FLY THROUGH TO TRAVEL FROM ONE PLACE TO ANOTHER

The space in the sky through which aircraft fly is called airspace, and there are two major distinctions: regulated and non-regulated airspace.[11] Within this division are four more categories: controlled, uncontrolled, special use, and other airspace.[12] This comment will focus more on the effects that commercial UAS use will have on controlled airspace and the aviation industry within it.

Within the controlled airspace categories are, from most to lease restrictive, Class A, B, C, D, and E airspace areas, each of which has specific requirements to entry.[13] In order to enter Class A airspace, a pilot must be on a flight plan governed by Instrument Flight Rules (IFR) and have clearance to enter the airspace from ATC, while meeting all communication and equipment requirements.[14] Class B airspace generally

---

5. *Id*.

6. Timothy M. Ravich, The Integration of Unmanned Aerial Vehicles into the National Airspace, 85 N.D. L.Rev. 597, 601 (2009).

7. Timothy M. Ravich, Commercial Drones and the Phantom Menace, 5 J. Int'l Media & Ent. L. 175, 176 (2015).

8. FAA MODERNIZATION AND REFORM ACT OF 2012 § 331, 49 USC 40101, Public Law 112-95 (2015) (Hereafter "FAA Reform Act").

9. *Id*.

10. Federal Aviation Administration, *Unmanned Aircraft Systems* (Oct. 10, 2016, 8:00 PM), https://www.faa.gov/uas/

11. FEDERAL AVIATION REGULATIONS supra note 2 at 3-1-1.

12. *Id*.

13. *Id*.

14. Class A airspace includes everything between 18,000 and 60,000 feet MSL. FAA

surrounds most of the busiest airports in the country.[15] In order to enter Class B airspace, an aircraft must be equipped with a two-way radio transmitter capable of communicating with ATC, and ATC must grant the aircraft's clearance to enter the airspace. In addition, the aircraft must also meet all of the additional requirements to enter Class D airspace.[16] Class C airspace is slightly more common. Airports that have approach procedures and an operational control tower with radar are usually within Class C or D airspace.[17] In order to fly an aircraft through Class C airspace it is still mandatory to make and maintain two-way radio communication with ATC both before entering and while in Class C airspace.[18] Class D airspace generally consists of the airspace around airports that have a control tower.[19] Normally, a two-way radio is required to fly into and through Class D airspace.[20] The last type of controlled airspace is the most expansive and is the least restrictive, Class E airspace has no entry or pilot requirements for Visual Flight Rules (VFR) flight.[21] It merely exists as a vertically undefined volume of space.[22] However, it can also be defined on a sectional chart to include all of the airspace from the surface to a stated altitude.[23] Class E airspace is used for transitioning between airspace, designating an airport, vectoring for approaches, and other uses.[24]

PILOTS ARE REGULATED BY TWO DISTINCT AND DETAILED SETS OF FLIGHT RULES: VISUAL FLIGHT RULES AND INSTRUMENT FLIGHT RULES

Before I discuss UAS's it is important to understand the flight rules that apply to general aviation. The FAA has set certain standards and regulations to protect pilots and passengers while transitioning through different airspaces.[25] Some major regulations that the FAA implement-

---

Federal Aviation Regulation 14 C.F.R. § 91.135 (2015).

15. Class B airspace includes everything from the surface to 10,000 feet mean sea level(MSL). FEDERAL AVIATION REGULATIONS supra note 2 at 3-2-3.

16. FAA Federal Aviation Regulation 14 C.F.R. § 91.131 (2015).

17. Class C airspace generally extends from the surface of the towered airport to 4000 feet MSL, U.S. Department of Transportation, FEDERAL AVIATION REGULATIONS AND AERONAUTICAL INFORMATION MANUAL supra note 2 at 3-2-4.

18. Federal Aviation Regulation § 91.131.

19. Class D airspace generally includes the airspace between the surface and 2,500 feet MSL, U.S. Department of Transportation, FEDERAL AVIATION REGULATIONS supra note 2 at 3-2-5.

20. *Id.*

21. Federal Aviation Administration, *Airspace, Special Use Airspace, and Temporary Flight Restrictions* (Oct. 10, 2016), https://www.faasafety.gov/files/gslac/courses/content/42/565/Airspace,%20Special%20Use%20Airspace%20and%20TFRs%20-%20Text%20Only.pdf.

22. FEDERAL AVIATION REGULATIONS supra note 2 at 3-2-.

23. *Airspace, Special Use Airspace, and Temporary Flight Restrictions* supra note 20.

24. Class E airspace is also used: for En Route Domestic Areas, extending to other class airspace, for transition, and Offshore Airspace Areas, U.S. Department of Transportation, FEDERAL AVIATION REGULATIONS supra note 2 at 3-2-6.

25. Federal Aviation Administration, *VFR Weather Minimums* (Nov. 3, 2015),

ed are called the Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).[26]

The Visual Flight Rules set up ground rules for the most basic and nonrestrictive meteorological conditions in which pilots can fly.[27] Every airspace has specific standards for how far away a pilot must remain from clouds or adverse weather to legally and safely operate an aircraft.[28] Flying according to Class C, D, and E airspace rules are the most common.[29] However, in Class E airspace flying below 10,000 feet eases pilots requirements.[30] The purpose of such stringent and exact specifications of visibility is to not only allow the pilot to be able to see and avoid any possible issues or aircraft that he may encounter while flying, but also to hold him responsible for avoiding other VFR traffic.[31] Pilots operating under VFR conditions are required to avoid other aircraft if the weather or selected flight path creates "a collision hazard."[32] VFR also creates obligations regarding "right-of-way" for the pilot-in-command to adhere to.[33] Also, certain altitude limitations are mandated to aircraft in VFR flight.[34] According to the regulations created by the FAA, if flying over a city or other congested area, the pilot must fly 1,000 feet higher than the highest obstacle around the aircraft.[35] If the pilot is flying over anything other than a congested area, the pilot must maintain a safe distance from the population underneath.[36] It is important to remember that when an aircraft is in cruise flight from one point to another it must maintain a specific altitude to help with collision avoidance.[37] The FAA has even mandated that pilots flying east must fly so they don't intercept others,[38] whereas planes flying west

---

https://www.faasafety.gov/files/gslac/courses/content/25/185/VFR%20Weather%20Minimums.pdf.

26. FAA Federal Aviation Regulation 14 C.F.R. § 91.151-91.161(2015), F AA Federal Aviation Regulation 14 C.F.R. § 91.167-91.193 (2015).

27. *Id*. at § 91.155.

28. In Class B airspace, pilots must maintain visual separation from clouds. In Class C, D, and E airspace pilots must remain 500 feet below, 1,000 feet above, and maintain a 2,000-foot horizontal distance from clouds, while never dropping below 3 statute mile visibility. *FAR 14 C.F.R. § 91.155 (2015).*

29. *Id*.

30. While flying below 10,000 feet in Class E airspace pilots must maintain a distance from clouds by 1,000 feet above and below them while maintaining 1 statute mile in horizontal distance from clouds as long as the conditions allow for 5 statute mile visibility. *Id*.

31. FEDERAL AVIATION REGULATIONS supra note 2 at 5-5-8.

32. FAA Federal Aviation Regulation 14 C.F.R. § 91.111 (2015).

33. FAA Federal Aviation Regulation AR 14 *C.F.R.* § 91.113 (2015).

34. FAA Federal Aviation Regulation 14 C.F.R. § 91.119 (2015).

35. Pilots are required to fly "1,000 feet above the" tallest "obstacle within a 2,000 feet horizontal radius of the aircraft" when flying over cities or congested areas. *Id*.

36. Pilots are required to fly higher than 500 feet AGL and must be able to handle an "emergency landing without" creating an "undue hazard" to the people or structures below when flying over anything other than cities. *Id*.

37. FAA Federal Aviation Regulation 14 C.F.R. § 91.159 (2015).

38. If the plane is flying on a heading between zero and 179 degrees, the pilot must fly at "any odd thousand foot MSL altitude plus 500 feet." *Id*.

have different altitudes to fly to maintain separation.[39] Under VFR, pilots are much less restricted and structured in flight than if they were to fly under IFR.[40]

A basic purpose of the Instrument Flight Rules is to allow pilots who have an instrument rating added to their pilot's certificate to have a set of standards to fly in meteorological conditions that are below those allowed by the VFR.[41] Essentially, an instrument rating allows a pilot to legally fly an aircraft if there is fog on the runway and the cloud cover is overcast at 400 feet above ground level (AGL), a pilot would be hard- pressed to take off into controlled airspace using VFR.[42] However, if a pilot follows the rules set forth under IFR and follows protocol, he is legal to fly in less than ideal meteorological conditions.[43]

Before flying according to IFR in controlled airspace, the pilot must file a valid flight plan with Air Traffic Control (ATC) and receive an ATC clearance.[44] When a pilot receives an IFR or any other clearance from ATC, he is obligated to follow and not deviate from it at any point unless issued an amended clearance or if an emergency exists.[45] When planning an IFR flight plan, the pilot uses certain navigational aids or GPS fixes to help specify the route he wishes to take.[46] There is also the option to use designated airways as a path to travel, acting like a highway in the sky.[47] After the flight plan has been filed, the pilot waits for ATC to read a clearance which will state the explicit route he is expected to take as well as the assigned altitude and transponder code he is expected to transmit.[48] These fixes along the route act as checkpoints to the final destination, allowing both the pilot and ATC to maintain a clear understanding of position and direction of the aircraft, even if it is flying in zero visibility out of the cockpit windows.[49] While on an IFR flight plan, pilots are required to monitor the appropriate radio frequency and maintain radio communication with ATC as is necessary.[50] As mentioned earlier, ATC will assign a specific altitude for the route during the clearance, and it is imperative that the pilot-in-command adheres to this clearance.[51] However, during the flight-planning phase,

---

39. If a plane is cruising on a heading between 180 and 359 degrees the pilot may fly on "any even thousand foot MSL altitude plus 500 feet." *Id.*

40. *VFR Weather Minimums* supra note 24.

41. *Id.*

42. Roger Sharp, *What are your IFR Takeoff Minimums?* FLYING MAGAZINE (Nov. 3, 2015), http://www.flyingmag.com/training/instrument-flight-rules/what-are-your-ifr-takeoff-minimums.

43. *Id.*

44. FAA Federal Aviation Regulation 14 C.F.R. § 91.173 (2015).

45. FEDERAL AVIATION REGULATIONS supra note 2 at 4-4-10.

46. FAA Federal Aviation Regulation 14 C.F.R. § 91.181 (2015).

47. *Id.*

48. FEDERAL AVIATION REGULATIONS supra note 2 at 4-4-.

49. FAA Federal Aviation Regulation 14 C.F.R. § 91.181 (2015).

50. FAA Federal Aviation Regulation AR 14 C.F.R. § 91.183 (2015).

51. FAA Federal Aviation Regulation AR 14 C.F.R. § 91.179 (2015).

it is common practice to request a preferred altitude.[52] IFR pilots are also required to fly a certain type of altitude if traveling east,[53] whereas people flying west fly can choose from a completely separate list of altitudes to avoid collisions.[54]

A pilot does not need to be in instrument meteorological conditions (IMC) to fly under IFR. There are several reasons why many pilots fly under IFR even if VFR is permitted.[55] As previously noted, while under IFR, ATC grants separation to aircraft by assigning different altitudes and flight paths.[56] While flying under IFR, the pilot not only has the ability to see and avoid traffic, but it is part of ATC's duty to issue traffic information and safety alerts when aircraft is in unsafe proximity to danger allowing for additional safety.[57] Moreover, when there is a high possibility for an incident, like converging aircraft at the same altitude, ATC will either assign one or more aircraft to a different expedited heading or safer altitude in order to avoid harm.[58]

TRANSPONDERS AND OTHER SIMILAR TYPES OF TECHNOLOGY EXIST TO ASSIST A PILOT AVOID WHAT IS DIFFICULT TO SEE BY INCREASING SITUATIONAL AWARENESS

In order to supplement the pilot's situational awareness in flight, aviation technology has grown to incorporate the use of on-board tracking and alert systems to make aviation safer.[59]

A staple in aviation technology is the transponder, a relatively small radar beacon transmitter that communicates with ATC.[60] It automatically sends specific information to receivers on the ground that communicate with ATC.[61] One use of the transponder is to help ATC identify any given plane on a flight plan by telling a pilot to "squawk" a certain numeric code on the transponder which becomes the aircraft's

---

52. American Flyers, *Chapter 10: IFR Flight* https://www.americanflyers.net/aviationlibrary/instrument_flying_handbook/chapter_10.htm (last visited Nov. 3, 2015).

53. Slightly altered from VFR so as to promote avoidance, IFR states that if flying below 18,000 feet MSL on a course between "zero and 170 degrees", the pilot can request to fly on "any odd thousand foot MSL altitude." FAA Federal Aviation Regulation 14 C.F.R. § 91.179 (2015).

54. If "the course" falls between "180 through 359 degrees," the pilot may fly on "any even thousand foot MSL altitude." *Id.*

55. Bill Cox, *20 Tips for IFR Flying,* PLANE AND PILOT MAGAZINE (Nov. 3, 2015), http://www.planeandpilotmag.com/proficiency/flight-training/20-tips-for-ifr-flying.html#.VkYxKoSx6nA.

56. FEDERAL AVIATION REGULATIONS supra note 2 at4-4-11.

57. FEDERAL AVIATION supra note 2 at 5-5-8.

58. FEDERAL AVIATION REGULATIONS supra note 2 at 5-5-10.

59. Federal Aviation Administration, *ADS-B Frequently Asked Questions (FAQs)* (Nov. 3, 2015), https://www.faa.gov/nextgen/programs/adsb/faq/.

60. FEDERAL AVIATION REGULATIONS supra note 2 at 1085.

61. *Id.*

temporary identifier.[62] Some transponders are designed to automatically transmit the aircraft's altitude to greatly increase ATC's ability to track and protect pilots.[63] A large number of aircraft flying in the National Airspace System (NAS) are required to be equipped with Mode C transponders due to specific FAA requirements.[64] Several regulations are in place that mandate Mode C transponders in specific flight situations.[65] However, certain aerial vehicles like balloons do not have to have a Mode C transponder as long as they fly under and outside of Class B airspace.[66] Furthermore, any aircraft that flies above Class C airspace, up to 10,000 feet mean sea level (MSL), is required to be equipped with a Mode C transponder.[67] When a pilot is flying a transponder equipped aircraft under VFR he is required to "squawk" the code "1200" to identify himself to ATC as VFR traffic.[68]

Lately, a newer technology is being implemented, it is called Automatic Dependent Surveillance-Broadcast (ADS-B).[69] By January 1, 2020, the FAA is mandating that all aircraft that flies within Class C Airspace must be equipped with ADS-B.[70] ADS-B receivers can transmit and receive data.[71] The transmission portion of the architecture is called ADS-B Out and transmits both the 3D position and velocity to other ADS-B receivers.[72] Even though ADS-B has the ability to show pilots and ATC where and how fast other aircraft are traveling, it is not a collision avoidance system and is only viable as supplemental equipment to aid in situational awareness.[73] Furthermore, there are a number of products in the aviation market, like the Appareo Stratus, that pilots can purchase that give any plane a portable Dual Band ADS-B receiver, while weighing only 9.7 ounces.[74]

---

62. "Squawking" is the term used when a pilot manually enters the identifier code given to him or her by ATC into the plane's transponder. A "squawk" is the term used to describe the transition of the identifier or the command given by ATC to a pilot to change. FEDERAL AVIATION REGULATIONS supra note 2 at 1077.

63. FEDERAL AVIATION REGULATIONS supra note 2 at 4-1-20.

64. Aircraft that operates at or above 10,000 feet MSL over the contiguous USA must be equipped with a Mode C transponder except if the aircraft never flies higher than 2,500 feet AGL FEDERAL AVIATION REGULATIONS supra note 2 at 4-1-16.

65. Aircraft must be equipped with a Mode C transponder if they operate at or above 10,000 feet MSL over the contiguous USA except if the aircraft never flies higher than 2,500 feet AGL, *Id*.

66. Any balloons or "aircraft not equipped with an engine driven electrical system are excepted from" this rule if they operate "outside" and "below the ceiling of the Class B airspace." *Id*.

67. *Id*.

68. FEDERAL AVIATION REGULATIONS supra note 2 at 4-1-17.

69. FEDERAL AVIATION REGULATIONS supra note 2 at 4-5-15.

70. *Id*.

71. *Id*.

72. FAA Federal Aviation Regulation 14 C.F.R. § 91.227 (2015).

73. FEDERAL AVIATION REGULATIONS supra note 2 at 4-5-7.

74. APPAREO, *Stratus Receivers*, AVIATION, http://www.appareo.com/aviation/ads-b/stratus/ (last visited Nov. 3, 2015).

Along with the emergence of ADS-B came Traffic Information Service-Broadcast (TIS-B).[75] TIS-B is the traffic information received by an aircraft from ATC when it is delivered through an ADS-B receiver.[76] In order to fly with TIS-B enabled information, the aircraft must fly through airspace with sufficient radar coverage and be outfitted with an ADS-B receiver.[77] Like ADS-B, TIS-B is not meant to be the only source of collision avoidance and is only intended to be an additional gateway of communication for pilots to be properly informed about their surroundings.[78]

ANYONE CAN FLY AN UAV FOR RECREATIONAL PURPOSES AS LONG AS HE OR SHE ADHERES TO CERTAIN GUIDELINES

If the UAS is being used strictly for hobby or recreational purposes, there is a campaign called "Know Before You Fly" which sets a number of safety guidelines in place to assist people with operating their UAVs safely.[79] According to these standards, anyone can fly an UAS without special permission as long as he or she adheres to certain rules.[80] Some of these rules include: flying below 400 feet and staying clear of obstacles, maintaining a constant line of sight with the UA during operation, flying a UA that is less than 55 pounds, and to avoid careless or reckless use of the UAS.[81] There are additional guidelines set forth in the FAA Modernization Act of 2012.[82] Additionally, when operating outside these guidelines or when operating for certain civil or public uses, additional authorization may be required.[83]

GOVERNMENT-FLOWN UAVS ARE CONSIDERED PUBLIC AIRCRAFT AND ANYTHING ELSE IS CONSIDERED CIVIL AIRCRAFT

Federal statutes determine Public Aircraft on a flight-by-flight basis, and they grant a certificate of waiver or authorization, (COA), which allows specifically outlined operation of the UAS.[84] Public aircraft

---

75. FEDERAL AVIATION REGULATIONS supra note 2 at 4-5-8.

76. *Id*.

77. *Id*.

78. *Id*.

79. Federal Aviation Administration, *Know Before You Fly* (Oct. 10, 2016), http://knowbeforeyoufly.org.

80. Federal Aviation Administration, *Summary of Small Aircraft Rules* (Oct. 10, 2016), http://www.faa.gov/uas/media/Part_107_Summary.pdf.

81. *Id*.

82. UAVs are also not to be operated near sports stadiums, nor within 5 miles of an airport without prior approval. The operator of an UAV is obligated to "remain clear of manned aircraft operations", Federal Aviation Administration, *Model Aircraft Operations* (Nov. 3, 2015), https://www.faa.gov/uas/model_aircraft/.

83. *Summary of Small Aircraft Rules* supra note 79.

84. Federal Aviation Administration, *Certificates of Waiver or Authorization* (Oct. 10, 2016), https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aai

is also known as governmental aircraft and is not the focus of this comment.[85]

Civil Aircraft consist of any UAS operation that does not fall under the statutory definition of a public aircraft operation or hobby/recreational use.[86]

USING AN UAV FOR A BUSINESS OR ENTERPRISE REQUIRES DIFFERENT PERMISSIONS AND FALLS UNDER ADDITIONAL REGULATIONS COMPARED TO RECREATIONAL UAV FLIGHT

Since using an UAV for a business or enterprise does not generally fall within the statutory requirements for public operation and it does not fall under the regulations for hobby/recreational flight usage, the rules of Civil Aircraft Operation apply.[87] In short, FAA approval is required for flights operating for business purposes.[88] A business operator can apply for a part 107 waiver or a Section 333 exemption these methods are applicable to business operations that occur in "low-risk, controlled environments," and must state how the operator will mitigate the risk of the flight.[89] Business operators may also apply for a Special Airworthiness Certificate, (SAC) which requires the operator/applicant to describe the structure and design of their specific UAS as well as inform the FAA of how and where they intend to fly.[90] There are two categories in which an SAC can be granted, either in the Experimental or Restricted category.[91] Generally, an experimental SAC is granted to an aircraft intending to perform market research or other training and development.[92] Carrying people or property for compensation is expressly prohibited under this SAC.[93] Lastly, a business operator can apply for an UAS type and airworthiness certificate in the "Restricted Category", this is highly regulated by statute and fit for special purpose operations.[94]

---

m/organizations/uas/coa/.

85. Federal Aviation Administration, *Unmanned Aircraft Systems Frequently Asked Questions* (Oct. 10, 2016), https://www.faa.gov/uas/faqs/.

86. *Id*.

87. *Id*.

88. *Id*.

89. *Id*.

90. Federal Aviation Administration, *Special Airworthiness Certification for Civil Operated Unmanned Aircraft Systems and Optionally Piloted Aircraft* (Oct. 10, 2016), https://www.faa.gov/aircraft/air_cert/airworthiness_certification/sp_awcert/experiment/sac/.

91. *Id*.

92. *Id*.

93. *Id*.

94. *Id*.

THE FAA MODERNIZATION AND REFORM ACT ADDED SEVERAL NEW REGULATIONS TO UAV OPERATORS AND UAV FLIGHT PATTERNS

The FAA Modernization and Reform Act of 2012 (FMRA) created a number of changes in the aviation community, notably so with UAS integration into the NAS.[95] FRMA intended to expedite the process by which the FAA integrated all UAS into the NAS by no later than September 30th, 2015.[96] Alongside the proposed integration plan, the FAA created a proposal for standards and recommendations in order to help demarcate the limits of safe UAS operation.[97] These limitations are much more structured and definite than the preceding recommendations noted earlier.[98] Included in the proposed rules for small UAS are line of sight limitations, altitude, and airspace limitations.[99] The most notable change is the inclusion of an aeronautical knowledge test that allows the dissemination of an UAS operator certificate.[100]

ANALYSIS

There isn't a single obvious alteration to be made in drone regulation that would fix every issue. It would be naïve to think so. If that were the case, the issue would have been resolved long ago. However, troublesome issues may be mitigated if aspects of UAV manufacturing are regulated, while drone operation limits are implemented.

THE GROWING NUMBER OF UAVS WHICH ARE IRRESPONSIBLY FLOWN CREATES THE NEED FOR MORE FOCUSED AND PREDICTABLE REGULATION AND PUNISHMENT

Proponents for less regulation of UAVs argue that UAV use within the NAS is not something that should cause concern.[101] The argument is that UAVs are currently far too few in number to impact daily flights; however, according to estimates, as many as half a million small UAVs were sold between 2011 and November 2014.[102] Other reports indicate

---

95. 126 Stat. 11 at § 332(a)(5).

96. 126 Stat. 11 at § 332(a)(3).

97. Federal Aviation Administration, *Overview of Small UAS Notice of Proposed Rulemaking* (Oct. 7, 2015), https://www.faa.gov/regulations_policies/ rulemaking/media/021515_sUAS_Summary.pdf.

98. *Id*.

99. *Id*.

100. Also included in the proposed rules are regulations pertaining to right of way, hours of operation limitations, minimum weather visibility standards for flight, and applying the same requirements to enter Class B, C, and D airspace that exist for general aviation to UAS, *Id*.

101. Steve Casner, *Clear Skies Ahead Why airline pilots aren't all that worried about drones*, SLATE (Nov. 8, 2015), http://www.slate.com/articles/technology/future_tense/2015/09/are_we_overreacting_about_drones_and_passenger_planes.html.

102. Craig Whitlock, *Near-collisions between drones, airliners surge, new FAA reports show*, THE WASHINGTON POST (Nov. 8, 2015),

that millions of small UAVs have been sold as of late 2015.[103] Drones are obviously not on the decline, as the number of UAVs in circulation is projected to increase 15-20% each year for the upcoming five years.[104]

The low cost, relative ease of use, and the simplicity of operation are the reasons drones are so easy to obtain and common in the sky.[105] A large number of retail stores, including most Apple Stores, sell UAVs.[106] Consumers can even buy UAVs online from places like Amazon.[107] In the future, it is possible that you will be able to order an UAV from Amazon, and Amazon would use an UAV to deliver it to your doorstep.[108]

Consumers can purchase some for around $50.[109] These drones are very similar to other, larger drones that cost $500 or more.[110] There are several tiers of UAVs and each has specific capabilities. Some come with cameras built in to the frame;[111] whereas, other UAVs can be flown and controlled from a smartphone.[112] The increase of UAVs purchased and the steady growth of application of UAVs in society has increased the opportunity for dangerous incidents.

A major cause of these dangerous incidents is that many drone operators lack the knowledge to safely operate UAVs.[113] The "Know Before You Fly campaign" and the "Think Before You Launch" initiative have been developed and are designed to fight ignorance of the rules and to promote proper UAV use.[114] This is a step in the right direction, but more needs to be done. Moreover, there are other issues that need to be addressed, including safe assimilation of UAVs into the NAS once the ineptitude of UAV pilots has been alleviated.

UAVs may be a great step forward in technology, but the airspace in which they intend to fly is full of vehicles that have vastly more impressive safety features.[115] Civilian-operated UAVs generally do not

---

https://www.washingtonpost.com/world/national-security/near-collisions-between-drones-airliners-surge-new-faa-reports-show/2014/11/26/9a8c1716-758c-11e4-bd1b-03009bd3e984_story.html.

103. Casner, supra note 100.

104. *Id*.

105. Whitlock, supra note 101.

106. APPLE INC., http://www.apple.com/us/search/parrot?src=globalnav (last visited Oct. 7, 2015).

107. AMAZON, INC., http://www.amazon.com/ (follow "Search" hyperlink; then search "drone"). http://www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias%3Daps&field-keywords=drone.

108. Whitlock, supra note 101.

109. AMAZON, INC., supra note 106.

110. APPLE INC., supra note 105.

111. Whitlock, supra note 101.

112. Parrot, http://ardrone2.parrot.com (last visited Oct. 8, 2015).

113. Casner, supra note 100.

114. Jim Moore, *Drones prove difficult for ag pilots to see,* AIRCRAFT OWNERS AND PILOTS ASSOCIATION (Nov. 8, 2015), http://www.aopa.org/News-and-Video/All-News/2015/October/08/Unseen-drones?WT.mc_id=151009epilot&WT.mc_sect=tec.

115. Whitlock, supra note 101.

contain the same safety equipment that has been fit to a large number of civilian-flown aircraft.[116] There are two reasons this is an important concept. First, people make mistakes and general aviation (GA) is subject to pilot error.[117] While GA aircraft can be equipped with transponders and other ADS-B equipment to help reduce incidents between two GA aircraft, GA aircraft's safety systems do not detect civilian-flown UAVs because they are far too small.[118] Secondly, and more obviously, because they are so small and do not transmit their location, by the time a pilot sees a drone on a collision course with the aircraft, it will be extremely difficult, if not impossible, to avoid an incident.[119]

Another prevalent issue is how to enforce the rules against UAV operators that consciously decide to disregard the rules.[120] Possibly the largest problem is how to track the operator of the improperly flown UAV.[121] When pilots report an illegally flown drone they can only attest as to the vehicle in the air since they cannot pinpoint where the operator is on the ground.[122] This has created a need for government involvement in the development of a very new, yet highly promising tracking technology.[123] The authorities would be able to utilize the radio signal, designed for flight control between the operator and any UAV, to track the location of the UAV controller as long as it was within the 5-mile-radius of an airport.[124] There is an inherent problem with this plan, because it creates a yet-to-be-determined invasion of privacy issue.

A lack of reasonably defined and predictable punishment adds to the problem of the inability to track perpetrators.[125] According to the FAA, as of September 2015, the largest civil fine imposed on a drone operator was $18,700.[126] Yet, on October 6, 2015, the FAA levied a $1.9 million civil fine against a drone operator for flights between March 2012 and December 2014, illustrating a lack of predictability in punishments.[127] There are still conversations about possible penalties, including the suggestion that drone misconduct can be punishable as a federal crime with possible jail time.[128]

---

116. *Id*.

117. Rich Stowell, *The Problem With Flight Training*, Aviation Safety (Nov. 22, 2015), http://www.aviationsafetymagazine.com/airplane/Flight-Training-Mistakes.html.

118. Whitlock, supra note 101.

119. *Id*.

120. Casner, supra note 100.

121. Moore, supra note 113.

122. *Id*.

123. *Id*.

124. Joan Lowy, *Government tests technology to find illegal drone operators, FOX 5 DC* (Oct. 24, 2015), http://www.fox5dc.com/news/31387091-story.

125. Moore, supra note 113.

126. *Id*.

127. *Id*.

128. *Id*.

UAVS INTERACTING WITH GENERAL AVIATION AND COMMERCIAL AVIATION IN THE NAS CREATE A MATERIAL DANGER OF COLLISION FOR PILOTS

There are many pilots and drone operators that feel that UAVs colliding with aircraft is a non issue and is more about media hype than anything.[129] Some pilots think the threat of drone collisions is less important than recent occurrences of people on the ground shining laser beams into cockpits, attempting to blind pilots, as aircraft are attempting to land.[130] Likewise, many commercial airline pilots compare the possibility of a drone strike to bird strikes, which happen fairly regularly and do not cause that much damage.[131] However, these statements are slightly misconstrued. The effects of a 10 pound bird striking the windshield of a commercial airliner might not affect the aircraft systems due to a number of reasons, chief among which is the actual rigidity and design of the aircraft.[132]

Secondly, a pilot who flies for a commercial airliner notes in a story for the media that "bird guts" being smeared on the windshield was the only damage caused.[133] Pilots in airline companies that have been quoted as comparing drone strikes to bird strikes all have something in common: they fly large commercial airliners that have much greater mass, travel at much higher speeds, and fly much higher than most pilots involved with general aviation.[134] The pilot quoted earlier does admit in his story that if a drone or bird flies into an engine there is a possibility of damage, but drones represent a "miniscule fraction" of what populates the skies, and the odds of of a strike are low. [135]

There are some fundamental issues with this argument.. First, it assumes that the only aircraft that will encounter UAVs are commercial airliners, which arguably have the smallest possibility of coming across drones due to the altitude jets can achieve,[136] which civilian drones cannot match.[137] Also, a pilot comparing a 10-pound duck to a metal or plastic UAV does not factor that a UAV can weigh 55 pounds or more, and travel at a rate of speed much faster than a duck.[138] Not to mention that a "soft and squishy" duck does not have the same potential for

---

129. Alistair Charlton, Fear of drones crashing into passenger planes is 'much ado about nothing' says airline pilot, INTERNATIONAL BUSINESS TIMES (Nov. 13, 2015,), http://www.ibtimes.co.uk/fear-drones-crashing-into-passenger-planes-much-ado-about-nothing-says-airline-pilot-1515001.

130. Casner, supra note 100.

131. Charlton, supra note 128.

132. *Id*.

133. *Id*.

134. *Id*.

135. *Id*.

136. BOEINGAIRCRAFT, http://www.boeing.com/assets/pdf/commercial/airports/misc/A20WE.pdf (last visited Nov. 22, 2015).

137. *Overview of Small UAS Notice of Proposed Rulemaking* supra note 96.

138. *Id*.

damage as a rigid piece of metal or plastic.

Another major issue with this argument is the fact it omits general aviation altogether.[139] GA aircraft are much smaller and slower than commercial airliners that operate at altitudes that are not accessible by UAVs.[140] This creates the issues presented in this paper. The same drone, which, by comparative standards, may not create enough damage to force a 300-passenger-jet into an emergency, may be enough to smash through the windscreen or propeller on a 5-person-aircraft that flies at a fraction of the airspeed and at a much lower altitude than the jet.[141] Such a collision could result in the aircraft crashing.

Another well-known pilot, former Captain Chesley "Sully" Sullenberger, has firsthand experience on how bad a bird strike can be and thinks that UAVs pose a very large danger to aircraft in general.[142] Sullenberger is famous for avoiding a catastrophe by landing a commercial airliner in the Hudson River after geese flew into, and destroyed, the engines on his aircraft minutes after takeoff.[143] He argues that "if an 8 pound bird can" "bring down an airplane," a machine weighing 25 to 55 pounds filled with "batteries and motors" can do more damage.[144] Clearly, this is an issue that affects everyone in aviation. However, due to the size of the aircraft and the unpredictable flights that comes from GA, something needs to be done quickly to prevent accidents from occurring.

Some pilots and hobbyists may try to argue that UAVs and manned aircraft do not cross paths that often.[145] However, that statement is not true.[146] These incidents affect both commercial and GA flights more often than they should.[147] In 2014, there was a total of 238 reported sightings of UAVs by aircraft.[148] Whereas in 2015, drone sightings above their designated altitude or around airports had skyrocketed to 650 as of July.[149] It is also important to note that 302 sightings of those were categorized as near misses.[150] These facts should be interpreted as slightly inaccurate because of three important points. First, there is no approved way for ATC or a regulating body to track actual flights of drones.[151] Second, drones, by their very nature, are difficult to see un-

---

139. Charlton, supra note 128.

140. Cirrus Aircraft, http://cirrusaircraft.com/aircraft/sr20/ (last visited Nov. 22, 2015).

141. *Id.*

142. Keith Lang, *Hero Pilot predicts drones will cause plane crashes*, THE HILL (Nov. 14, 2015), http://thehill.com/policy/transportation/250093-hero-pilot-predicts-drones-will-cause-plane-crashes.

143. *Id.*

144. *Id.*

145. Charlton, supra note 128.

146. Federal Aviation Administration, *Pilot Reports of Close Calls With Drones Soar in 2015* (Oct. 9, 2015, 11:21 PM), https://www.faa.gov/news/updates/?newsId=83445.

147. Whitlock, supra note 101.

148. *Pilot Reports of Close Calls With Drones Soar in 2015* supra note 145.

149. Center for the Study of the Drone, *Drone Sightings and Near Misses*, BARD COLLEGE (Nov. 10, 2015), (http://dronecenter.bard.edu/drone-sightings-and-near-misses/.

150. *Id.*

151. Mark Harris, *The Guardian*, US TESTING AN 'AIR TRAFFIC CONTROL SYSTEM' FOR

less they are very close since they are very small compared to general aviation aircraft, implying that the vast majority go unnoticed. Finally, even if they are spotted, there is nothing forcing the pilot to report that he has encountered an UAV.[152] Because of this, the reported sightings likely underestimate the total number of actual infractions or narrow escapes with aircraft.

THE FAA'S STATED ALTITUDE RESTRICTIONS DO NOT WORK, BUT NATIONWIDE IMPLEMENTATION OF GEO-FENCING CAN BE A POSSIBLE SOLUTION IN CERTAIN SITUATIONS.

The FAA has tried to implement a plan which does not allow UAVs to fly higher than 400 feet.[153] According to data obtained over the course of 2015, only 9.9% of recorded incidents occurred below the legal limit. Conversely, incidents occurred at an average reported altitude of higher than 3,000 feet.[154] These statistics imply that the FAA altitude limitation is not working because there is nothing keeping drones from going higher other than strong suggestions. Of the 302 near miss incidents mentioned earlier, more than half involved private GA aircraft, and 113 of those incidents involved single engine propeller planes.[155] There have also been numerous accounts of UAVs passing just off the wing or underneath commercial aircraft, which forced the aircraft to abort their final approach into an airport.[156]

A possible solution to the altitude and airport invasion issues is a promising concept called geo-fencing.[157] The basics behind geo-fencing are that the software embedded in the UAVs programming physically prevent them from flying higher than 400 feet or from entering prohibited airspace.[158] There is at least one drone manufacturer that has already implemented this regulatory software.[159] The same manufacturer that developed the limiting software also allowed its customers to download an updated version of the software that removes the restriction, albeit with safety warnings.[160] This is understandable from a business point of view because the majority of manufacturers do not have regulatory software, and, therefore, people would be less inclined to purchase an UAV that is less capable compared to similarly priced devices.

DRONES (Oct. 10, 2016), https://www.theguardian.com/technology/2015/nov/26/drone-regulations-united-states-testing-air-traffic-control-system-precisionhawk.

152. Mike Jesch, *Required Reports*, ANGEL FLIGHT WEST (Nov. 5, 2015), http://www.angelflightwest.org/pilot-page/a-culture-of-professionalism/safety-articles/required-reports/.

153. Center for the Study of the Drone, supra note 148.

154. *Id.*

155. *Id.*

156. Whitlock, supra note 101.

157. *Id.*

158. *Id.*

159. *Id.*

160. *Id.*

One possibility is for the FAA to create predetermined geo-fences, which some drone companies have attempted to implement.[161] If the FAA mandates that all drone manufacturers include software that restricts UAVs from flying within five miles of an airport or restricts them to a certain altitude, a large majority of incidents can be prevented.

This theory also has issues, most importantly this sort of limiting regulation focuses less on a true integration into the NAS, and acts more as an excessive blanket restriction on operation. The high probability of illegal software designed to bypass geo-fence restrictions is another foreseeable problem, which would be no more difficult or different from downloading or distributing pirated movies.

In the end, the FAA will have to regulate UAVs in order to integrate them safely into the NAS. This will have the result of increasing governmental involvement and power within aviation. Nevertheless, safety should always be the highest concern.

A Form of an UAV Operator Knowledge Test is a Fundamental Step in the Successful Integration of UAVs into the NAS

The FAA has outlined several rules to be implemented concerning UAV operation, yet most of the new rules are similar to the old guidelines set forth in the "Know Before You Fly" campaign."[162] There is one requirement that is completely new to the proposed regulations, and that is the introduction of an aeronautical knowledge test at an FAA testing center which would award those who pass with an UAV operator license.[163] The logic behind this concept is sound. Arguably, there should be fewer infractions if the operators have to be educated in a structured format.

Again, there are a number of problems with the FAA's proposed plan. These new regulations apply to all UASs under 55 pounds that are being used for non-recreational purposes.[164] There are not any statistics available to differentiate the number of incidents between commercial and non-commercial UAVs.[165] It is mere speculation to argue that the non-commercial UAS operator is more inclined to cause an accident. Therefore, the operator certification requirement for commercial UAV use appears to be a step in the right direction. Although it is a start, the concept of licensing creates a very large logistical and quality control hurdle. While this will increase jobs in the aviation department, it will also cost a great deal of money for the FAA to create a plan of study to obtain an operator license.[166] There will also be the challenge of

---

161. *Id*.

162. *Know Before You Fly,* supra note 78.

163. *Overview of Small UAS Notice of Proposed Rulemaking* supra note 96.

164. Federal Aviation Administration, *Press Release – DOT and FAA Propose New Rules for Small Unmanned Aircraft Systems* (Oct. 10, 2015), http://www.faa.gov/news/press_releases/news_story.cfm?newsId=18295.

165. Center for the Study of the Drone, supra note 148.

166. Federal Aviation Administration, *Performance and Accountability Report*, Pg. 29,

determining whether a simple knowledge test is sufficient, as opposed to creating a practical test like European countries have imposed.[167] Additionally, the FAA would have to determine how often licensed UAS operators would have to complete recurrent.

The largest issue with the implementation of this knowledge test is that it only applies to a small number of UAV operators, which does not include the people who use drones merely as a hobby.[168] The issue becomes clear when analyzed through an analogy.

The government requires a driver's license to operate a car, which is similar to the requirement of an operator's license for UAVs under the proposed rules.[169] However, the DMV does not allow those that drive as a hobby to do so without a license. This is because the same dangers exist on the road for everyone that decides to drive. The same logic should be applied to UAVs and their operators. People are quick to categorize UAVs as toys or a form of entertainment; however, when there is a substantial and material risk of death, UAVs should be treated as machines that are capable of injuring and killing people, which they are.

REQUIRING UAVS TO HAVE ADS-B EQUIPMENT INSTALLED BY THE MANUFACTURER AND MANDATING OPERATORS TO FILE AND ADHERE TO FLIGHT PLANS MAY ALLEVIATE SEVERAL DANGEROUS ISSUES

It is important to remember that the UAV as an industry is blooming at an incredible rate, and possible uses for drones are worth billions of dollars.[170] Because of this, new regulations were rushed and created as quickly as the FAA could manage.[171] While the creation of the operator license sounds promising, it doesn't address the problem with incidents involving non-commercial drones.[172]

Regulating the Manufacturing of UAVs to Include Relatively Inexpensive ADS-B Receivers Will Improve Safety and Visibility for Pilots and Controllers, as well as Aid Authorities with Identification of Improper Drone Usage

In the end, there seems to be a much simpler, cheaper solution that has already been implemented in a different area of aviation: regulate

---

(Oct. 10, 2016), http://www.faa.gov/about/plans_reports/media/2014-FAA-PAR.pdf.

167. Clive Irving, *New FAA Rules For Drones Include A Pilot Test*, THE DAILY BEAST (Oct. 10, 2015), http://www.thedailybeast.com/articles/2015/02/16/new-faa-rules-for-drone-swarm.html.

168. Jeff Foster, KEEP CALM: *The FAA and sUAVs/Drone Rules UPDATED 9/22*, PROVIDEO COALITION (Nov. 21, 2015), http://www.provideocoalition.com/drone-law-update-faa.

169. *Summary of Small Aircraft Rules,* supra note 79.

170. Irving, supra note 166.

171. *Id*.

172. *Press Release – DOT and FAA Propose New Rules for Small Unmanned Aircraft Systems,* supra note 163.

the physical attributes and components of UAVs rather than setting physical limitations to drone capabilities.[173]

Both commercially and non-commercially used UAVs are relatively small and physically hard to see.[174] Therefore, the digital footprint of UAVs should be increased in order to compensate for their physical size. This can be accomplished simply by regulating the construction of UAVs much like GA aircraft construction is regulated.[175] Recently, the FAA has mandated that ADS-B must be equipped to all aircraft flying within airspace that requires a Mode C transponder.[176] The exact same regulation does not need to be enacted to drones simply from a cost stand point. It would not be reasonable to mandate the inclusion of $5,000 worth of avionics from GA aircraft into all drones since UAVs cost 10% or less than the traffic system that would be installed.[177] However, there are alternatives to expensive avionics. Several lightweight and portable ADS-B receivers can be found on sale for around $500.[178] If an UAV can carry a video camera hundreds of feet into the air, there is no reason why it cannot carry what would amount to an additional video camera in weight. Five hundred dollars may still sound like a lot of money, and it is; however, because of economies of scale, and growth of demand, the technology of portable ADS-B receivers would only improve and become more accessible to manufacturers to install as hardware into both commercial and non-commercial drones.

ADS-B receivers would allow ATC to track the altitude, speed, and location of all UAVs within the NAS and allow ATC to warn other pilots of any potential incidents.[179] Moreover, because GA aircraft will be required to be ADS-B equipped, pilots will also be able to see and hear traffic advisories alerting them to the position of the drone before they are able to physically see it without assistance from ATC.[180]

Additionally, receivers would allow ATC to follow and track any illegally operated drones, and, most importantly, they would allow the authorities to determine who is responsible for the infraction accurately through a similar identification system to transponder codes used in aircraft.[181]

---

173. Guide to Aircraft Airworthiness, AIRCRAFT OWNERS AND PILOTS ASSOCIATION (Oct. 10, 2016), https://www.aopa.org/go-fly/aircraft-and-ownership/maintenance-and-inspections/aircraft-airworthiness/guide-to-aircraft-airworthiness.

174. Whitlock, supra note 101.

175. Air Traffic Services Brief, *Automatic Dependent Surveillance-Broadcast (ADS-B),* AIRCRAFT OWNERS AND PILOTS ASSOCIATION (Oct. 10, 2015), http://www.aopa.org/Advocacy/Air-Traffic-Services-,-a-,-Technology/Air-Traffic-Services-Brief-Automatic-Dependent-Surveillance-Broadcast-ADS-B.

176. *Id*.

177. *Id*.

178. Sporty's Pilot Shop, http://sportysnetwork.com/ipad/files/2013/04/ADS-B-Comparison-052114b.png (last visited Oct. 8, 2015).

179. Air Traffic Services Brief, *supra note 174.*

180. *Id*.

180. Aaron Flodin, *Transponder and Squawk Codes*, VIRTUAL AIR TRAFFIC SIMULATION NETWORK (Oct. 10, 2015), http://www.vatsim.net/pilot-resource-

Requiring UAV Operators to File and Fly Accurate Flight Plans Increases Efficiency and Predictability of Air Traffic and Aids Situational Awareness of Manned Aircraft

The second concept that should be implemented affects commercial drones in the NAS more than recreational drones, even though it can apply to both. It is the utilization of a pinpoint flight plan, similar to an IFR flight plan to help pre-determine and plan the route an UAV is likely to take, and clear it of any conflicting traffic by way of GPS tracking through an ADS-B receiver or the controller on the ground.[182] Commercial or recreational UAV operators can file a flight plan similar to an IFR flight plan that will indicate the path and altitude at which the UAV intends to fly and allow ATC to track its progress along the route.[183] This makes sense in a lot of scenarios. For example, if Amazon intends to use UAVs to deliver specific goods around urban areas in the near future, it would help logistically, and perhaps even for future full automation of flight, to map out the route of the flight before the flight even starts. Carriers like UPS and FedEx already implement pre-route planning software to emphasize efficiency of their routes,[184] and this would be very similar to a flight plan of a commercial drone, which could use intersections from the road beneath it or coordinates from GPS positioning to maintain its path and stay on course.[185]

There are downsides to the implementation of these ideas. Cost will always be the biggest driving factor. Manufacturers and people who purchase drones will not be happy to have to pay more to own and operate drones. However, the possibility to reduce the number of injury to others and other legal liabilities might make the increase in capital worth it.

Future developments in UAV safety are uncertain and there will have to be additional training incorporated by commercial UAV operators so everyone that utilizes the NAS is aware of the regulations and requirements. However, the purpose of these ideas is to greatly increase efficiency and safety simultaneously. If ATC is able to track the path of UAVs and help them maintain optimum route efficiency while maintaining a minimum safe distance from GA aircraft, then the results should be beneficial for everyone.

This is not the solution to all the issues that appear when trying to incorporate UAVs into the NAS. However, maintaining the FAA's

---

centre/general-lessons/transponder-and-squawk-codes.

181. Justin Martin, *Basic IFR Flight Planning, Understanding conventional navigation SIDs and STARs, and airways*, VIRTUAL AIR TRAFFIC SIMULATION NETWORK, (Oct. 11, 2015), https://www.vatsim.net/pilot-resource-centre/ifr-specific-lessons/basic-ifr-flight-planning.

182. *Id.*

183. Daniel Moore, *UPS and FedEx try every tech trick to speed up deliveries*, THE SEATTLE TIMES (Nov. 21, 2015), http://www.seattletimes.com/business/ups-and-fedex-try-every-tech-trick-to-speed-up-deliveries/.

184. FAA Federal Aviation Regulation 14 C.F.R. § 91.181 (2015).

stance on altitude, speed, and airspace limitations while incorporating ADS-B into the construction of UAVs has the possibility of greatly reducing incidents between Aircraft and UAVs in the NAS. The next step would be to require commercial drones and any other UAVs operated in densely populated areas to fly along flight paths that were pre-approved by ATC as a means to reduce traffic congestion and increase situational awareness and safety for all members of the NAS. If these suggestions can be achieved and maintained, the sky will be an even safer place.

CONCLUSION

Due to the potential of new revenue streams created by mass UAV use, drone operation and orders have skyrocketed in recent years.[186] Because of the increase of UAV traffic, there has been an ever strengthening call to the FAA to satisfactorily assimilate drones into the NSA by way of regulation.[187]

When creating the new regulations, the FAA has had to tackle several hurdles, including the lack of collision avoidance systems in UAVs, overcoming the size of the drone, teaching operators who may not fully understand the law, and prosecuting those that deliberately break the regulations.

Some argue that the danger involved is due to the media hype involved with automated machines that appear to be beyond human control. Others use logic and statistics to prove that illegally operated UAVs are a dramatically increasing concern for aircraft in general. Some companies have even attempted to help the FAA improve safety by limiting the UAVs' abilities through software; however, these attempts are not concrete solutions.

Geo-fencing and licensing appears to be a step in the right direction, but probably places too much of a burden on the operators and creates overreaching government restrictions. Instead, the FAA should treat UAVs the same way it treats GA aircraft: require certain collision avoidance systems that are relatively light and are not cost prohibitive to install.

Alongside the training programs created for the licensing for UAV operators, all commercial drone operators should be required to file a flight plan in controlled urban airspace similar to the structure of an IFR flight plan so that traffic controllers can maintain safety in the sky while giving people the freedom they already have. This solution can help prevent aviation accidents of the future by using methods of aviation already in place today.

186. Casner, supra note 100.
186. 126 Stat. 11 at § 332(a)(3).