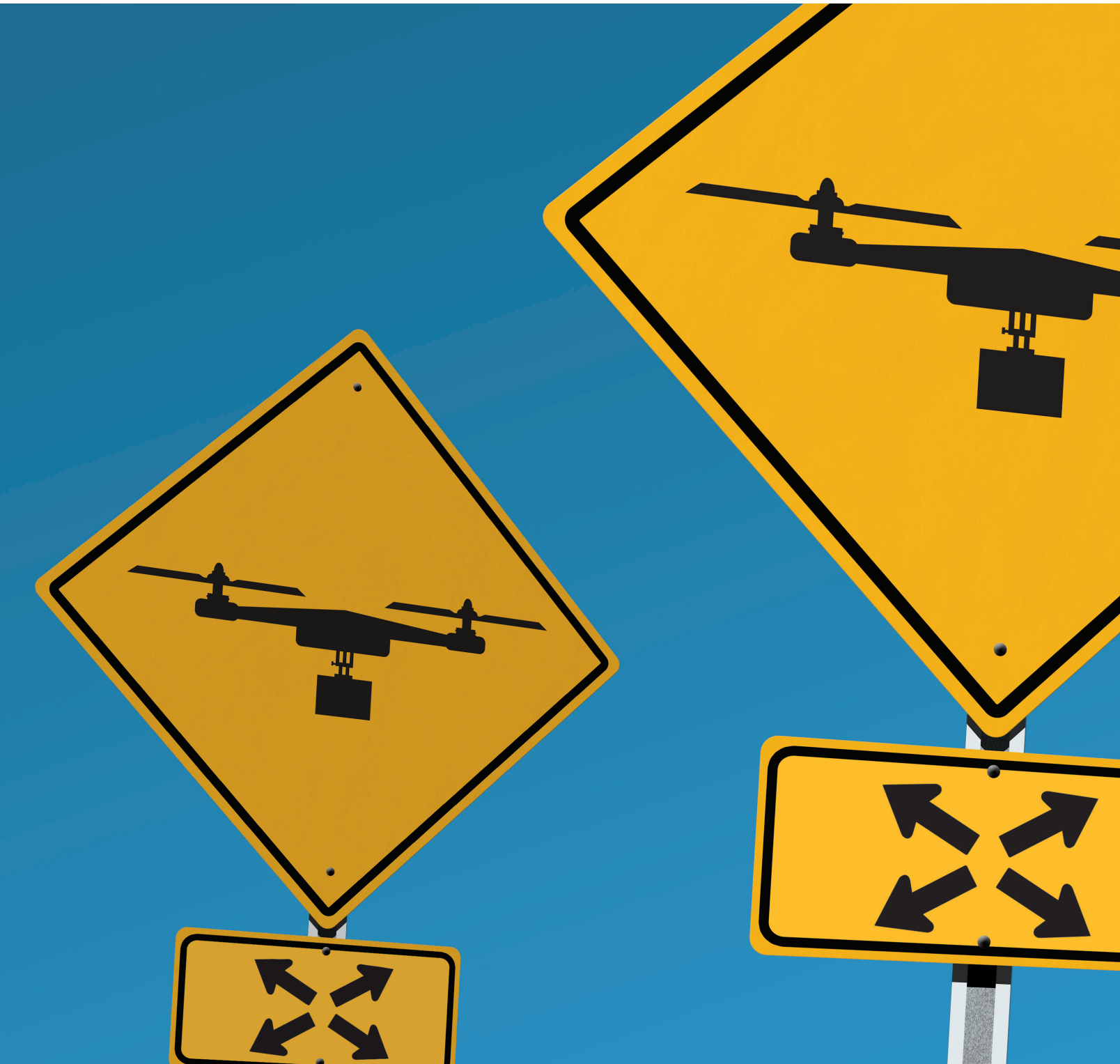
The Drone Revolution

By Bob Lambrechts



I. Background

Due to the steadily increasing use of drones, both recreational and commercial, the Federal Aviation Administration (FAA) has determined that drones must be regulated to ensure safety of flight, people, and property on the ground. The frequency of incidents involving the unauthorized or unsafe use of these small, remote-controlled aircraft has risen dramatically. For example, on December 22, 2015, a drone crashed at a World Cup slalom event and nearly hit Austrian skier Marcel Hirscher in Madonna Di Campiglio, Italy.[1] Pilot reports of interactions with suspected unmanned aircraft have increased from 238 sightings in all of 2014 to 650 from January 1 through August 9, 2015.[2] Since the publication of those statistics, drone purchases have skyrocketed. The FAA estimates that more than one million drones, also known as unmanned aerial systems (UAS), were sold during the 2015 holiday season alone.[3] In addition, the U.S. is regarded as one of the largest potential markets for commercial UAS.[4] The proliferation of drone use has resulted in increased regulation, and, more recently, an FFA registration requirement for drone users. As of December 21, 2015, owners of drones that weigh in excess of 0.55 pounds are required to register their devices under rules to control the sharp increase of unmanned aircraft in U.S. skies.[5] The registration requirement is driven in part by concerns that drones threaten public safety.

While drone registration is new, the FAA has been regulating their use since 2012 with the passage of the FAA Modernization and Reform Act (FMRA), which prohibits the use of a UAS for a commercial objective without an exemption from the FAA. And those commercial uses for UAS run the gamut. For example, a UAS can quickly produce high-resolution three-dimensional maps of vast geographic areas.[6] Another industry significantly impacted by the UAS is filmmaking.[7] UAS are revolutionizing how movies are made by capturing images previously unattainable or attainable only by spending thousands of dollars a day on helicopters. Notably, UAS were used on the sets of Game of Thrones and the newest Star Wars film.[8] Drones are even getting into the delivery business. On July 17, 2015 a drone delivered medical supplies from an airfield to a medical clinic in Wise County, Va.[9] That was the first drone delivery approved by the FAA and was performed by an Australian drone-delivery startup named Flirtey.[10] And, importantly for Kansas, the Association of Unmanned Vehicle Systems International (AUVSI) reports that the agricultural use of UAS could ultimately comprise 80 percent of the commercial market.[11]

This article will discuss the current and rapidly evolving law of UAS from the perspective of federal, state and local law, as well as touch upon the many current and anticipated uses of drone technology.

II. The Growing Role of the UAS Globally and Within the State of Kansas

In 2014, nonmilitary UAS made up a $2.5 billion industry, growing 15 percent to 20 percent annually.[12] The AUVSI estimates that between 2015 and 2025, the UAS industry will create 100,000 jobs and contribute $82 billion to the U.S. economy.[13] Research suggests that the state of Kansas will be in the top ten states to receive economic benefits associated with UAS, and that the economic impact in Kansas alone will exceed $2.9 billion dollars and create an anticipated 3,700 jobs over the next decade.[14]

With the growing capabilities of UAS, the markets they support will likely continue to develop including the agricultural industry, where UAS are making a significant impact. UAS can closely monitor crops regularly and cheaply to improve crop management and yield, and use on private land means that agricultural UAS pose little threat of interference with the rights of others.

Near-infrared sensors can be programed to monitor crop health by decting green, healthy plant mass through the crop's absorption of light that falls within a certain wavelength range. By measuring the ratio of light reflected by the plant in these spectral ranges, plant health can be determined, letting farmers react and improve conditions locally with inputs of fertilizer or insecticide.[15] This Normalized Difference Vegetation Index (NDVI) calculation is valuable

to agricultural scientists due to the unique spectral signature healthy plants radiate.[16] Using NDVI maps derived through the use of multispectral cameras and associated spectral filtering software, it is possible to generate strong conclusions regarding the status of an active crop via the crop's spectral reflectivity. When soil testing and field scouting is coupled with highly accurate spectral signature data, crop prescriptions can be quickly generated. Furthermore, infestations and disease outbreaks can be mitigated before they affect other healthy plant material through periodically scheduled spectral scans. The same concept extends to livestock. Infrared sensors can pick up small differences in animals' temperature to determine if any herd membrs are sick.

In February 2015, the FAA bestowed upon Kansas State University-Salina the status of the first civil entity in the U.S. to have statewide access for UAS flight operations. The university has received three Certificates of Authorization (COA) from the FAA, allowing its unmanned systems program to perform research anywhere in the state on public or private property, as long as they have the landowner's permission.[17] The UAS will be used for researching drought stress and insect infestation.

In addition to agricultural applications, pipelines, power lines, wind towers and processing plants will all benefit from regular aerial monitoring. The drones' abilities to sense in three dimensions, take thermal readings, and detect cracks in structures will greatly improve infrastructure inspection. Small UAS are capable of hovering and surrounding infrastructure, such as a bridge or plant, and can provide a new level of detail during such inspections.

UAS are also useful in many other applications. Following a natural or manmade disaster, UAS provide a means to quickly navigate debris while gathering information or conducting search and rescue missions. A search and rescue mission is a battle against time, particularly in harsh conditions, and UAS have become a powerful tool because of their ease of deployment. With thermal sendors, UAS can quicly discover the location of lost persons, and are particularly useful at night or in challenging terrain. The technology is ideal for use by rescue teams because UAS are not loud enough to overpower the human voice in an emergency situation, when people might be shouting for assistance. In addition, the ability of UAS to rapidly deploy and capture an area of interest in concert with site-specific measurements provides an advantage in remedial environmental efforts.

III. The Role of the Federal Aviation Administration

A. Federal Framework

To ensure the maintenance of a safe air transportation system and of navigable airspace free from inconsistent restrictions, the FAA has regulatory authority over matters pertaining to aviation safety. Congress has vested the FAA with authority to regulate the areas of airspace use, management and efficiency, air traffic control, safety, navigational facilities, and aircraft noise at its source.[18] The FAA Modernization and Reform Act of 2012 (FMRA) contains language addressing Model Aircraft, which provides a safe harbor for pilots while flying UAS strictly for hobby or recreation as long as all of the conditions set forth in the statute are satisfied.[19]

Consistent with its statutory authority,[20] the FAA requires federal registration to operate a UAS. Registering UAS will help protect public safety in the air and on the ground, aid the FAA in the enforcement of safety-related requirements for the operation of UAS, and build a culture of accountability and responsibility among users operating in U.S. airspace.

B. The FAA Small Unmanned Aircraft System Registry

Registration is the latest step signifying the drone industry's transition from a hobbyist community to a mass-market commercial industry. New federal regulations require drone owners to register on a government website to receive unique user numbers with which they are required to label any drones they own. Regulators are signaling to drone users that the devices are more than toys, and that misuse could lead to penalties. Regulators say that registration will assist the government in holding reckless drone operators accountable and deter unsafe flights. The registration process will also put regulators in contact with drone users, enabling better education about drone rules.

The FAA's small UAS registry became active on December 21, 2015, and ready for UAS owners to use on the FAA website.[21] A small unmanned aircraft is defined as an unmanned aircraft weighing less than 55 pounds on takeoff, including everything that is on board or otherwise attached to the aircraft.[22] The FMRA limits model aircraft to no more than 55 pounds. All aircraft weighing more than 0.55 pounds (250 grams) and less than 55 pounds must be registered.[23] Under the interim final rule requiring registration, owners who previously operated an unmanned aircraft exclusively as a model aircraft prior to December 21, 2015, must register no later than February 19, 2016.[24] Owners of any other UAS purchased for use as a model aircraft after December 21, 2015 must register before the first flight outdoors.[25] Owners may use either the existing paper-based process or a new streamlined, web-based system.[26] Also, owners using the web-based system must be at least 13 years old to register.[27]

As part of the registration process, each owner must provide a name, home address and email address.[28] The current fee to register an aircraft is $5.[29] The fee is required by the regulation and is based on an estimate of the costs of the system and services associated with aircraft registration. When registration is complete, the web application will generate a certificate of aircraft registration/proof of ownership including a unique identification number for the UAS owner, which must be marked on the aircraft.[30] Owners using the model aircraft for recreation will only have to register once, and may use the same identification number for all of their UAS. The registration is valid for three years.[31]

To mitigate risks in the national airspace, the FAA will continue to use outreach and education to encourage compliance with regulatory requirements that pertain to the registration of unmanned aircraft. The FAA may also use administrative action or legal enforcement action to gain compliance. Failure to register an aircraft can result in civil penalties of up to $27,500.[32]

Importantly, no state or local UAS registration law may

relieve a UAS owner or operator from complying with the federal UAS registration requirements. Because federal registration is the exclusive means for registering UAS for purposes of operating such an aircraft in navigable airspace, no state or local government may impose an additional registration requirement on the operation of UAS in navigable airspace without first obtaining FAA approval.

C. The *Pirker* Decision and Commercial Operation of a UAS

When the UAS arrived, the FAA faced novel regulatory challenges. For decades prior to the drone, the FAA's definition of "aircraft" did not include "model aircraft," the majority of which are now of the UAS type.[33] That all changed when the FAA issued an agency order against a foreign national UAS pilot named Raphael Pirker.[34] In October 2011, at the request of the University of Virginia, Pirker flew a UAS over the campus to obtain video footage and was compensated for the flight. That flight resulted in the FAA issuing a proposed order of assessment of a civil penalty of $10,000. In its order of assessment, the FAA listed all of its alleged facts concerning the flight, including an allegation that Pirker was compensated for it. At that time there was no Federal Aviation Regulation (FAR) that expressly prohibited commercial operation of UAS. Instead, the FAA based its proposed order of Assessment solely upon an allegation that Pirker flew recklessly in violation of FAR 91.13.

The relevant portion of FAR 91.13 reads: "No person may operate an aircraft in a careless or reckless manner so as to endanger the life or property of another." Pirker filed a motion to dismiss. In March 2014, the administrative law judge (ALJ) granted Pirker's motion to dismiss,[35] vacating the FAA's order of assessment and terminating the proceedings with prejudice.[36] The ALJ held that UAS are not aircraft under the federal definitions, and therefore the FAA had no jurisdiction over Pirker's flight.[37] The FAA appealed the decision immediately to the full National Transportation Safety Board (NTSB).[38] In November 2014, the NTSB issued a decision reversing the ALJ's order, granting the FAA's appeal, and remanding the case.[39]

The NTSB held that UAS are "aircraft" as the word is defined under federal law and are therefore subject to the regulation prohibiting reckless operation of an aircraft. It remanded the matter to the ALJ to decide whether Pirker's flight was, in fact, conducted recklessly. Pirker ultimately settled the case for $1,100, with no admission of wrongdoing on his part.[40] The NTSB held that because UAS are aircraft, FAR 91.13 applies. It did not address the definition of "commercial use" since that was not addressed by the ALJ, and it did not hold that any other FAR applies to UAS. Critically, the NTSB's decision did not qualify which size UAS are "aircraft." Thus, anything from a toy UAS to a 55-pound industrial-sized UAS are "aircraft" subject to FAR 91.13.[41]

Today, UAS operators have more regulatory guidance than *Pirker*. The statutory parameters of a model aircraft operation are outlined in the FMRA. Individuals who fly within the scope of those parameters are only required to register their UAS with the FAA as discussed above. Any flight outside the parameters requires FAA authorization pursuant to the FAA's interpretation of the special rule for model aircraft.[42] In its interpretation, the FAA declares, among other things, that compensation of any sort is banned unless proper authorization from the FAA is obtained. The special rule for model aircraft also provides that flying a UAS in a manner that is "in furtherance of a business," is not a hobby or a recreational flight. Operators must provide prior notice to air traffic control or airport operations before flying within five miles of any airport, heliport, etc., but requests for such flights may be denied. Also, operating UAS using "first person view" ("FPV") is prohibited. This means operators cannot use goggles or any modern "watch it on a monitor" system to fly. Instead, the operator's own eyes must be able to see the UAS at all times while flying.[43]

While the FAA concluded in its interpretation that flying in furtherance of a business is generally illegal, there are three methods of gaining FAA approval for flying civil (non-governmental) UAS commercially: (1) obtain a special airworthiness certificate,[44] (2) obtain a UAS type and airworthiness certificate in the restricted category;[45] or (3) petition for exemption with a civil Certificate of Waiver or Authroization (COA) for civil aircraft to perform commercial operations in low-risk, controlled environments.[46] The third option, to petition for a Section 333 exemption,[47] allows operators to fly UAS commercially, but with restrictions.

D. The Section 333 Exemption

In a new interim policy statement, the FAA relaxed the areas in which operations may be conducted under an exemption.[48] Under the new policy, the FAA will grant a "blanket" COA that may be exercised "anywhere in the country except restricted airspace and other areas, such as major cities, where the FAA prohibits UAS operations."[49] The blanket COA may be granted to any UAS operator (1) who has been granted a Section 333 exemption, as long as (2) the UAS weighs less than 55 pounds, (3) it is flown at or below 200 feet, (4) it is operated during daytime visual flight rules conditions, (5) it is operated within visual line of sight of the UAS operator, and (6) it is operated at certain distances away from airports or heliports.[50]

The Section 333 exemption provides that the UAS must be operated at least five nautical miles (NM) from an airport with an operational control tower; three NM from an airport with a published instrument flight procedure, but not an operational tower; two NM from an airport without a published instrument flight procedure or an operational tower; or two NM from a heliport with a published instrument flight procedure. If a UAS operator wishes to fly outside the blanket parameters, he or she must first obtain a separate COA that is specific to the airspace intended to be used for that operation.[51]

As of January 9, 2016, the FAA had granted a total of 2,883 Section 333 exemptions.[52] Roughly one-third of the exemptions were granted for applicants in three states: Texas, California and Florida.[53] When looking at the industry sectors seeking the exemptions, roughly 50 percent have been sought by the photography and film industries.[54] Applicants seeking exemptions were also heavily into real estate at approximately 29 percent, with utilities, energy and infrastructure taking

third place at 23 percent. Agriculture and construction follow with 20 percent and 17 percent respectively.[55]

IV. The Role of Local Law Enforcement

The proliferation of small, relatively inexpensive UAS have presented the FAA with a challenge in identifying people who are not following the rules of the air or who endanger the nation's airspace. So the FAA is asking local law enforcement communities for help. State and local police are often in the best position to immediately investigate unauthorized UAS operations and, as appropriate, to stop them. On January 8, 2015, the FAA issued a guidance document that explains how first responders and others can provide invaluable assistance to the FAA by: (1) identifying potential witnesses and conducting initial interviews, (2) contacting the suspected operators of the UAS or model aircraft, (3) viewing and recording the location of the event, (4) collecting evidence, (5) identifying whether the UAS operation was in a sensitive location, event or activity, and (6) notifying one of the FAA's Regional Operation Centers about the operation as soon as possible.[56]

The FAA recognizes that almost all of those actions are within a local law enforcement agency's capabilities, but is careful to note that certain law enforcement actions, such as arrest and detention or non-consensual searches, almost always fall outside of the allowable methods to pursue administrative enforcement actions by the FAA. The FAA suggests that local law enforcement agencies seek consent to examine UAS and equipment and conduct "stop and talk" sessions with suspected violators. The FAA also provides tips on how to spot illegitimate commercial UAS users, and asks local law enforcement agencies to look for unregistered aircraft.[57]

V. Who Owns the Airspace?

A. Supreme Court Guidance

Well-settled case law will likely influence the evolution of new laws and regulations governing UAS. For example, in the landmark case *United States v. Causby*,[58] the Supreme Court considered the extent of a landowner's rights to airspace. Causby owned a chicken farm within 2,300 feet of an airfield used by the United States Army and Navy. Military aircraft passed over Causby's property at elevations as low as 83 feet during takeoffs and landings.[59] Causby alleged that the noise frightened and killed his chickens, thereby ruining his farm's production.[60] Causby sued the U.S. government under the Fifth Amendment, alleging that the frequent and regular low altitude flights over his farm constituted a taking of his property without just compensation.[61]

Because the government cannot "take" private property from a person unless that person actually owns a property interest, a key component of *Causby* was determining the extent of a landowner's rights to the airspace above his land. Although the Supreme Court did not set out a test for determining the extent of a landowner's airspace rights, the court recognized that a property owner owns at least as much of the space above the ground as he can occupy or use in connection with the land. For such airspace surrounding the property, a physical invasion may constitute a taking when the government's use (i.e., airplane flight) is so low and so frequent as to be a direct and immediate interference with the use and enjoyment of the land. The court held that the government's (1) frequent and (2) low altitude flights of large military aircraft met that standard, having the effect of interfering with Causby's use of his land and enveloping airspace.[62] What resulted from that set of circumstances, though, was a victory for aviators. The Court affirmed that the air above the minimum safe altitude of flight is a public highway and part of the public domain.[63]

The *Causby* court divided the sky into two separate domains: an upper altitude subject to the public's right of flight and a lower altitude which could be potentially owned by the landowner. The lesson is that a UAS likely would not be trespassing in an uncongested area at an altitude of 500 feet or higher. Conversely, a UAS will trespass at or very near the surface and additionally at higher altitudes where the landowner can show that the UAS actually interferes with the landowner's use of real property based upon such factors as the altitude, frequency, and impact of the UAS flights.

Unfortunately, the case law after *Causby* has struggled to determine the exact extent of the public and private domains. UAS, however, do not fit neatly into this case law. UAS can be much smaller, quieter, and have a smaller impact on the use of the land than the aircraft considered in *Causby*. As a result, it cannot be stated with certainty exactly which altitudes a UAS may fly without trespassing on a landowner's property. Consequently, the closer a UAS is to the ground, the more likely it is to trespass on a landowner's property. Some guidelines for evaluating the extent of the rights of the landowner and the public to airspace include: (1) the impact on the landowner's then existing use of the land and enveloping airspace; and (2) the minimum safe flight altitude (which for airplanes is 500 feet in uncongested areas or 1,000 feet in a congested area, such as a city).[64] FAA regulations may clarify the second benchmark for UAS in the future, but the first benchmark likely will remain a case-by-case determination for the courts to decide.

B. Can I Legally Shoot Down the UAS If I Think It Is Trespassing?

An Idaho ammunition manufacturer named Snake River Shooting Products and Consulting, Inc. is selling ammunition specifically for removing remote-controlled aerial drones from the sky and to prepare for the invasion of the privacy apocalypse that camera drones will bring.[65] The new product, called Drone Munition, is a three-inch, 12-gauge shotgun load for targeting UAS. The website for the ammunition also conveys that drones are aircraft and are protected by the federal government.[66] The website declares that the users of Drone Munitions should employ common sense and be informed of and obey all laws with respect to drones and firearms.[67] Overall, some very good advice, but what is the law of the drone?

Within the typical backyard airspace environment, any action taken against a UAS is subject to state laws – and it is unlikely that target practice in one's backyard is allowed. Kansas law does not allow for the use of force to remove a trespasser unless the property owner reasonably believes that such use of force is necessary to prevent or terminate the trespasser's unlawful entry into or attack upon such person's dwelling,

place of work or occupied vehicle.[68] Under the restatement (Second) of Torts Section 260, "one is privileged to commit an act which would otherwise be a trespass to a chattel or a conversion if the act is, or is reasonably believed to be, necessary to protect the actor's land or chattels or his possession of them, and the harm inflicted is not unreasonable as compared with the harm threatened."[69] Arguably in certain instances, a landowner would not be liable to the owner of a drone for damage necessarily or accidentally resulting from removing it from his property.

Nonetheless, before employing that 12-gauge shotgun loaded with Drone Munition which might result in charges of wanton endangerment, criminal mischief[70] or destruction of an aircraft[71] (a federal crime), Kansans ought to consider a more restrained approach to a UAS loitering above their homes. A property owner should find out who owns and/or operates the UAS and call the police and request that they draw upon the FAA's *Law Enforcement Guidance for Suspected Unauthorized UAS Operations*.[72] In addition, the property owner may consider sending a cease and desist letter or possibly filing suit.

If filing suit is the chosen path, the homeowner could bring a number of causes of action, depending on the situation: trespass,[73] private nuisance,[74] public nuisance,[75] stalking and harassment,[76] or breach of privacy.[77] There may be instances when landowners are entitled to protect their property from intrusion by a drone. And if the UAS is operated by any government entity, the property owner may be able to sue for violation of constitutional protections against illegal search and seizure. Such suits could result in a restraining order or injunction against such flights over the property. But there is a real question whether the property owner can prove any injury or damage as a result of the UAS flight. More states[78] and localities[79] are stepping up to further regulate the use of UAS; However, conflicting laws regulating the UAS are creating challenges for operators.

C. State and Local Laws Controlling Drones

Substantial air safety issues are raised when state or local governments attempt to regulate the operation or flight of aircraft. If multiple municipalities enact ordinances regulating UAS, the result is fractionalized control of the navigable airspace. In turn, this patchwork of differing restrictions may severely limit the flexibility of the FAA in controlling the airspace and flight patterns and in ensuring safety and an efficient air traffic flow. A navigable airspace free from inconsistent state and local restrictions is essential to the maintenance of a safe and sound air transportation system.[80]

As of January 3, 2016, 45 states have considered 168 bills related to UAS. On March 7, 2013 Kansas HB 2394 was introduced to prohibit the use of drones by any law enforcement agency to obtain evidence. House Bill 2394 died in committee on May 30, 2014.[81] Senate Bill 409 was introduced on February 18, 2014 to protect the privacy of individuals and businesses from drones equipped with cameras and recording devices.[82] That Senate bill also died on May 30, 2014 even after a Senate committee report recommended passage of the bill. Unlike Kansas, 20 states have passed legislation.[83] Four other states, also not including Kansas, have adopted resolutions related to UAS.[84] State and local governments have passed laws that seek to regulate UAS flight. However, as discussed above, if challenged in court, any such laws may be challenged as preempted by federal law, and would therefore be invalid.[85]

VI. Conclusion

There is little doubt that UAS are here to stay and will be more heavily utilized for recreational and commercial purposes with each passing day. Widespread use of UAS will be a reality in the near future. The framework for such usage will be directed by FAA rules and regulations. A legal framework will also need to be adapted to this new technology, and individual rights will need to be balanced with technological advancements. ■

About the Author

Bob Lambrechts is a partner with Lathrop & Gage LLP in Overland Park where he practices patent and environmental law. He formerly served with the U.S. Environmental Protection Agency in the Clean Air Division and as a special assistant to the Region 7 Administrator. In addition to a law degree from St. Louis University, Mr. Lambrechts has a Bachelor's and Master's Degree in Mechanical and Aerospace Engineering from the University of Missouri at Columbia and prior to practicing law he served as a robotics engineer with the Allied-Signal Corporation in Kansas City. As avocations, Mr. Lambrechts has served as an Engineering Duty Officer in the U.S. Navy Reserves for over 25 years and as an adjunct faculty member for the Schools of Law and Engineering at the University of Missouri at Kansas City since 1993.

blambrechts@lathropgage.com

Footnotes

1. Eric Willemsen, *Ski Federation Bans Drones after Camera Nearly Hits Racer,* U.S. News, Dec. 23, 2015, http://www.usnews.com/news/sports/articles/2015-12-23/ski-federation-bans-drones-after-camera-nearly-hits-racer.

2. Federal Aviation Administration, *Pilot Reports of Close Calls with Drones Soar in 2015*, Aug. 12, 2015, https://www.faa.gov/news/updates/?newsId=83445.

3. Ryan Jackson, *Reluctant Townie: Set for takeoff: Best practices for drones,* The News-Gazette, Jan. 3, 2016, http://www.news-gazette.com/living/2016-01-03/reluctant-townie-set-takeoff-best-practices-drones.html.

4. Ryan Mac, *Bow to Your Billionaire Drone Overlord: Frank Wang's Quest to Put DJI Robots into the Sky*, Forbes, May 6, 2015, http://www.forbes.com/sites/ryanmac/2015/05/06/dji-drones-frank-wang-china-billionaire/. Just one company, Dajiang Innovation Technology Co. (DJI), accounts for 70% of the consumer UAS market. In 2014, the company sold about 400,000 units, mostly of the Phantom model with sales of $500 million in 2014 and anticipated sales of more than $1 billion in 2015. 3D Robotics, a Berkeley, California, company, has sold approximately $100 million and is seeking a much larger share of the commercial UAS market. In addition, French manufacturer Parrot sold more than $90 million worth of UAS in 2014.

5. The Department of Transportation/FAA published an interim final rule at 80 Fed. Reg. 78593 *et seq.* (Dec. 16, 2015) (to be codified at 14 C.F.R § 48.1 *et seq*.). The rule had an effective date of December 21, 2015, and the Department considered all comments received before the closing date of January 15, 2016 and will make amendments as appropriate. See also 80 Fed. Reg. 78646 (Dec. 16, 2015) (to be codified at 14 C.F.R. § 48.15).

6. See Tom Simonite, *High Resolution 3D Scans Built From Drone Photos, Technology Review,* MIT Technology Review, Mar. 19, 2015, http://www.technologyreview.com/news/535596/high-resolution-3-d-scans-built-from-drone-photos/.

7. Angela Watercutter, *Drones Are About to Change How Directors Make Movies*, Wired, Mar. 6, 2015, http://www.wired.com/2015/03/drone-filmmaking/.

8. Mac, supra note 4.

9. Mike Murphy, *Attention Amazon: The First Successful Drone Delivery in the U.S. Has Taken Place,* Quartz, Jul. 20, 2015, http://qz.com/458703/the-first-successful-drone-delivery-in-the-us-has-taken-place/.

10. *Id.*

11. Gretchen West, ASSN. for unmanned vehicle systems Int'l, Unmanned Systems and Agriculture: An Industry on he Rise (2013), http://infoag.org/abstract_papers/papers/abstract_214.pdf.

12. Clay Dillow, *Get Ready for Drone Nation*, Fortune, http://fortune.com/2014/10/08/drone-nation-air-droid/.

13. Association for Unmanned Vehicle Systems International, The Economic Impact of Unmanned Aircraft Systems Intergration in the United States 2 (2013), https://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New_Economic%20Report%202013%20Full.pdf.

14. *Id*.at 4.

15. John Weier and David Herring, *Measuring Vegetation (NDVI & EVI)*, (August 30, 2000), http://earthobservatory.nasa.gov/Features/MeasuringVegetation/.

16. *Id.*

17. Kansas State University, *K-State Salina receives statewide access for flight operations of small UAS,* (Feb. 24, 2015), https://www.k-state.edu/media/newsreleases/feb15/statewideuas22415.html. Kansas State University at Salina's unmanned aircraft systems program is one of only a few civil entities granted a certificate of authorization from the Federal Aviation Administration. The flight operations will use a mix of fixed-wing and rotary wing UAS, all components of K-State Salina's fleet of more than 20 aircraft. UAS students will be able to participate in multiple facets of the research missions, from integrating equipment on the unmanned aircraft to acting as part of the ground support crew analyzing data from the flights.

18. 49 U.S.C. §§ 40103, 44502, and 44701-44735.

19. FAA Modernization and Reform Act of 2012, Pub L. No. 112-95 Sec. 336. The conditions include:

(1) the aircraft is flown strictly for hobby or recreational use; (2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization; (3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization; (4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and (5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport).

20. *Id*. at 333(c) ("If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system"); see also *Id*. at 332(b)(1) (requiring the Secretary to issue "a final rule on small unmanned aircraft systems that will allow for civil operation of such systems in the national airspace system, to the extent the systems do not meet the requirements for expedited operational authorization under section 333 of [Public Law 112-95].").

21. Raymond Wong, FAA: More than 45,000 Drones have been Registered in Just 2 days, Mashable , Dec. 23, 2015, http://mashable.com/2015/12/23/faa-45000-drones-registered/#_8WVvZqQoZqy.

22. 14 C.F.R. § 1.1.

23. *Id.* § 48.15.

24. *Id.* § 48.5.

25. *Id.*

26. *Id.* § 48.30.

27. *Id.* § 48.120.

28. *Id.* § 48.100.

29. *Id.*

30. *Id.* C.F. R. § 48.100(d)

31. *See also* 49 U.S.C. § 46306 (criminal penalties for failure to register can include fines of up to $250,000); 18 U.S.C. § 3571 (criminal penalties for failure to register can include imprisonment for up to 3 years).

32. Federal Aviation Administration, *Advisory Circular 91-57: Model Aircraft Operating Standards,* (June 9, 1981), http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf ; *cf.* Federal Aviation Administration, AC 91-57 *(Cancelled) – Model Aircraft Operating Standards* (cancelling the 1981 Operating Standards on Sept. 2, 2015), www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/information/documentid/22425. document.

33. *Michael P. Huerta v. Raphael Pirker,* N.T.S.B. Order No. EA-5730 at 1 (2014).

34. *Id*. at 7.

35. *Id.* at 11.

36. *Id.*

37. *Id.* at 1.

38. *Id*. at 5-6.

39. Jack Nicas, *U.S. Federal Aviation Administration Settles With Videographer Over Drones*, Wall Street Journal, Jan. 22, 2015, http://www.wsj.com/articles/u-s-federal-aviation-administration-settles-with-videographer-over-drones-1421960972.

40. The FAA Modernization and Reform Act of 2012 at 336(a)(2)-(3) provides that hobby or recreational aircraft shall be limited to no more than 55 pounds.

41. Interpretation of the Special Rule for Model Aircraft, 79 Fed. Reg 43240, (July 25, 2014) (to be codified at 14 C.F.R. pt. 91).

42. *Id.*

43. Federal Aviation Administration, Order No. 8900.227, Unmanned Aircraft Systems (UAS) Operational Approval 1 (2013), https://www.faa.gov/documentlibrary/media/notice/n_8900.227.pdf.

44. See Federal Aviation Administration, Order No 8110.56A, restricted category type certification (2008), http://www.faa.gov/documentLibrary/media/Order/Order811056A.pdf; see also Federal Aviation Administration, Type Certification (2007), http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgOrders.nsf/0/d21193af2d37a8ba862570ab0054c104/$FILE/8110.4C_CHG5_Incorporated.pdf.

45. Section 333 of the FAA Modernization and Reform Act of 2012 grants the secretary of transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the national airspace system.

46. Supra n. 19.

47. Federal Aviation Administration, *FAA Streamlines UAS COAs for Section 333,* (March 24, 2015, 12:46 PM), https://www.faa.gov/news/updates/?newsId=82245.

48. *Id.*

49. *Id.*

50. *Id.*

51. Federal Aviation Administration, Section 333, https://www.faa.gov/uas/legislative_programs/section_333/, (last visited January 9, 2016).

52. UAS Vision, Analysis of FAA Section 333 Exemptions, http://www.uasvision.com/2015/09/07/analysis-of-faa-section-333-exemptions/, (last visited January 9, 2016).

53. *Id.*

54. *Id.*

55. Federal Aviation Administration, Law Enforcement Guidance for Suspected Unauthorized UAS Operations 6-7 (2016), https://www.faa.gov/uas/regulations_policies/media/FAA_UAS-PO_LEA_Guidance.pdf.

56. *Id.*

57. 328 U.S. 256, 66 S.Ct. 1062, 90 L.Ed. 1206 (1946).
58. *Id.* at 258.
59. *Id.* at 259.
60. *Id.* at 258.
61. *Id* at 260-261.
62. *Id.* at 266
63. *Id.* at 266.
64. 14 C.F.R: § 91.119(a).
65. Snake River Shooting Products and Consulting, Inc., http://snakeriver shootingproducts.com/ ((last visited January 9, 2016).
66. *Id.*
67. *Id.*
68. K.S.A. 21-5220-5231.
69. Restatement (Second) of Torts § 260.
70. Justin Peters, *Judge Dismisses Case Against Man Who Shot Down a Drone Over His Property,* Slate, Oct. 28, 2015, http://www.slate.com/blogs/future_tense/2015/10/28/case_against_william_merideth_for_shooting_down_a_drone_is_dismissed.html.
71. 18 U.S.C. § 32.
72. Supra n. 56.
73. K.S.A § 21-5808.
74. *Sandifer Motors, Inc. v. City of Roeland Park*, 6 Kan. App. 2d 308, Syl. 24, 628 P.2d 239 (1981) ("A private nuisance is a tort related to an unlawful interference with a person's use or enjoyment of his land. The concept of a private nuisance does not exist apart from the interest of a landowner.").
75. PIK 4th 103.06 ("A nuisance is a condition created or maintained that unreasonably interferes with the personal rights or property rights of another and that causes harm, inconvenience, or damage."); see also *Sandifer Motors, Inc. v. City of Roeland Park*, 6 Kan. App. 2d 308, Syl. 4, 628 P.2d 239 (1981) ("What may or may not constitute a nuisance in a particular case depends upon many things, such as the type of neighborhood, the nature of the thing or wrong complained of, its proximity to those alleging injury or damage, its frequency, continuity or duration, and the damage or annoyance resulting. Each case of necessity must depend upon the particular facts and circumstances.").
76. K.S.A. 60-31a02.
77. In Kansas, breach of privacy is a felony. K.S.A. 21-6101 See also Restatement (Second) of Torts § 159(2) ("Flight by aircraft in the air space above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the air space next to the land, and (b) it interferes substantially with the other's use and enjoyment of his land.").
78. National Conference of State Legislatures, *Current Unmanned Aircraft State Law Landscape*, (November 25, 2015), http://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx#1. (As of November 25, 2015, twenty-six states have enacted laws addressing UAS. Kansas is not one of them.).
79. David Schaper, NPR, Chicago City Council Approves Ban on Drones, November 23, 2015, http://www.npr.org/2015/11/19/456600405/chicago-city-council-approves-ban-on-drones.
80. See *Montalvo v. Spirit Airlines,* 508 F.3d 464 (9th Cir. 2007); *French v. Pan Am Express, Inc.*, 869 F.2d 1 (1st Cir. 1989); Arizona v. U.S., 132 S.Ct. 2492, 2502, 132 S.Ct. 2492, 183 L.Ed.2d 351 (2012) ("Where Congress occupies an entire field . . . even complimentary state regulation is impermissible. Field preemption reflects a congressional decision to foreclose any state regulation in the area, even if it is parallel to federal standards."); *Morales v. Trans World Airlines, Inc.*, 504 U.S. 374, 386-87, 112 S.Ct. 2031, 119 L.Ed.2d 157 (1992).
81. Kansas 2013-2014 Legislative Sessions, HB 2394, http://kslegislature.org/li_2014/b2013_14/measures/hb2394/, (last visited Jan. 12, 2016).
82. Kansas 2013-2014 Legislative Sessions, SB 409, http://kslegislature.org/li_2014/b2013_14/measures/sb409/ , (last visited Jan. 12, 2016).
83. Supra note 79.
84. *Id.*
85. *See* cases cited supra note 81.