



U.S. GOVERNMENT ACCOUNTABILITY OFFICE

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**Unmanned Aircraft Systems:
Current Jurisdictional, Property, and Privacy Legal Issues
Regarding the Commercial and Recreational Use of Drones**

APPENDICES I-VI

The FAA Reauthorization Act of 2018, Public Law No. 115-524, provided for GAO to study and report on a number of key legal issues relating to the ongoing integration of unmanned aircraft systems (UAS)—commonly known as drones—into the national airspace system. Section 373 of the 2018 Reauthorization Act provided for us to study the relative roles and authorities of the federal, state, local, and tribal governments in the regulation and oversight of low-altitude UAS operations (referred to in this report as “UAS jurisdiction” or “UAS federalism” issues). Section 358 of the 2018 Reauthorization Act provided for us to study UAS-related personal privacy issues and the federal, state, and local laws that currently address them (referred to in this report as “UAS privacy” issues).

Our report responding to these mandates is presented in multiple parts: a correspondence summarizing key aspects of our analysis and six appendices providing more detailed analysis. This document contains the appendices; our correspondence is presented in an accompanying document.

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Before addressing the legal authority of the federal, state, local, and tribal governments to regulate the operation of civil (non-government) unmanned aircraft systems (UAS)¹—more commonly known as drones—we begin with a brief summary of the current use of drones.

As we have previously reported, the federal government currently uses UAS for purposes such as military and national security activities, law enforcement, disaster response, and scientific research.² State and local governments use UAS for some of these same purposes.³ At the same time, the commercial and recreational use of drones by non-government entities has grown substantially in recent years and is expected to increase as technology improves and legal and policy issues are resolved. According to the Federal Aviation Administration (FAA), in 2019, about 77 percent of the approximately 1.7 million “small” UAS (less than 55 pounds)⁴ used in non-government operations were used for recreational purposes, while about 23 percent were in commercial use.⁵ By 2024, FAA predicts the total non-government use fleet likely will increase to approximately 2.3 million small UAS, with the proportions shifting to about 64 percent recreational use and 36 percent commercial use—although the fleet might increase to as many as 2.8 million small UAS by that date (about 57 percent recreational use and 43 percent commercial use).⁶

As of 2018, according to FAA, the predominant commercial UAS uses in the U.S. were industrial inspection, event photography, real estate, and research and development/training.⁷

¹ For purposes of regulating aviation safety and the efficient management of airspace, Congress has defined “aircraft” as “any contrivance invented, used, or designed to navigate, or fly in, the air.” 49 U.S.C. § 40102(a)(6). An “unmanned aircraft” is defined as “an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.” 49 U.S.C. § 44801(11). An “unmanned aircraft system” is defined as “an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the operator to operate safely and efficiently in the national airspace system.” 49 U.S.C. § 44801(12).

² See, e.g., GAO, *Small Unmanned Aircraft Systems: FAA Should Improve Its Management of Safety Risks*, GAO-18-110 (Washington, DC: May 24, 2018); *Unmanned Aerial Systems: FAA Continues Progress toward Integration into the National Airspace*, GAO-15-610 (Washington, DC: July 16, 2015); *Unmanned Aircraft Systems: Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System*, GAO-12-981 (Washington, DC: Sept. 14, 2012); *Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses within the National Airspace System*, GAO-08-511 (Washington, DC: May 15, 2008).

³ See GAO-18-110, GAO-15-610, GAO-12-981, GAO-08-511, *supra* note 2.

⁴ A “small” UAS is defined as one that weighs less than 55 pounds, including the weight of anything attached to or carried by the aircraft. 49 U.S.C. § 44801(9).

⁵ FAA, *FAA Aerospace Forecast, Fiscal Years 2020-2040* (March 26, 2020), at 48, 52, available at https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2020-40_faa_aerospace_forecast.pdf (last visited Sept. 1, 2020).

⁶ *Id.*

⁷ Commercial operators used UAS for the following purposes: research and development/training (21%), event photography (personal events, entertainment, sports) (21%), industrial inspections (16%), real estate (13%), construction and agriculture (about 8% each), press and media (5%), and other uses (9%). See FAA, *FAA Aerospace Forecast, Fiscal Years 2019-2039* (April 30, 2019), at 48, available at

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Routine, for-hire UAS package delivery may be on the horizon, however, and FAA predicts that growth in the UAS small-package delivery sector could be “phenomenal.”⁸ Under FAA’s general operating rules for commercial UAS operations, deliveries made beyond a UAS operator’s visual line of sight currently are allowed only by FAA waiver. Over the last year, however, initially in connection with the Department of Transportation’s (DOT) UAS Integrated Pilot Program and more recently under FAA’s traditional air carrier regulations, FAA has approved drone deliveries on a broader basis by several commercial ventures.⁹ FAA also has announced its intention to issue “type certificates” for package-delivery drones, to ensure their safety and airworthiness, once certification standards evolve for this special class of UAS.¹⁰ On a potentially broader scale, the U.S. Postal Service has explored the possibility of UAS package and mail delivery.¹¹

A. Constitutional Framework of Federal, State, Local, and Tribal Authorities to Regulate UAS Operations

The fundamental balance of power between the federal government and the state, local, and tribal governments is established by the U.S. Constitution and governing case law. As the Supreme Court has explained, “[i]n our federal system, the National Government possesses only limited powers; the States and the people retain the remainder. The States have broad authority to enact legislation for the public good—what we have often called a ‘police power.’ . . . The Federal Government, by contrast, has no such authority and ‘can only exercise the powers granted to it’”¹²

www.faa.gov/data_research/aviation/aerospace_forecasts/media/fy2019-39_faa_aerospace_forecast.pdf (last visited Sept. 1, 2020).

⁸ *FAA Aerospace Forecast, Fiscal Years 2020-2040*, *supra* note 5, at 53.

⁹ For example, In March 2019, FAA approved the first revenue-generating UAS package deliveries in the U.S. in connection with DOT’s Integration Pilot Program (IPP) (discussed in Part B.2.b. below). Under this FAA approval, United Parcel Service (UPS), in partnership with drone manufacturer and operator Matternet, delivered medical samples for laboratory testing to a hospital campus in Raleigh, North Carolina.

In April 2019, again in connection with the IPP, FAA issued its first Single Pilot air carrier certificate for drone operations to Wing Aviation, LLC, for delivery of food and over-the-counter pharmaceuticals to homes in Christiansburg, VA. FAA certified Wing under its 14 C.F.R. Part 135 air carrier regulations rather than its 14 C.F.R. Part 107 UAS regulations (exempting the operations from inapplicable Part 135 provisions), because the Part 107 rules currently prohibit routine flights beyond a pilot’s visual line of sight absent a waiver.

In September 2019, FAA issued its first Standard Operator Part 135 certificate for drone delivery operations to UPS Flight Forward, Inc., with no weight or time-of-day restrictions or limits. FAA issued its second Standard Operator Part 135 air carrier certificate for drone delivery operations in October 2019 to Wing Aviation. In August 2020, FAA issued temporary exemptions and an operating certificate to Amazon Prime Air to conduct drone delivery operations within a “UAS test range.” As of May 2020, FAA said it is working on Part 135 air certificate applications for several additional UAS operators involved in the IPP.

¹⁰ 85 Fed. Reg. 5905 (Feb. 3, 2020).

¹¹ In 2016, the Postal Service’s Office of Inspector General conducted a nationwide public opinion survey about the appeal of drone technology and its perceived risks and benefits. U.S. Postal Service Office of Inspector General, *Public Perception of Drone Delivery in the United States*, Report No. RARC-WP-17-001 (Oct. 11, 2016).

¹² *Bond v. United States*, 572 U.S. 844, 854 (2014) (citations omitted).

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One of the enumerated powers the Constitution grants to Congress is the Commerce Clause power. The Commerce Clause, which has been Congress’s principal source of authority in enacting aviation safety and airspace management legislation, authorizes Congress:

“[t]o regulate Commerce with foreign Nations, and among the Several States, and with the Indian Tribes.”¹³

The powers of the states and the people are addressed by the Tenth Amendment, part of the Bill of Rights. The Tenth Amendment provides that:

“[t]he powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.”¹⁴

These reserved state powers include traditional police powers to protect public health, safety, and welfare on matters such as property rights, privacy, land use and zoning, and law enforcement.

Congress’s authority with respect to Indian tribes derives from what is referred to as the Indian Commerce Clause, part of the Commerce Clause quoted above—the power “[t]o regulate Commerce . . . with the Indian Tribes.” Congress’s authority also derives from the Senate’s right to approve treaties made by the President, which comes from the Constitution’s Treaty Clause. The Treaty Clause provides that:

“[t]he President shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur”¹⁵

Treaties between the United States and Indian tribes grant certain rights to the United States and reserve other rights not explicitly granted to the United States to the tribes.¹⁶ Together, the Commerce Clause and the Treaty Clause provide Congress with broad, general powers to legislate with respect to Indian tribes.¹⁷

Finally, the Constitution provides that federal law is “supreme” and that when the federal

¹³ U.S. Const. Art. I, sec. 8, cl. 3.

¹⁴ U.S. Const. Amend. X.

¹⁵ U.S. Const. Art. II, § 2, cl. 2.

¹⁶ *United States v. Winans*, 198 U.S. 371, 381 (1905). Although the federal government’s treaty-making with Indian tribes ceased in 1871, treaties remain in force as the supreme law of the land under the Constitution’s Supremacy Clause (discussed below) unless and until abrogated by a later enacted statute. See 25 U.S.C. § 71; *The Cherokee Tobacco Case*, 78 U.S. 616, 621 (1870).

¹⁷ See *United States v. Lara*, 541 U.S. 193, 200 (2004), citing *Morton v. Mancari*, 417 U.S. 535 (1974); *McClanahan v. Arizona Tax Comm’n*, 411 U.S. 164 (1973).

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government acts within its enumerated powers, federal law prevails over state law. Otherwise, the powers remain with the states and the people. This doctrine, known as the preemption doctrine, is based on the Supremacy Clause, which provides that:

“[t]his Constitution and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.”¹⁸

Federal preemption by “Laws of the United States” can occur in three basic ways: “express preemption,” “conflict preemption,” and “field preemption.”¹⁹ The Supreme Court has made clear, however, that particularly in areas of traditional state concern, one must “start with the assumption that the historic police powers of the States [are] *not* to be superseded by . . . Federal Act[s] unless that [is] the clear and manifest purpose of Congress.”²⁰ This assumption is based on the status of states as “independent sovereigns in our federal system”²¹ The Supreme Court also has required clear congressional intent to preempt because “the state is powerless to remove the ill effects of [federal preemption], while the national government, which has the ultimate power, remains free to remove the burden.”²²

Whether federal law prevails over laws promulgated by Indian tribes under their inherent sovereign powers is not governed by the Supremacy Clause, which applies only to states and does not address the unique historical origins of tribal sovereignty.²³ Rather, federal laws of

¹⁸ U.S. Const. Art. VI, cl. 2. See, e.g., *Gustafson v. City of Lake Angelus*, 76 F.3d 778, 782 (6th Cir. 1996), cert. denied, 519 U.S. 823 (1996) (citation omitted) (preemption doctrine “springs from the Supremacy Clause of the Constitution”).

¹⁹ Express preemption occurs when the language of the statute expressly indicates it preempts state law. Conflict preemption occurs either when compliance with both federal and state law is impossible or when compliance with both laws is possible but state law stands as an obstacle to the full accomplishment of the purposes and objectives of Congress. Field preemption occurs when federal law so thoroughly occupies a legislative field, or federal regulation is so pervasive, that courts can reasonably infer Congress intended to leave no room for state action. See, e.g., *Cipollene v. Liggett Group, Inc.*, 505 U.S. 504 (1992); *Rice v. Santa Fe Elevator Corp.* 331 U.S. 218 (1947); *Hines v. Davidowitz*, 312 U.S. 52 (1941).

²⁰ *Cipollene*, supra note 19, 505 U.S. at 516, citing *Rice*, supra note 19, 331 U.S. at 230 (emphasis added). “Preemption is predicated on congressional intent.” *Gustafson*, supra note 18, 76 F. 3d at 782.

²¹ *Medtronic, Inc. v. Lohr*, 518 U.S. 470, 485 (1996) (“[B]ecause the states are independent sovereigns in our federal system, we have long presumed that Congress does not cavalierly pre-empt state-law causes of action. . . . particularly in those [cases] in which Congress has ‘legislated . . . in a field which the States have traditionally occupied’”) (citations omitted). See also *San Diego Building Trades Council v. Garmon*, 359 U.S. 236, 243 (1959) (assumption that state police power laws are not to be preempted absent clear congressional intent derives from “due regard for the presuppositions of our embracing federal system, including the principle of diffusion of power not as a matter of doctrinaire localism but as a promoter democracy . . .”).

²² *Penn. Dairies, Inc. v. Milk Control Comm’n*, 318 U.S. 261, 275 (1943).

²³ As the Supreme Court has explained, Indian tribes are neither states, nor part of the federal government, nor subdivisions of either, but instead are “domestic dependent nations.” *Cherokee Nation v. Georgia*, 30 U.S. 1, 17 (1831). Indian tribes pre-date the establishment of the United States and have inherent powers of limited sovereignty which have never been extinguished. *United States v. Wheeler*, 435 U.S. 313, 322-23 (1978), quoting *Cohen’s*

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general applicability apply to Indian tribes if the laws neither explicitly include nor exclude tribes, unless there is evidence of congressional intent to the contrary or the law's application would adversely affect treaty rights or the tribe's inherent right of self-government.²⁴ Depending upon the text of the generally applicable law, its application to Indian tribes may then preempt or permit tribal regulation.²⁵

B. Federal UAS Regulation and Enforcement

1. Congress's Enactment of Aviation Legislation under the Commerce Clause

Pursuant to this Constitutional framework and relying on its Commerce Clause power, Congress has enacted a series of aviation laws beginning with the Air Commerce Act of 1926.²⁶ Over time, Congress expanded and amended the 1926 Act through numerous authorization acts, including substantial legislation in 1938²⁷ and the landmark Federal Aviation Act of 1958, FAA's organic statute.²⁸ The Federal Aviation Act was passed following a series of fatal collisions between civil and military aircraft operating under separate flight rules, to which Congress responded by creating and providing for enforcement of one unified system of flight rules under the control of the Federal Aviation Agency, renamed as the Federal Aviation Administration in 1966.

Today, the Federal Aviation Act, as amended, provides in part that every "citizen of the United States has a public right of transit through the navigable airspace" and that FAA shall regulate the use of this airspace "to ensure the safety of aircraft and the efficient use of airspace."²⁹ Congress originally defined "navigable airspace" in 1926 as "airspace above the minimum safe altitudes of flight prescribed by the Secretary of Commerce"³⁰ It expanded this definition in

Handbook of Federal Indian Law at 122 (1945). See generally *Reich v. Mashantucket Sand & Gravel*, 95 F.3d 174, 181 (2d Cir. 1996) (because tribes are not states, federal Occupational Safety and Health Act does not preempt tribal safety regulations in the same manner as it preempts state laws).

The Supreme Court also has explained that "the unique historical origins of tribal sovereignty make it generally unhelpful to apply to federal enactments regulating Indian tribes those standards of pre-emption that have emerged in other areas of the law. Tribal reservations are not States, and the differences in the form and nature of their sovereignty make it treacherous to import to one notions of pre-emption that are properly applied to the other." *White Mountain Apache Tribe v. Bracker*, 448 U.S. 136, 143 (1980).

²⁴ See *Cohen's Handbook of Federal Indian Law* § 2.03 at 124-27 (Nell Jessup Newton ed., 2012).

²⁵ Cf. *NLRB v. Little River Band of Ottawa Indians Tribal Gov't*, 788 F. 3d 537 (6th Cir. 2015) (federal National Labor Relations Act applies to tribe's operation of casino resort; tribe's conflicting employment and labor-organizing ordinances are not enforceable, but court does not explicitly address preemption).

²⁶ Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568 (1926).

²⁷ Civil Aeronautics Act of 1938, Pub. L. No. 75-706, 52 Stat. 973 (1938).

²⁸ Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731 (1958), as amended and recodified, 49 U.S.C. §§ 40101 *et seq.*

²⁹ 49 U.S.C §§ 40103(a)(2), (b)(1).

³⁰ Air Commerce Act of 1926, *supra* note 26, § 10, 44 Stat. at 574.

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1958 to add airspace needed for safe takeoffs and landings in addition to flight³¹ and today, the definition is codified as “airspace above the minimum altitudes of flight prescribed by regulations . . . , including airspace needed to ensure safety in the takeoff and landing of aircraft.”³²

Congress took explicit action to regulate civil (non-government) UAS operations starting in 2012. In the FAA Modernization and Reform Act of 2012 (FMRA)³³ and subsequent acts,³⁴ Congress directed FAA to determine whether civil UAS may operate safely in the “national airspace system” and if it so determines, to establish requirements for safe operation in and integration into that system.³⁵ Congress has not defined “national airspace system”; FAA has defined this term in its Pilot/Controller Glossary as a “network” consisting of “U.S. airspace” (an undefined term)³⁶ together with aviation-related facilities, rules, technical information, manpower, and material.³⁷ DOT officials told us that as so defined, “national airspace system” is “a broader concept than the ‘navigable airspace.’”

2. FAA’s Regulation of UAS Operations

a. Operational Requirements

Based on its reading of these statutory authorities, FAA and its predecessor agencies³⁸ have

³¹ Federal Aviation Act of 1958, *supra* note 28, § 101(24), 72 Stat. at 739.

³² 49 U.S.C. § 40102(a)(32).

³³ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 332, 126 Stat. 11 (2012).

³⁴ See, e.g., FAA Extension, Safety, and Security Act of 2016, Pub. L. No. 114-190, 130 Stat. 615 (2016); FAA Reauthorization Act of 2018, Pub. L. No. 115-254, 132 Stat. 3186 (2018 FAA Reauthorization Act). See *also* National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 1092(d), 131 Stat. 1283, 1610-1611 (2017).

³⁵ See 49 U.S.C. §§ 44802, 44807.

³⁶ Congress declared in the 1926 Air Commerce Act that “the Government of the United States has, to the exclusion of all foreign nations, complete sovereignty of the *airspace over the lands and waters of the United States*, including the Canal Zone.” Air Commerce Act of 1926, *supra* note 26, § 6(a), 72 Stat. at 572 (emphasis added). Today, the Federal Aviation Act similarly provides that “the United States Government has exclusive sovereignty of *airspace of the United States*.” 49 U.S.C. § 40103(a)(1) (emphasis added). Congress has not defined either of these “U.S. airspace”-related terms, with respect to altitude or any other characteristic.

³⁷ See FAA Order JO 7110.65Y, Air Traffic Control, Appendix - *Pilot/Controller Glossary* at p. PCG N-1, available at https://www.faa.gov/documentLibrary/media/Order/7110.65Y_ATC_Bsc_w_Chg_1_2_dtd_7-16-20.pdf (last visited Sept. 1, 2020) (defining “national airspace system” as the “common network of U.S. airspace; air navigation facilities, equipment and services, airports, or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.”). See *also* Presidential Memorandum to Heads of Executive Departments and Agencies, *Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems*, 80 Fed. Reg. 9355, 9355 (Feb. 20, 2015) (same except last sentence states, “Included in this definition are system components shared jointly by the Departments of Defense, Transportation, and Homeland Security.”).

³⁸ Starting with the 1926 Air Commerce Act, Congress has assigned responsibility for regulating aviation safety, airspace management, and related matters to a number of federal agencies as follows:

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developed a comprehensive regulatory system governing the safe operation of aircraft and the efficient use of the airspace.³⁹ Among other things, FAA's regulations govern air traffic control and prevention of collisions between aircraft, including establishment of minimum safe flight altitudes—generally 500 feet above the ground in most non-congested areas and 1,000 feet above the highest structure in congested areas, except that certain aircraft or aircraft operating under certain circumstances may fly below these altitudes pursuant to FAA-prescribed regulations, routes, or altitudes.⁴⁰

Over time, FAA has integrated UAS operations into this existing regulatory system originally developed in the context of manned aircraft.⁴¹ Prior to enactment of FMRA in 2012, FAA addressed UAS operations through agency guidance and policy statements⁴² as well as through

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- 1926 – a new Aeronautics Branch was established within the Department of Commerce; its functions included testing and licensing of pilots, certification of aircraft, and accident investigations.
 - 1934 - the Aeronautics Branch was renamed the Bureau of Air Commerce.
 - 1938 – an independent Civil Aeronautics Authority was created; its responsibilities included non-military aviation, air traffic control, and regulation of airline fares and routes.
 - 1940 – the Civil Aeronautics Authority was split into the Civil Aeronautics Administration—which was returned to the Department of Commerce and which was responsible for air traffic control, airman and aircraft certification, safety enforcement, and airway development—and the Civil Aeronautics Board (CAB)—which was responsible for safety rulemaking, accident investigation, and economic regulation of airlines.
 - 1958 – the independent Federal Aviation Agency was created and became responsible for civil aviation safety, receiving the CAA's responsibilities and certain of the CAB's responsibilities. The CAB retained responsibility for commercial airline practices, fares, and accident investigations.
 - 1966/1967 – the Federal Aviation Agency was renamed the Federal Aviation Administration as part of the creation of the Department of Transportation. The CAB's accident investigation function was transferred to the newly created National Transportation Safety Board. CAB was sunsetted in 1984.

See generally FAA, *A Brief History of the FAA*, available at https://www.faa.gov/about/history/brief_history/ (last visited Sept. 1, 2020).

³⁹ See 14 C.F.R. Parts 21-193.

⁴⁰ 14 C.F.R. §§ 91.119(b), (c). Helicopters may be operated below these minimum altitudes in accordance with FAA-prescribed routes and altitudes. Other aircraft may operate below these minimum altitudes in other than congested areas if they are flying over open water or a sparsely populated area (but in that case, not closer than 500 feet from any person, vessel, vehicle, or structure). *Id.*, §§ 91.119(c), (d). Agricultural aircraft (e.g., crop dusters) may operate below 500 feet in certain limited circumstances. 14 C.F.R. §§ 137.49, 137.51.

⁴¹ In addition to FAA, other federal agencies have or have had certain UAS-related responsibilities. These include the National Aeronautics and Space Administration, the Federal Communications Commission, the Departments of Justice, Defense, Homeland Security, and Energy, the Federal Trade Commission (FTC), and the Department of Commerce's National Telecommunications and Information Administration (NTIA). We discuss the UAS-related roles and responsibilities of FTC and NTIA in Appendix III.

⁴² In 1981, FAA issued Advisory Circular 91-57, *Model Aircraft Operating Standards* (AC- 91-57, June 9, 1981) (now superseded), which set forth general "safety standards" for model aircraft operations. In 2007, FAA issued a policy statement, *Unmanned Aircraft Operations in the National Airspace System*, Notice 07-01, 72 Fed. Reg. 6689 (Feb. 13, 2007), acknowledging that "[r]egulatory standards need to be developed to enable current technology for unmanned aircraft to comply with Title 14 Code of Federal Regulations (CFR)"; clarifying its current requirements for

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enforcement of general aircraft safety regulations.⁴³ In response to Congress's directives in FMRA and subsequent legislation directing FAA to plan and carry out the safe integration of civil UAS into the national airspace system as noted above, FAA has developed regulations tailored to the unique flight characteristics and capabilities of UAS, such as their small size and low-altitude flight capabilities.

FAA's UAS-specific rulemaking began in 2015 and is ongoing. In 2015, FAA required registration of all UAS weighing more than 0.55 pounds and display of the registration number on the UAS.⁴⁴ In 2016, FAA promulgated what are known as the Part 107 regulations, which are now the default operating rules for small UAS and mandatory for all commercial UAS operations.⁴⁵ Prior to promulgation of Part 107, commercial UAS operators were required to obtain a traditional pilot's license and FAA permission for each flight. Part 107 allows UAS operators to obtain a Remote Pilot Certificate so that FAA per-flight permission is unnecessary.

Absent an FAA waiver, the Part 107 rules currently impose a number of restrictions on how and where small UAS may fly. These include a maximum flight altitude of 400 feet above ground level, flights only within the operator's visual line of sight and during daylight hours, and no flights over persons not participating in the UAS operation (known as "flights over people").⁴⁶ While as noted above, FAA has prescribed explicit regulatory minimum flight altitudes in the context of manned aircraft, it has prescribed no explicit regulatory minimum flight altitude for UAS. DOT officials nevertheless told us "it is the Department's stance that, for purposes of the definition of the term navigable airspace, zero feet ('the blades of grass') is the minimum altitude of flight for UAS."

UAS recreational fliers—that is, operators of small UAS that are flown strictly for "recreational purposes" and meet other criteria (previously known as hobbyist or model aircraft UAS operators)—can but are not required to follow the Part 107 requirements. Instead, they may operate without specific FAA certification or authorization if the operation adheres to statutory requirements for UAS "limited recreational operations." These include that the UAS is flown in accordance with community-based organization safety guidelines developed in coordination

government, commercial, and recreational UAS use; and noting current FAA policy that "no person may operate a UAS in the National Airspace System without specific authority." *Id.* at 6689-90.

⁴³ In *Huerta v. Pirker*, 2014 WL 8095629 (NTSB 2014), for example, an enforcement action filed before promulgation of FAA's UAS regulations, FAA assessed a \$10,000 civil penalty against a model airplane operator for operating his "aircraft" in a "careless or reckless manner so as to endanger the life or property of another," in violation of 14 C.F.R. § 91.13(a). The National Transportation Safety Board rejected the operator's challenge that his model airplane was not an "aircraft" and upheld FAA's penalty. Ultimately, Mr. Pirker agreed to pay a \$1,100 penalty without admitting liability.

⁴⁴ 80 Fed. Reg. 78594 (Dec. 16, 2015).

⁴⁵ 81 Fed. Reg. 42063 (June 28, 2016), codified at 14 C.F.R. Part 107.

⁴⁶ 14 C.F.R. §§ 107.29, 107.31, 107.39, 107.51. According to a recent analysis by a UAS trade association, as of the first quarter of 2020, FAA had granted more than 4,000 waivers. The analysis concluded that almost 95% percent of the 4,153 currently active waivers authorize UAS operations at night, with the remaining 5% authorizing flights over people, higher than 400 feet above ground level, beyond the operator's visual line of sight, in excess of 100 miles per hour, and in other advanced scenarios. See Association for Unmanned Vehicle Systems International, *New Part 107 Waiver Report—Analysis of Advanced Operations Granted by the FAA* (May 2020).

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with FAA, is flown below 400 feet and within the visual line of sight of the operator or a co-located observer, and is flown by an operator who passes an aeronautical knowledge and safety test.⁴⁷

FAA has proposed to amend the Part 107 rules to authorize routine UAS “flights over people” and at night.⁴⁸ The agency has indicated that because such operations could pose a risk to public safety and national security, it does not intend to finalize these proposed changes until it also finalizes requirements for a Remote Identification (Remote ID) system.⁴⁹ According to FAA, the general purpose of a Remote ID system—which would assign what many have called a “digital license plate” to each UAS device—would be to make certain location and identification information remotely available in real time to other airspace users and persons on the ground. FAA issued a proposed Remote ID rule on December 31, 2019;⁵⁰ DOT officials told us FAA plans to complete its analysis of public comments on the proposal by December 2020 and FAA officials have recently said the agency plans to issue the final rule by that time. (We discuss issues regarding Remote ID in Part D.2.c. below.) Finally, FAA has sought public comment on whether and in what circumstances it should impose additional UAS operating and performance restrictions, implement a UAS Traffic Management (UTM) system (there is currently no nationwide drone traffic management system), and other matters.⁵¹

b. Federal Preemption of State, Local, and Tribal Laws and Regulations

Congress and the courts have made clear that most, but not all, state and local laws and regulation relating to aviation safety and airspace management are preempted. Congress has expressly preempted states from regulating the prices, routes, and services of air carriers with economic authority from the DOT Office of the Secretary.⁵² In addition, the courts have ruled that the federal government occupies the field of aviation safety and the efficient use of the national airspace, and thus have generally struck down state and local aviation laws as “field-preempted.”⁵³ In *City of Burbank v. Lockheed Air Terminal Inc.*, for example, even though noise

⁴⁷ 49 U.S.C. § 44809. As promulgated, FAA’s 2015 UAS registration rule applied to UAS used for both recreational and commercial purposes. The U.S. Court of Appeals for the D.C. Circuit struck down the rule as applied to recreational fliers, however, holding that FAA lacked authority to require registration of model aircraft under FMRA § 336(a), which provided that FAA “may not promulgate any rule or regulation regarding a model aircraft.” *Taylor v. Huerta*, 856 F.3d 1089, 1092 (D.C. Cir. 2017) (“Statutory interpretation does not get much simpler. The Registration Rule is unlawful as applied to model aircraft.”). Congress then amended the law to restore application of the 2015 registration rule to recreational fliers. National Defense Authorization Act for Fiscal Year 2018, *supra* note 34, § 1092(d).

⁴⁸ 84 Fed. Reg. 3856 (Feb. 13, 2019).

⁴⁹ See 84 Fed. Reg. 72438, 72450, 72495 (Dec. 31, 2019).

⁵⁰ See *supra* note 49.

⁵¹ 84 Fed. Reg. 3732 (Feb. 13, 2019). Pursuant to section 373(b)(6) of the 2018 FAA Reauthorization Act, we will be issuing an audit report later this year on infrastructure requirements necessary for monitoring low-altitude UAS operations, including UTM.

⁵² 49 U.S.C. § 41713.

⁵³ See, e.g., *City of Burbank v. Lockheed Air Terminal Inc.*, 411 U.S. 624 (1973); *Abdullah v. American Airlines, Inc.*, 181 F.3d 363, 371 (3rd Cir. 1999) (“it follows from the evident intent of Congress that there be federal supervision of

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regulation was a traditional area of local rather than federal control, the Supreme Court struck down a local noise-based ordinance restricting airport takeoff and landing hours. The Court found that the Federal Aviation Act “requires a delicate balance between safety and efficiency . . . and the protection of persons on the ground The interdependence of these factors requires a uniform and exclusive system of federal regulation if congressional objectives underlying the . . . Act are to be fulfilled.”⁵⁴ Further, with respect to UAS-specific laws, the court in *Singer v. Newton* found that local ordinances effectively banning all UAS operations within city limits were “conflict-preempted” because they conflicted with FAA’s rules authorizing such flights.⁵⁵

Nevertheless, state⁵⁶ and federal⁵⁷ courts have upheld certain state and local laws affecting, but

air safety and from the decisions in which courts have found federal preemption of discrete, safety related matters, that federal law preempts the general field of aviation safety.”); *Montalvo v. Spirit Airlines*, 508 F. 3d 464 (9th Cir. 2007); *French v. Pan Am Express, Inc.*, 869 F.2d 1 (1st Cir. 1989); *British Airways Board v. Port Authority of New York and New Jersey*, 564 F.2d 1002 (2nd Cir. 1977). See also *Flores v. Texas*, 2017 WL 1397126 (S.D. Tex. 2017) (suit alleging federal field preemption of Texas Privacy Act’s original “border exception,” allowing unrestricted drone photography of persons and property within 25 miles of the U.S. border, dismissed on technical grounds).

⁵⁴ *City of Burbank*, *supra* note 53, 411 U.S. at 638-39. Justice Rehnquist, dissenting with three other Justices in *City of Burbank*, acknowledged that “[t]he paramount substantive concerns of Congress [in enacting the Federal Aviation Act] were to regulate federally all aspects of air safety . . . and, once aircraft were in ‘flight,’ airspace management” *Id.*, 411 U.S. at 644 (Rehnquist, J., dissenting). However, the dissenting Justices found this did not mean Congress had preempted states from regulating aircraft noise.

⁵⁵ *Singer v. Newton*, 284 F. Supp. 3d 125 (D. Mass.), *appeal dismissed on other grounds*, 2017 WL 8942575 (1st Cir. 2017). *Singer* found to be preempted the city’s prohibitions on: (1) UAS flight below an altitude of 400 feet over any private property without the express permission of the property owner; (2) UAS flight over public property without prior permission of the city; and (3) UAS flight at a distance beyond the visual line of sight of the operator. The court also found the city’s law imposing certain registration requirements on UAS owners to be preempted as conflicting with FAA’s registration rules. Cf. *Pan American Properties Corp. v. Municipality of San Juan*, 2018 WL 6503215 (D.P.R. 2018) (declining to rule on claim that local ordinance banning non-government authorized drone flights during festival was federally preempted because drone operator was authorized by FAA).

Another federal court is currently considering drone-related federal preemption, privacy, and First Amendment issues in a suit seeking to strike down the so-called surveillance and no-fly provisions of the Texas Privacy Act. See *Nat’l Press Photographers Ass’n v. McCraw*, No. 1:19-cv-00946-RP (W.D. Tex., filed Sept. 26, 2019).

⁵⁶ A number of states have enacted either general criminal reckless endangerment laws or criminal laws specifically prohibiting reckless operation of aircraft, and some courts have found these laws not to be preempted by FAA’s aviation safety regulations. See, e.g., *North Dakota v. Turgeon*, No. 30-2016-CR-1373 (Morton County, N.D. South Central Jud. Dist.), Order, May 17, 2017, and Transcript of Proceedings, May 17, 2017, at 7-9 (discussed below; court ruled reckless endangerment charges against UAS operator were not preempted by FAA’s UAS safety regulations); *Ward v. State*, 374 A.2d 1118, 1123-24 (Md. 1977) (upholding Maryland law criminalizing “operat[ion] of] an aircraft . . . in a careless or reckless manner so as to endanger the life or property of another” and declaring “[w]e have no difficulty whatever in deciding that Congress has not occupied the entire field of aeronautics by the Federal Aviation Act of 1958.”).

⁵⁷ Federal Courts of Appeals and the U.S. Supreme Court have upheld certain state and local laws that affected aircraft flight but did not regulate aviation safety or efficient airspace management. In *Skysign International, Inc. v. City and County of Honolulu*, 276 F.3d 1109 (9th Cir. 2002), the Ninth Circuit upheld a county ordinance banning aerial advertising. The court found Congress did not intend to preempt state regulation of all activity within navigable airspace and ruled the advertising ban did not conflict with any actual FAA regulation. In *Goodspeed Airport, LLC v. East Haddam Inland Wetland & Watercourses Comm’n*, 634 F.3d 206 (2d Cir. 2011), the Second Circuit upheld state and local requirements for a local airport to obtain a permit to remove trees it claimed were “obstructions to air navigation” under FAA regulations. Although the court held that “Congress has established its intent to occupy the entire field of air safety, thereby preempting state regulation of that field,” it found the local requirement to obtain a permit did not “sufficiently intrude upon the field of air safety to be preempted.” 634 F.2d at 208. See also *id.* at 212

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not regulating, aviation and airspace management, including at least one state-level court that ruled that state criminal laws may be used to address unsafe acts by UAS operators and are not federally preempted. It appears courts have not yet ruled on whether federal UAS laws, or aviation laws in general, apply to Indian tribes or preempt them from regulating UAS operations.⁵⁸

FAA's Part 107 rules do not indicate whether the agency believes the Federal Aviation Act or the agency's implementing regulations preempt state, local, or tribal laws or regulations affecting UAS. In issuing Part 107, FAA explained that federal preemption "necessitate[s] a case-specific analysis that is not appropriate in a rule of general applicability" and acknowledged that "certain legal aspects concerning small UAS may be best addressed at the State or local level."⁵⁹ Similarly, FAA stated in issuing the Part 107 rules that it will address the applicability of its regulations to Indian tribes on a case-by-case basis, in accordance with Executive Orders and FAA implementing guidance.⁶⁰

("Although we hold that Congress has indicated its intent to occupy the entire field of aviation safety, the generally applicable state laws and regulations imposing permit requirements on land use challenged here do not, on the facts before us, invade that preempted field."). DOT officials told us that the courts in *Skysign* and *Goodspeed Airport* sought the federal government's views and that in both cases, the government agreed there was no preemption. Finally, in *Braniff v. Nebraska State Bd. of Equalization and Assessment*, 347 U.S. 590 (1954), the Supreme Court upheld a state's assessment of an ad valorem personal property tax on an interstate air carrier's flight equipment. Although Congress had given the Civil Aeronautics Authority broad authority to regulate the safe and efficient use of the navigable airspace, the Court found this did not preempt states from imposing certain property-related requirements, such as taxes, on interstate air carriers.

⁵⁸ In a closely watched case, the Supreme Court earlier this year declined to review a federal appeals court decision that the Federal Aviation Act does not preempt state-law negligence and strict liability claims against an airplane engine manufacturer under either field-preemption or conflict-preemption principles. See *Slikkelee v. Precision Airmotive Corp.*, 907 F.3d 701 (3d Cir.), cert. denied sub nom. *Avco Corp. v. Slikkelee*, 140 S. Ct. 860 (2020). If the Supreme Court had agreed to hear the case, its ruling may have had implications for Federal Aviation Act preemption more broadly, including preemption of state and local regulations affecting UAS operations.

⁵⁹ 81 Fed. Reg. at 42194. FAA's views on the preemptive effect of federal UAS laws would not be dispositive; ultimately this would be for a court to decide. As the Supreme Court has made clear, while courts defer to agency interpretations of their implementing statutes in certain circumstances, courts do not defer "to an agency's conclusion that state law is pre-empted. Rather, we have attended to an agency's explanation of how state law affects the regulatory scheme. . . .The weight we accord the agency's explanation of state law's impact on the federal scheme depends on its thoroughness, consistency, and persuasiveness." *Wyeth v. Levine*, 555 U.S. 555, 576-77 (2009) (emphasis in original) (citations omitted).

⁶⁰ 81 Fed. Reg. at 42079, 42189; see also 84 Fed. Reg. 3856, 3902 (Feb. 13, 2019) (discussing its proposed "flights over people" rule, FAA stated it will "engage in government-to-government consultations with tribes as appropriate in accordance with Executive orders and FAA guidance"). Section 5(c) of Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, 65 Fed. Reg. 67249 (Nov. 6, 2000), directs federal agencies to consult with tribes when developing regulatory policies that have tribal implications. These include regulations that have substantial direct effects on either one or more Indian tribes, on the relationship between the federal government and Indian tribes, and on the distribution of power and responsibilities between the federal government and Indian tribes. Section 5(c) also states that "[t]o the extent practicable and permitted by law, no agency shall promulgate any regulation that has tribal implications and that preempts tribal law" unless the agency has taken certain steps.

In turn, FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures* (Jan. 28, 2004), directs FAA to follow the requirements of Executive Order 13175. Although FAA has determined that its Part 107 UAS regulations do not have unique tribal implications, it has stated that it is outreaching to tribes in response to their inquiries about their UAS regulatory authority, to explore how tribes' concerns can be addressed within FAA's broader UAS integration effort. See 81 Fed. Reg. at 42079, 42189.

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While emphasizing that preemption is a case-specific determination, FAA has issued and continues to reference several guidance documents setting forth its general legal position on these matters, and DOT officials reiterated the general principles in these guidance documents during our work on this report. In December 2015, the FAA Chief Counsel's Office issued a fact sheet for states and localities, *State and Local Regulation of Unmanned Aircraft Systems* (2015 FAA UAS Fact Sheet).⁶¹ The 2015 FAA UAS Fact Sheet describes the "extensive federal statutory and regulatory framework pertaining to control of the airspace, flight management and efficiency, air traffic control, aviation safety, navigational facilities, and the regulation of aircraft noise at its source," citing 49 U.S.C. §§ 40103, 44502, and 44701-44735 (the Federal Aviation Act as amended and recodified). The 2015 Fact Sheet then states that "[s]tate and local restrictions affecting UAS operations should be consistent with" this framework and cautions that "[s]ubstantial air safety issues are raised when state or local governments attempt to regulate the operation or flight of aircraft," citing several of the federal court decisions noted above.

As DOT officials explained to us, however, while the federal preemption doctrine "invalidates State and local laws that interfere with or are contrary to the laws of Congress," and which courts "have confirmed [provides FAA with] exclusive authority over aviation safety, efficient use of the navigable airspace, and air traffic control . . . , non-Federal government actors may still issue ordinances affecting UAS [as long as they] do not touch the federally preempted field" of aviation safety and the efficient management of airspace. The 2015 Fact Sheet provides examples of the types of state and local laws that generally would and would not be preempted—"operational UAS restrictions on flight altitude, flight paths; operational bans; any regulation of navigable airspace"; and "[m]andating equipment or training for UAS related to aviation safety," such as geo-fencing, likely would be preempted and police power laws such as "land use, zoning, privacy, trespass, and law enforcement operations" likely would not be preempted.⁶² FAA supplemented this list of likely non-preempted state and local laws in a 2018 press release, *Federal vs. Local Drone Authority* (2018 FAA UAS Press Release), which added land use laws and zoning laws that regulate where UAS landing sites may be located as examples.⁶³

In addition to these 2015 and 2018 guidance documents, another tool FAA is using to identify and address UAS-related preemption issues, as well as to accomplish a number of other UAS integration goals, is DOT's UAS Integration Pilot Program (IPP). DOT, in consultation with FAA,

⁶¹ FAA Office of the Chief Counsel, *State and Local Regulation of Unmanned Aircraft Systems (UAS) Fact Sheet* (Dec. 17, 2015) (2015 FAA UAS Fact Sheet), available at https://www.faa.gov/uas/resources/policy_library/media/UAS_Fact_Sheet_Final.pdf (last visited Sept. 1, 2020).

⁶² More specifically, the 2015 Fact Sheet lists the following examples of police power laws that likely would not be preempted: (1) requiring police to obtain a warrant before using UAS for surveillance; (2) prohibiting voyeurism by UAS; (3) prohibiting use of UAS for hunting or fishing or for harassment of hunters or fishermen; and (4) prohibiting attachment of firearms or other weapons to UAS.

⁶³ FAA, *Federal vs. Local Drone Authority* (July 20, 2018) (2018 FAA UAS Press Release), available at https://www.faa.gov/news/press_releases/news_story.cfm?newsId=22938&omniRss=press_releasesAoc&cid=102_P_RPress (last visited Sept. 1, 2020). The 2018 FAA UAS Press Release did not include "trespass" as an example of a state law that likely would not be preempted, in contrast to the 2015 UAS Fact Sheet's inclusion of that example. DOT officials told us this change was inadvertent and not intended to serve as a change in FAA policy.

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established the IPP in 2017 as directed by a Presidential Memorandum,⁶⁴ and the program was codified by section 351 of the 2018 FAA Reauthorization Act.⁶⁵ Section 351 provides that the IPP as established under the statute is to be concluded by October 2020.⁶⁶ As required by section 351 and according to DOT, the IPP is bringing state, local, and tribal governments together with private sector entities, such as UAS operators and manufacturers, to accelerate safe drone integration by helping these parties and DOT and FAA to:

- identify the most effective models of balancing local and national interests in UAS integration (including preemption issues);
- improve communications with state, local, and tribal jurisdictions;
- address competing interests regarding UAS operational expansion, safety, security, roles and responsibilities of non-federal government entities, and privacy risks; and
- accelerate FAA's approval of UAS operations that currently require special authorizations.⁶⁷

There are currently nine IPP Lead Participants, selected by FAA from a variety of state, local, and tribal governments and private sector entities.⁶⁸ The Lead Participants are testing and evaluating a variety of operational concepts such as flights over people, at night, and beyond the operator's visual line of sight, as well as UAS package delivery.⁶⁹ In soliciting applicants for the IPP, FAA provided the opportunity for governments to request temporary so-called reasonable time, place, and manner limitations on low-altitude UAS operations within their jurisdictions, in order to facilitate the proposed development and testing of new and innovative UAS concepts of operations.⁷⁰

⁶⁴ See Presidential Memorandum for the Secretary of Transportation, Subject: Unmanned Aircraft Systems Integration Pilot Program (Oct. 25, 2017), available at <https://www.whitehouse.gov/presidential-actions/presidential-memorandum-secretary-transportation/> (last visited Sept. 1, 2020). Section 1 of the Memorandum references the need for input from state, local, tribal, and private-sector stakeholders "to craft an optimal strategy for the national management of UAS operations" and states that "[a] coordinated effort between the private sector and among these governments will provide certainty and stability to UAS owners and operators, maximize the benefits of UAS technologies for the public, and mitigate risks to public safety and security."

⁶⁵ 132 Stat. at 3301-3304.

⁶⁶ See § 351(i), 132 Stat. at 3304.

⁶⁷ See *generally* FAA, UAS Integration Program: Program Overview, available at https://www.faa.gov/uas/programs_partnerships/integration_pilot_program/ (last visited Sept. 1, 2020).

⁶⁸ 82 Fed. Reg. 51903 (Nov. 8, 2017) (FAA announcement of IPP application process). FAA originally selected 10 IPP Lead Participants. The 9 current Lead Participants are the Choctaw Nation of Oklahoma (Durant, OK); the City of San Diego, CA; the Kansas Department of Transportation (Topeka, KS); the North Carolina Department of Transportation (Raleigh, NC); the Innovation and Entrepreneurship Investment Authority (Herndon, VA); the Memphis-Shelby County Airport Authority (Memphis, TN); the North Dakota Department of Transportation (Bismarck, ND); the City of Reno, NV; and the University of Alaska-Fairbanks (Fairbanks, AK). We interviewed representatives from the first four Lead Participants.

⁶⁹ As noted, *see supra* note 9 and accompanying text, FAA has approved several UAS package delivery ventures as part of the IPP.

⁷⁰ See 82 Fed. Reg. 51903, 51905 (Nov. 8, 2017). FAA's examples of time/place/manner limitations it would consider as part of the IPP included imposing bans on UAS flights during specified hours; designating UAS takeoff and landing zones; restricting UAS flights over public roads and parks, sidewalks, or private property based on zoning density or other land use considerations; requiring prior notice of UAS flights to public safety or zoning/land use authorities;

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Importantly, however, FAA's legal position regarding federal preemption of state and local laws and other UAS-jurisdiction related issues is currently under an in-depth review by attorneys at FAA and DOT's Office of the Secretary. According to DOT officials, the rapid technical advancement of UAS has brought significant preemption issues to the forefront. In addition, the unique operating characteristics of UAS continue to raise the issue of whether the existing framework of federal regulation of low-altitude UAS operations should be modified in response to this new technology. Given these issues and continuing questions from states, localities, and others concerning the breadth of federal preemption with respect to UAS operations, in late 2017, the DOT General Counsel convened a "preemption task force" to consider these issues, comprised of attorneys from DOT and FAA. DOT officials told us the mission of this group, known as the Joint Lawyers Working Group on Federal Preemption and the Regulation of Unmanned Aircraft Systems (DOT Preemption Working Group), is to develop a "unified legal position" on the application of federal preemption and related principles to the regulation of UAS. The Working Group's purposes, the officials said, are to establish a strong legal foundation not only for ensuring the safety of the national airspace system but also to encourage innovation in UAS technology and enable widespread commercial use of drones for the benefit of the American people.

In describing the efforts of the Preemption Working Group, DOT officials told us they recognize state and local governments have legitimate interests in protecting the property rights, privacy, and security of their citizens. Nevertheless, the officials also expressed concern that some jurisdictions are seeking to ban or significantly limit UAS operations. Such restrictions, the officials said, are presenting UAS operators with what they characterized as a "daunting regulatory patchwork" of differing restrictions, many of which the Department believes will conflict either with current law or regulatory policies it may wish to develop in the future. Further, the DOT officials told us, the Department believes the regulatory uncertainty created by what they referred to as a "hodge-podge of differing federal and state regimes" threatens to dampen innovation and investment in commercial drone use and impede progress toward the federal goal of UAS integration. Clearly defining what DOT believes is the scope of its regulatory authority, and thus the boundaries of its authority to preempt states and localities, will enable policymakers to proceed with greater clarity as they develop additional UAS regulations, according to the DOT officials.

The officials told us the DOT Preemption Working Group expects to provide its analysis and recommendations to senior DOT leadership in the coming months, following review and concurrence by the Department of Justice (DOJ). Public announcement of DOT's legal position is expected sometime thereafter. The DOT officials said they expect that the results of the IPP will inform the Working Group's analysis and that while the Working Group's efforts are focused on FAA's authority to regulate UAS operations, the conclusions reached could apply to FAA's regulation of manned aircraft as well. We discuss stakeholder positions about UAS preemption issues in Part D.1.b. below.

c. Enforcement and Compliance Assurance Regarding UAS Operations

FAA's primary approach to promoting compliance with its UAS requirements is to educate UAS

imposing limits on UAS operations below designated altitudes; imposing maximum flight speeds over specified areas; and imposing flight bans over transitory community events such as parades.

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operators about how they can operate safely under the law. The agency also uses compliance tools such as counseling, warning notices, and letters of correction, and it has used its formal civil administrative enforcement authority (non-criminal certificate actions) as well.⁷¹ In *Huerta v. Haughwout*, for example, FAA issued an investigative subpoena to a father and son regarding their use of a drone-mounted firearm and flame thrower a few feet above their private property.⁷² When the Haughwouts challenged FAA's authority to issue the subpoena, FAA explained to the court that it was investigating a possible violation of 14 C.F.R. § 91.13(a), which prohibits operation of an aircraft in a careless or reckless manner. The court enforced the subpoena but with considerable skepticism about FAA's authority to regulate UAS operations in low-altitude airspace over private property. (We discuss the *Haughwout* case and these jurisdictional issues in Part D.1.a. below.) Another example of FAA's use of its civil enforcement authority is its \$200,000 settlement with SkyPan International, Inc. in 2017, resolving FAA's proposed \$1.9 million civil penalty for dozens of allegedly unauthorized UAS flights in congested airspace over New York City and Chicago. DOT officials told us, however, that this enforcement action pre-dated the Part 107 rules and does not reflect current case types.

Finally, although FAA itself has no criminal enforcement authority, it may request DOJ to file charges for criminal violations. For example, DOJ has filed criminal charges against an individual for flying a UAS over two sports stadiums during professional football games, in alleged violation of FAA Temporary Flight Restrictions issued under 49 U.S.C. § 40103(b)(3) and FAA's classification of that airspace as National Defense Airspace.⁷³ DOJ alleges that this conduct violated 49 U.S.C. § 46307, which prohibits knowing or willful violation of such restrictions. While some state prosecutors have filed state criminal charges against individuals for shooting down a drone, as discussed in Part C.1. below, FAA and DOJ officials told us that as of August 1, 2020, they have not taken enforcement action or filed criminal charges in such cases.⁷⁴

d. FAA Actions to Address UAS-Related Privacy Concerns

One aspect of UAS operations that FAA has not addressed in its regulations is the impact of UAS on personal privacy. FAA officials told us the agency lacks authority to regulate UAS operations to address privacy concerns, noting that Congress has not directed it to do so as part of FAA's work to integrate UAS into the national airspace system and that this would be beyond

⁷¹ See generally FAA, *Law Enforcement Guidance for Suspected Unauthorized UAS Operations, Version 5* (Aug. 14, 2018) (2018 FAA Law Enforcement Guidance) at 1, 6; GAO, *Unmanned Aircraft Systems: FAA's Compliance and Enforcement Approach for Drones Could Benefit from Improved Communication and Data*, [GAO-20-29](#) (Washington, DC: Oct. 17, 2019).

⁷² *Huerta v. Haughwout*, 2016 WL 3919799 (D. Conn. 2016).

⁷³ See *United States v. Mapes*, 2020 WL 759541 (N. D. Cal. Feb. 14, 2020).

⁷⁴ See generally Joseph Suh, *Drones: How They Work, Applications, and Legal Issues*, 3 Geo. Tech. Rev. 502, 514 (Spring 2019); William J. Black III, *A No-Drones Home: Solving the Home Airspace Dilemma*, 11 J. Marshall L.J. 1, 27 (2017-2018). FAA's UAS-related enforcement actions between 2011 and 2015 reportedly consisted of incidents involving stadium/sporting events, mid-air or landing collisions, airspace violations (including a UAS operator who crashed a drone into a tree on the White House lawn), aircraft interference, hobbyist use, and unlicensed commercial use. Black, 11 J. Marshall L.J., at 16-20.

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FAA's traditional mission to ensure aviation safety and the efficient use of the airspace.⁷⁵ The officials also said FAA's rulemaking authority neither mandates nor permits it to issue or enforce regulations specifically aimed at protection privacy interests between private parties.

FAA nonetheless acknowledges the public's concerns about the use of small UAS to collect information about individuals and it has addressed these concerns by engaging and collaborating with the public, stakeholders, and other agencies that have authority and expertise in privacy law and policy. FAA also has noted that state and local governments may address UAS privacy concerns involving private parties using their police power authorities.⁷⁶ We discuss UAS privacy issues and the actions FAA and other government entities have taken to address these concerns in Appendix III.

C. State, Local, and Tribal UAS Regulation and Enforcement

Pursuant to their traditional police powers, some states and localities have relied on their general laws to address UAS operations, while almost all states and some localities also have enacted UAS-specific laws. We describe these laws below and provide examples of how they have been applied.⁷⁷

We begin with a note regarding UAS regulation and enforcement by Indian tribes. We spoke with tribal stakeholders to identify any unique interests tribal governments believe they may have regarding UAS operations. One stakeholder emphasized that there are 573 federally recognized tribes, each with a different view.⁷⁸ Another tribal stakeholder told us that while their interests are similar to those of local governments, tribes are sovereign nations with separate treaties and described them as a "patchwork nation." A third tribal stakeholder we spoke to indicated tribes have interests similar to states and localities, and want to be able to control their own property and airspace. This stakeholder emphasized a desire to promote UAS operations rather than restrict them, but wanted the ability to accept and manage that risk. In this section and throughout this report, we have noted any specific tribal stakeholder positions we obtained.

1. State and Local General Laws

Perhaps the most widely reported incident to date involving state and local efforts to address concerns about drone is known as the "Drone Slayer" case. This case, cited to us by a number of stakeholders, illustrates how states and localities have sought to use their non-UAS specific

⁷⁵ See also 81 Fed. Reg. 42064, 42190-92 (June 28, 2016) (final Part 107 rules).

⁷⁶ *Id.*, 81 Fed. Reg. at 42192.

⁷⁷ In addition to these state and local laws and actions taken to protect the public interest, individuals also may have legal rights to seek redress for what they believe are UAS-related harms particularized to them. We discuss possible individual claims under state and federal law for UAS-related interference with airspace property interests in Appendix II. We discuss possible individual claims under state and federal law for UAS-related interference with personal privacy rights in Appendix III.

⁷⁸ Since we spoke with this stakeholder, another Indian tribe has been federally recognized, bringing the total to 574 federally recognized tribes. Section 2870 of the National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92 (Dec. 20, 2019), added the Little Shell Tribe of Chippewa Indians of Montana as a federally recognized Indian tribe. The Bureau of Indian Affairs' updated listing of these 574 tribal entities appears at 85 Fed. Reg. 5462 (Jan. 30, 2020).

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laws to address such concerns. According to court filings and press reports, in 2015, a Kentucky landowner shot down a drone he said was hovering at a low altitude over his property, possibly taking video or photographs of his daughter, who was sunbathing. The state charged him with felony wanton endangerment and criminal mischief, but the landowner asserted he was justified under Kentucky's "stand your ground" law authorizing physical force to prevent an act of criminal trespass. The landowner also said he perceived the drone's presence as an invasion of his personal privacy. The state district court judge dismissed the charges, reportedly finding that because the drone was flying "below the tree line" and had violated the landowner's privacy, he had acted "within his rights" and "had a right to shoot" down the drone.⁷⁹

Some state and local government stakeholders cited the *North Dakota v. Turgeon* case to us as another example of a state or locality's efforts to use its general laws to address UAS concerns.⁸⁰ In connection with a public protest over construction of the North Dakota Access Pipeline, the state charged a UAS operator with criminal reckless endangerment for allegedly flying his UAS close to a plane in flight and over protestors, law enforcement officials, and moving vehicles. The operator sought to have the charges dismissed on the ground that as applied to UAS safety, the state criminal laws were preempted.

According to court filings, although local law enforcement told the UAS operator at the scene that he had violated various FAA UAS regulations, the operator was prosecuted under state criminal laws. The UAS operator argued that because the federal government has exclusive sovereignty of U.S. airspace and FAA has issued comprehensive regulations governing aircraft safety including UAS safety, the federal government has occupied this field and left the states without power to regulate or take enforcement action to address unsafe UAS operations. The court disagreed and ruled the criminal charges were not preempted, explaining that while the UAS operator's conduct might violate FAA regulations and the state would be preempted from regulating in that area, the state could still criminally prosecute the same conduct using its

⁷⁹ After the criminal charges were dropped, the UAS operator filed suit in federal court. He sought reimbursement for the cost of his destroyed drone and the court's declaration that he had a right to fly in federal "navigable airspace" within the federal government's exclusive jurisdiction, which he argued was not subject to private ownership or state tort claims. We discuss this federal suit, *Boggs v. Merideth*—which the court dismissed without reaching the merits of these jurisdictional arguments—in Part D.1. below.

In 2014, prior to the Drone Slayer incident, in what was said to be the first case brought against a civilian shooting down a drone, a Cape May, New Jersey landowner reportedly shot down a drone that was hovering over his family sitting by their backyard pool. The landowner said the drone was trespassing and invading his family's privacy. Local law enforcement charged him with possession of a firearm for an unlawful purpose and criminal mischief, and he ultimately pled guilty to criminal mischief.

According to press reports, state criminal charges also have been filed in connection with drone shootings in May 2020 (criminal damage to property and reckless discharge of a weapon within city limits charges filed against an individual who allegedly shot down a drone taking photographs over a Butterfield, Minnesota meat processing plant); February 2019 (third degree criminal mischief and prohibited use of a weapon charges filed against a Long Island, N.Y. landowner who allegedly shot down a missing-pet-rescue drone flying over or near his home); and November 2018 (criminal mischief charges filed against an Austin, Texas landowner who allegedly shot down a neighbor's drone flying over his home).

⁸⁰ *North Dakota v. Turgeon*, *supra* note 56.

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traditional police powers.⁸¹ Following a trial, the court found the UAS operator not guilty.

Another local government stakeholder we spoke to cited a longstanding ordinance of that locality—New York City—as an example of a general law being applied to UAS operations. The ordinance, enacted in 1948, prohibits takeoff and landing of “aircraft” within city limits except at locations designated by the local department of transportation or port authority.⁸² As a result of this restriction and with the exception of designated areas in specified local parks,⁸³ it appears UAS operations are currently prohibited throughout the entire city.

Finally, state and local stakeholders provided us with examples of their general laws being used to address UAS-related invasions of privacy. We discuss these examples in Appendix III.

2. State and Local UAS-Specific Laws

According to our analysis of information compiled by the National Conference of State Legislatures, 46 states had enacted some type of UAS-specific legislation or had issued UAS-specific resolutions or executive orders as of 2019, the most recent compilation available. As detailed in Appendix IV, these state laws and resolutions have addressed a wide variety of issues, including:

- protecting personal privacy against intrusion both by private individuals⁸⁴ and by law enforcement⁸⁵ (at least 26 states had passed personal privacy-related UAS laws or resolutions)⁸⁶
- prohibiting UAS operations above certain locations, such as prisons;⁸⁷
- prohibiting the use of UAS for hunting;⁸⁸ and

⁸¹ Order, May 17, 2017, and Transcript of Proceedings - Motion Hearing, May 17, 2017, at 7-9, *North Dakota v. Turgeon*, *supra* note 56.

⁸² N.Y.C. Admin. Code § 10-126(c).

⁸³ New York City local rules allow designation of park areas for flying of “toy or model aviation” devices. See N.Y.C. Dept. of Parks and Recreation Rules and Regulations § 1-05(r)(2) (“No person shall engage in any toy or model aviation, model boating, model automobiling, or activity involving other similar devices except at such times and at such places designated or maintained for such purposes. Violation of this paragraph constitutes a misdemeanor.”).

⁸⁴ See, e.g., Del. Code tit. 11, § 1334 (making it a crime to use a UAS to invade the privacy of another person on private property in a manner that violates the state’s existing invasion of privacy statute).

⁸⁵ See, e.g., Alaska Stat. §§ 14.40.082, 18.65.900-03, 09, 29.10.200, 29.35.146 (allowing police to use a UAS only pursuant to a search warrant or a judicially recognized exception to the warrant requirement).

⁸⁶ According to our analysis of the NCSL information, the 26 states were Alaska, Arkansas, California, Colorado, Delaware, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Mississippi, Montana, North Carolina, Oregon, New Jersey, South Dakota, Tennessee, Texas, Utah, Virginia, and Wisconsin.

⁸⁷ See, e.g., Cal. Penal Code § 4577 and Cal. Food and Agric. Code § 11901 (prohibiting the knowing and intentional operation of a UAS on or above the grounds of a state prison or jail or above a juvenile hall, camp, or ranch).

⁸⁸ See, e.g., Idaho Code § 36-1101 (prohibiting the use of UAS for hunting, molesting, or locating game animals, game birds, or fur-bearing animals).

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- preempting the regulation of UAS by localities.⁸⁹

In addition to these laws enacted at the state level, some localities also have enacted UAS-specific laws. For example, Stone Harbor, New Jersey officials told us they enacted UAS restrictions following consultation with FAA attorneys. As revised, the ordinances now prohibit operating a UAS in a careless or reckless manner; stalking or harassing with a UAS; taking photographs, video, or audio with a UAS where persons have “a reasonable expectation of privacy”; using a UAS to interfere with emergency responders, parades, and wildlife; and attaching weapons to a UAS.⁹⁰ By contrast, the city of Newton, Massachusetts had enacted ordinances that, among other things, banned UAS flights below 400 feet absent the underlying landowner’s consent and beyond the UAS operator’s line of sight. As noted above, however, the court in *Singer v. Newton* found that those ordinances conflicted with FAA’s UAS rules and struck them down as preempted.⁹¹

D. Stakeholder Issues and Positions

1. Stakeholder Positions on the Scope of Federal, State, Local, and Tribal Authority to Regulate UAS Operations in Low-Altitude Airspace

A threshold issue in deciding how to integrate small-UAS operations into the national airspace system is determining who—the federal government or the state, local, and tribal governments, or all of them—has the legal authority to make these decisions. The same question was raised a century ago when the federal government first began considering the need for aviation legislation.⁹²

On the one hand, as noted above and discussed in Part D.1.a. below, FAA states that it has authority to create a comprehensive regulatory system governing the safe and efficient management of all UAS operations—including non-commercial UAS operations at ground-level altitudes, over private property, and solely within state boundaries—pursuant to laws Congress has enacted under its constitutional Commerce Clause power. In addition, as noted above and discussed in Part D.1.b. below, FAA states that under the Constitution’s Supremacy Clause, state and local laws affecting aviation safety and the efficient management of airspace are federally preempted, although states and localities may still issue laws affecting UAS that do touch this federally preempted field. UAS industry stakeholders generally agree with FAA’s views of its UAS regulatory authority and the preemptive effect of its regulations.

On the other hand, as discussed in Part D.1.a. below, some state and local stakeholders and

⁸⁹ See, e.g., N.J. Stat. Ann. § 2C:40-29 (preempting any county or locality from enacting any laws, ordinances, resolutions, or regulations regarding private UAS use in a manner inconsistent with state UAS requirements).

⁹⁰ See STONE HARBOR, N.J., CODE § 405-15 (2019).

⁹¹ See *Singer v. Newton*, *supra* note 55.

⁹² See Elza C. Johnson, *Legal Questions Affecting Federal Control of the Air*, U.S. Army Air Service (Washington, DC: Government Printing Office, 1921) at 3 (“The development of air navigation by reason of increased use of aircraft of all kinds in commercial and private enterprise and for pleasure presents the old and interesting problem of control for the protection and safety of the public. . . . ‘What shall be done?’ and ‘How shall we do it?’ and ‘Who has authority to do it?’”).

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legal commentators have questioned whether Congress's Commerce Clause power extends to non-commercial, non-interstate, low-altitude UAS operations over private property and if it does, whether Congress has authorized FAA to regulate such operations. In addition, as discussed in Part D.1.b. below, many states and localities believe they are not wholly preempted from regulating in this area and, relying on their Tenth Amendment-reserved police powers to protect persons and property, seek to regulate and enforce with respect to at least some aspects of UAS operations in the same low-altitude airspace where FAA has asserted its regulatory authority. For example, some states and localities wish to place so-called "reasonable time, place, and manner" restrictions on drone operations, while others assert they have, or want to obtain, authority to use so-called "counter"-UAS measures to respond to "rogue" drones that are either flying in an unsafe manner or where drones are not permitted to fly. By contrast, other states seek to encourage and promote UAS operations within their borders, particularly for commercial purposes.

Part of what states and localities are seeking to protect are property rights, which have long been governed by state rather than federal law. As discussed below and in Appendices II and V, property rights are significant in the UAS context because states, localities, and courts have recognized such rights in the low-altitude airspace above private property, in the context of both unconstitutional takings of property and state-law aerial trespass claims. States and localities also want to protect their citizens' privacy rights, which likewise have long been governed by state law.

To date, there have been few federal court cases in which these UAS jurisdiction and federalism issues have been raised and even fewer in which they have been decided. The one case where the merits of a UAS jurisdiction issue have been decided is the *Singer v. Newton* case noted above, where the court ruled that city ordinances effectively banning UAS operations within city limits were preempted as conflicting with FAA regulations.⁹³ Even more fundamental UAS jurisdiction issues were raised (but not decided) in *Boggs v. Merideth*,⁹⁴ the federal case that followed dismissal of state criminal charges against the landowner in the so-called Drone Slayer case discussed above.⁹⁵ The *Boggs* court recited the drone operator's argument that the landowner who shot down his drone must reimburse him for the drone's cost in part because under federal law, the drone was an "aircraft" legally operating in federal "navigable airspace" within the United States' exclusive jurisdiction, not in the landowner's privately owned airspace subject to state law claims of aerial trespass or invasion of privacy. The *Boggs* court dismissed the suit without ruling on these arguments, however, finding that it lacked jurisdiction to hear what it said were fundamentally state law claims.

The decision in which a federal court has discussed (but not decided) UAS jurisdiction and federalism issues most extensively is *Huerta v. Haughwout*.⁹⁶ Although as noted above, the court in that case held that FAA had authority to issue an investigative subpoena to obtain information about a father and son operating a drone a few feet above their private property, the

⁹³ See *Singer v. Newton*, *supra* note 55.

⁹⁴ *Boggs v. Merideth*, 2017 WL 1088093 (W.D. Ky. 2017).

⁹⁵ See *supra* note 79 and accompanying text.

⁹⁶ See *Haughwout*, *supra* note 72.

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court expressed considerable skepticism that Congress had authorized FAA to regulate UAS operations in such airspace. The court noted “substantial questions” about FAA’s position that, in the court’s words, the agency “has regulatory sovereignty over every cubic inch of outdoor air in the United States (or at least over any airborne objects therein)”—including “what people do in their own backyards”—based on its 49 U.S.C. § 40103 “navigable airspace” regulatory authority.⁹⁷ The *Haughwout* court also questioned whether FAA’s assertion in its fact sheet *Busting Myths about the FAA and Unmanned Aircraft—Update*—that “[t]he FAA is responsible for air safety from the ground up”⁹⁸—can be reconciled with the terms of FAA’s “navigable airspace” authority. That authority, the court said, “might sensibly and plausibly be understood to condition the exercise of the FAA’s authority on either the protection of or regulation of activities related in some manner to navigable airspace and related equipment and facilities.”⁹⁹

Further, the *Haughwout* court said, even assuming Congress intended to give FAA such broad authority to regulate activities in the “navigable airspace,” it is not clear Congress itself has such authority under the Commerce Clause. Acknowledging the Commerce Clause has been broadly interpreted to authorize congressional action regarding not just business activity that crosses state lines but also “the channels of interstate commerce, the instrumentalities of interstate commerce, and other activities that substantially affect interstate commerce,”¹⁰⁰ the court declared:

“Congress surely understands that state and local authorities are (usually) well positioned to regulate what people do in their own backyards. The Constitution creates a limited national government in recognition of the traditional police power of state and local governments. No clause in the Constitution vests the federal government with a general police power over all of the air or all objects that leave the ground. Although the Commerce Clause allows for broad federal authority over interstate and foreign commerce, it is far from clear that Congress intends—or could constitutionally intend—to regulate all that is airborne on one’s own property and that poses no plausible threat to or substantial effect on air transport or interstate commerce in general.”¹⁰¹

Finally, explaining its doubt that FAA has a right to regulate “all that is airborne on one’s own property,” the *Haughwout* court said this would seem to conflict with the Supreme Court’s recognition in *United States v. Causby*,¹⁰² in the context of deciding whether airspace property rights had been unconstitutionally taken by the federal government, that landowners have property rights in the “immediate reaches” of the airspace overlying their land. Given the

⁹⁷ *Haughwout*, *supra* note 72, 2016 WL 391799 at *4.

⁹⁸ *Busting Myths about the FAA and Unmanned Aircraft—Update*, available at <https://www.faa.gov/news/updates/?newsId=76381> (last visited Sept. 1, 2020).

⁹⁹ *Haughwout*, *supra* note 72, 2016 WL 391799 at *4.

¹⁰⁰ *Haughwout*, *supra* note 72, 2016 WL 391799 at *4, citing *United States v. Lopez*, 514 U.S. 549, 558-59 (1995).

¹⁰¹ *Haughwout*, *supra* note 72, 2016 WL 391799 at *4.

¹⁰² *United States v. Causby*, 328 U.S. 256 (1946), discussed below.

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Supreme Court's recognition of such property rights in *Causby*, the court asked, "does it follow that this foundational principle [of property rights in immediate reaches airspace] must vanish or yield to FAA dictate the moment that a person sets any object aloft (i.e., an 'aircraft') no matter how high in the airspace above one's home?"¹⁰³

These UAS legal jurisdiction questions remain unresolved by the courts. Consensus among federal, state, local and industry stakeholders and other interested parties on these matters also has been elusive to date. For example, in early 2017, FAA convened a Drone Advisory Committee "Roles and Responsibilities" task group of industry, academic, and state and local stakeholders to provide recommendations on issues related to federal, state, and local jurisdiction over low-altitude airspace, including property rights in airspace. In a number of key areas, the group was not able to reach consensus on common principles or to make recommendations by the group's mid-2018 endpoint.¹⁰⁴ Similarly, as discussed in Appendix II, the Uniform Law Commission's Uniform Tort Law Relating to Drones Act Drafting Committee, which began work in late 2017 to draft state model legislation on drone aerial trespass, suspended its work in January 2020 reportedly due in part to disagreement over property rights in airspace. Federal legislation addressing some of these UAS jurisdiction issues has been introduced, but not yet enacted, in several recent Congresses.¹⁰⁵

We discuss below the differing positions on these federal-state jurisdiction matters that we obtained from stakeholders or that have been identified by legal commentators. As detailed below, a common theme among many stakeholders and legal commentators was the need for additional clarity from FAA, Congress, or the courts.

¹⁰³ *Haughwout*, *supra* note 72, 2016 WL 391799 at *5.

¹⁰⁴ FAA asked the task group to provide consensus recommendations about the federal, state, and local government roles and responsibilities for regulating UAS operations in low-altitude airspace. FAA, *Drone Advisory Committee (DAC) – Task Group (TG) 1, Recommended Tasking on Roles and Responsibilities, January 31, 2017* (Feb. 10, 2017). Among the issues on which FAA specifically sought recommendations were: (a) the possibility of "Defining Low-Altitude UAS Navigable Airspace Susceptible to State/Local Governmental interests" ("perhaps [using] a type of boundary line") and the relevance to UAS operations of altitude-based definitions of "immediate reaches" airspace from manned aircraft aerial trespass case law [referencing the Supreme Court's *Causby* decision]; (b) whether FAA's exclusive authority over low-altitude UAS operations "should be reconsidered in light of state and local government interests"; and (c) whether states and localities should be given responsibilities for enforcement of federal statutes or regulations governing low-altitude UAS operations. *Id.* at 5-6.

The Task Group took on what it called this "big, audacious, transformative" task in part by seeking to develop nine "Common Ground Principles" on which it would make recommendations; three of the principles specifically pertained to airspace and property issues (principle 2 – "UAS Operations Impact on Private Property and Interests;" principle 4 – "Takeoff and Landing;" and principle 6 – "Altitude Estimation Challenges"). Ultimately, according to public records of the Task Group's meetings, it could not reach agreement on these three principles (and one additional principle) and made no consensus recommendations to FAA about them. See Drone Advisory Committee Meeting # 5, Nov. 8, 2017, Materials; Drone Advisory Committee Meeting, Nov. 8, 2017, Meeting Minutes and attachments.

¹⁰⁵ See, e.g., Advanced Unmanned Delivery Services Act, H.R. 6943, 116th Cong. (2020); Drone Integration and Zoning Act of 2019, S. 2607, 116th Cong. (2019); Drone Federalism Act of 2017, S. 1272, 115th Cong. (2017); Drone Innovation Act, H.R. 2930, 115th Cong. (2017).

As discussed in Appendix III, questions about protection of personal privacy from surveillance by UAS also remain unresolved by the courts; efforts by the Uniform Law Commission's Uniform Tort Law Relating to Drones Act Drafting Committee to draft a UAS privacy model law were suspended in January 2020; and federal legislation regarding UAS personal privacy matters has been introduced but not enacted in recent Congresses.

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a. Stakeholder Positions on the Scope of FAA’s Authority and the Impact of Possible Property Rights in Airspace

(i) Stakeholder Positions on the Scope of Congress’s and FAA’s Commerce Clause Authority over Low-Altitude UAS Operations

Like the *Haughwout* court, some state and local stakeholders and legal commentators have questioned whether Congress’s Commerce Clause power authorizes it to regulate all low-altitude UAS operations. A state-member organization stakeholder we spoke to noted, for example, that UAS rarely fly across state lines due to technical limitations such as short battery life. Stakeholders and commentators also have questioned whether recreational UAS operations are truly “commerce” and if low-altitude UAS operations are commerce, whether they meaningfully affect *interstate* commerce.¹⁰⁶

FAA has strongly disagreed that its low-altitude regulation of UAS operations exceeds Congress’s Commerce Clause authority. In issuing the Part 107 rules and in speaking with us for this report, FAA officials noted that 49 U.S.C. § 44701 authorizes FAA to prescribe “regulations and minimum standards for . . . practices, methods, and procedures the Administrator finds necessary for safety in *air commerce* and national security.”¹⁰⁷ “Air commerce,” in turn, is defined to include “the operation of aircraft that directly affects, or may endanger safety in . . . interstate air commerce,” and “interstate commerce” is defined to include “the operation of aircraft [between two states] in furthering a business or vocation”¹⁰⁸ As FAA noted in its final Part 107 rule preamble, the courts have interpreted this statutory “air commerce” definition as including both commercial and non-commercial flights and both interstate and intrastate flights.¹⁰⁹

¹⁰⁶ See, e.g., Stephen J. Migala, *UAS: Understanding the Airspace of States*, 82 J. Air. & Com. 3 (Winter 2017). See also Maxwell Mensinger, *Remodeling “Model Aircraft”: Why Restrictive Language That Grounded Unmanned Industry Should Cease to Govern It*, 100 Minn. L. Rev. 405, 420 (Nov. 2015).

¹⁰⁷ 49 U.S.C. § 44701(a)(5) (emphasis added). FAA also cited us to 49 U.S.C. § 40101 (“Policy”), which similarly provides that in carrying out its statutory air safety and enforcement responsibilities, the Administrator shall consider as being in the public interest “regulating *air commerce* in a way that best promotes safety and fulfills national defense requirements.” *Id.*, § 40101(d)(2) (emphasis added).

¹⁰⁸ 49 U.S.C. §§ 40102(a)(3), (a)(24).

¹⁰⁹ FAA explained in the Part 107 preamble:

“Because of this broad definition [of “air commerce”], the NTSB has held that ‘any use of an aircraft, for purpose of flight, constitutes air commerce.’ *Administrator v. Barrows*, 7 N.T.S.B. 5, 8-9 (1990). Courts that have considered this issue have reached similar conclusions that ‘air commerce’ . . . encompasses a broad range of commercial and non-commercial aircraft operations. See, e.g., *United States v. Healy*, 376 U.S. 75, 84 (1964) . . . ; *Hill v. NTSB*, 886 F.2d 1275, 1280 (10th Cir. 1989) (“[t]he statutory definition of ‘air commerce’ is therefore clearly not restricted to interstate flights occurring in controlled or navigable airspace”); *United States v. Drumm*, 55 F. Supp. 151, 155 (D. Nev. 1944) (upholding amendments of Civil Air Regulations, which among other things prohibited any person from piloting a civil aircraft unless the person held a valid pilot certificate and the aircraft possessed an airworthiness certificate, on the grounds that the regulatory action was within the scope of powers conferred by Congress).”

81 Fed. Reg. at 42069.

In additional support of FAA’s position that it has authority to regulate non-commercial air operations at low altitudes, FAA officials cited to us *United States v. McHenry*, 97 F.3d 125, 127 (6th Cir. 1996) (“airplanes . . . retain the inherent

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The Supreme Court has recognized boundaries on Congress's Commerce Clause power, however, as the *Haughwout* court noted in questioning its reach to all low-altitude, non-commercial drone flights and citing *United States v. Lopez*. In *Lopez*, the Supreme Court cautioned that the Commerce Clause cannot be read to "obliterate the distinction between what is national and what is local and create a completely centralized government" or "to convert congressional authority under the Commerce Clause to a general police power of the sort retained by the States."¹¹⁰ The Supreme Court has found Congress exceeded its Commerce Clause authority in other circumstances in recent times.¹¹¹ In the absence of any federal precedent on this issue in the context of UAS operations, it appears unclear whether the courts would find that Congress's Commerce Clause power extends to all low-altitude, non-interstate, non-commercial UAS operations.

Assuming Congress has such Commerce Clause power, however, some state and local stakeholders and legal commentators also have questioned whether Congress in fact intended to authorize FAA to regulate UAS flight operations (versus takeoffs and landings) "from the ground up."¹¹² An agency "literally has no power to act, let alone pre-empt [state law] . . . , unless and until Congress confers power upon it."¹¹³ As noted, the *Haughwout* court found it "far from clear that Congress intends [FAA] . . . to regulate all that is airborne on one's property. . . ." ¹¹⁴ Similarly, one commentator has asked, "was the intent of Congress [in FMRA] to extend the full protections of 'aircraft' to small drones? . . . [A]nd since [FAA's] Part 107 Rule did not specify a minimum safe altitude, does that mean every cubic inch of airspace outdoors is now considered 'navigable airspace'? If so, does this mean that the FAA, rather than a property

potential to affect commerce . . . at some future point in time"); *United States v. Red Frame Parasail*, 160 F. Supp. 2d 1048, 1056 (D. Ariz. 2001) (parachutes operating only in ultra-low airspace subject to FAA regulation because "[w]ith prior authorization, they may fly in other classes of airspace" and they "also have the mechanical ability to fly in other classes of airspace."); and *Throckmorton v. NTSB*, 963 F.2d 441 (D.C. Cir. 1992) (upholding NTSB and FAA suspension of helicopter pilot's certificate for making unauthorized "low pass" over airport 10-20 feet above ground level). These cases are additional authority supporting a broad reading of "air commerce," the officials said. See also *United States v. Hume*, 453 F.2d 339 (5th Cir. 1971) (crop-dusting aircraft shot at in Texas was found to be used in "interstate commerce" because it had been dusting crops in New Mexico the previous day).

¹¹⁰ *Lopez*, *supra* note 100, 514 U.S. at 557, 567 (quotations and citations omitted). The Court therefore struck down a federal statute criminalizing gun possession in local schools, finding this was not an economic activity substantially affecting interstate commerce.

¹¹¹ See, e.g., *Nat'l Fed'n of Indep. Bus. v. Sebelius*, 567 U.S. 519 (2012) (Affordable Care Act's individual health insurance mandate exceeded Congress's Commerce Clause power; mandate upheld under the Taxing Power); *United States v. Morrison*, 529 U.S. 598 (2000) (Violence Against Women Act's criminalizing of gender-motivated violence exceeded Commerce Clause power due to lack of interstate commerce nexus).

¹¹² See, e.g., Migala, *supra* note 106, at 77, 80; Robert A. Heverly, *The State of Drones: State Authority to Regulate Drones*, 8 Albany Gov't L. Rev. 29, 38-39 (2015) ("That the federal government has the authority to regulate navigable airspace is not seriously in dispute . . . How far the federal government can go, or, more precisely, how low the federal government can go for purposes of aviation regulation, remains a highly contested question.").

¹¹³ *Louisiana Public Service Com'n v. FCC*, 476 U.S. 355, 374 (1986). See *Michigan v. EPA*, 268 F.3d 1075, 1081 (D.C. Cir. 2001) (a federal agency is "a creature of statute" and "has no constitutional or common law . . . authority, but only those authorities conferred upon it by Congress").

¹¹⁴ *Haughwout*, *supra* note 72, 2016 WL 391799 at *4.

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owner, controls every cubic inch of airspace? Is this what Congress really intended?”¹¹⁵ Likewise, another legal commentator, while stating that “navigable airspace” needs to include some altitudes below 500 feet (the general minimum flight altitude for manned aircraft), has testified to Congress that “just as clearly, it shouldn’t include the airspace two inches above the ground in a person’s backyard.”¹¹⁶

Other legal commentators, supporting their position that Congress did not intend to authorize routine flight operations down to the ground, have noted that Congress has taken care to distinguish between “navigable airspace” and what some have referred to as “non-navigable airspace.” For example, when Congress enacted the 1926 Air Commerce Act and each subsequent aviation statute, it declared the United States’ exclusive sovereignty over “airspace of the United States” but authorized federal regulation only within “navigable airspace.”¹¹⁷ Further, legal commentators have noted, Congress has limited “navigable airspace” to the airspace *above* minimum safe altitudes of flight (later flight plus takeoff and landing), where Congress understood air commerce would occur and—at least in 1926—where it understood flight operations would not interfere with underlying landowners’ property use.¹¹⁸ Congress has made the same navigable/non-navigable airspace distinction by declaring a public right of transit in the 1926 Air Commerce Act and each subsequent aviation statute only within “navigable airspace,” not all airspace, the commentators also observed.

In addition, at least one legal commentator¹¹⁹ has questioned FAA’s reliance for its low-altitude airspace authority on 49 U.S.C. § 40103(b)(2)(B), which the agency cited as support for its proposed and final Part 107 rules.¹²⁰ This provision is part of FAA’s 49 U.S.C. § 40103(b) general authority to regulate the use of “navigable airspace” to ensure the safety of aircraft and

¹¹⁵ Testimony of James Grimsley to the Oklahoma House of Representatives on Drone Issues (Sept. 18, 2017), available at <https://www.linkedin.com/pulse/my-written-statement-oklahoma-house-representatives-drone-grimsley/> (last visited Sept. 1, 2020). This commentator also said that “if we place every cubic inch of airspace above the surface under the strict control of the federal government, and eliminate the authority of private landowners and state governments to control private property at the lowest altitudes, then we may eviscerate federalism as we know it, but possibly more importantly, we may eviscerate property rights as we know them. We run the risk of fundamentally altering what it means to own, control, and possess property in the United States.” *Id.* See also James Grimsley, *Singer v. City of Newton: When a win is not completely a win . . .* (Sept. 30, 2017), available at <https://www.linkedin.com/pulse/singer-vs-city-newton-when-win-completely-james-grimsley/> (last visited Sept. 1, 2020) (“[T]here has never been an intent of either Congress or the courts to recognize FAA authority over every cubic inch of airspace that exists in the nation.”).

¹¹⁶ Testimony of John Villasenor before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Aviation Operations, Safety, and Security, March 24, 2015.

¹¹⁷ See, e.g., Migala, *supra* note 106, at 33-34.

¹¹⁸ Migala, *supra* note 106, at 36 (quoting House report accompanying 1926 Air Commerce Act: “It is not urged that flights should be permitted below certain altitude or in such manner as to deprive the owner of the submerged land of the normal use and enjoyment of his land. But it is submitted that Congress may provide for minimum safe altitudes of flight which are analogous to harbor lines or the navigable channel of a stream.”).

¹¹⁹ Migala, *supra* note 106, at 52-54.

¹²⁰ See 80 Fed. Reg. 9543, 9544 (Feb. 23, 2015); 81 Fed. Reg. 42063, 42067-68 (June 28, 2016). FAA also cited this provision as “consistent with” its regulation of UAS and all aircraft “irrespective of the altitude at which the aircraft is operating” in its *Busting Myths about the FAA and Unmanned Aircraft—Update* fact sheet cited by the court in *Haughwout*. See *Haughwout*, *supra* note 72, 2016 WL 3919799 at *4.

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efficient use of airspace, with § 40103(b)(2)(B) directing FAA to prescribe flight “air traffic regulations” for the purpose of “protecting individuals and property on the ground.” However, according to this commentator, the provision is not a separate “stand alone power that could be used as a catch-all reason to regulate, including within non-navigable airspace,” but instead applies only to aircraft in or authorized to enter navigable airspace, as confirmed by the legislative history of the 1958 Federal Aviation Act where it was added. Because small UAS are prohibited by FAA and Congress from flying above 400 feet absent a waiver, and thus are prohibited from entering navigable airspace, § 40103(b)(2)(B) does not authorize FAA to regulate their operations below navigable airspace and down to the ground, the commentator reasoned.

FAA and DOT officials we spoke with strongly disagreed that FAA lacks authority to regulate UAS operations down to the ground. FAA is “responsible for air safety from the ground up,”¹²¹ including with respect to unmanned aircraft operations, they said, and stated it is the agency’s “long-held position that . . . [FAA] has the responsibility to regulate aviation safety and the efficiency of the airspace within the navigable airspace, which may extend down to the ground.”

In support, FAA officials cited a number of FAA’s general aviation regulatory authorities including 49 U.S.C. § 40103(b)(1), directing FAA to regulate the use of the “navigable airspace . . . to ensure the safety of aircraft and the efficient use of [that] airspace,” and 49 U.S.C. § 40103(b)(2)(A), (B), and (D), directing FAA to prescribe “air traffic regulations” for “navigating, protecting, and identifying aircraft,” “protecting individuals and property on the ground,” and “preventing collisions between aircraft, between aircraft and land or water vehicles, and between aircraft and airborne objects, respectively. The officials also cited 49 U.S.C. § 44701(a)(5), directing FAA to issue regulations and standards necessary for safety in “air commerce and national security.” The statutory definition of “air commerce” (quoted above), they noted, unlike the definition of “navigable airspace” (quoted above), is not explicitly tied to any particular altitude. Therefore, according to the officials, if UAS operating below 500 feet are in the stream of interstate air commerce, FAA can regulate their operations,¹²² even if the aircraft is on the ground.¹²³

DOT officials noted that consistent with its interpretation of these statutory authorities as authorizing aircraft operations at ground level, FAA has promulgated rules that apply to all “aircraft” (manned and unmanned) irrespective of the altitude at which the aircraft is operating. For example, the officials noted that 14 C.F.R. § 91.13 prohibits any person from operating an aircraft “in a careless or reckless manner so as to endanger the life or property of another”; 14 C.F.R. Parts 91 and 137 authorize operation below FAA’s general 500- and 1,000-foot minimum altitudes of certain aircraft (e.g., helicopters and agricultural aircraft) or aircraft operating under certain conditions; and 14 C.F.R. § 71.1 incorporates FAA Order JO 7400.11D, which extends Class B airspace “from the surface” to various designated altitudes in locations across the

¹²¹ *Busting Myths about the FAA and Unmanned Aircraft—Update*, *supra* note 98.

¹²² FAA cited *Hill v. NTSB*, *United States v. McHenry*, *United States v. Red Frame Parasail*, and *Throckmorton v. NTSB*, all *supra* note 109, as support for this point.

¹²³ As an example, the FAA officials cited *Miranda v. NTSB*, 866 F.2d 805 (5th Cir. 1989), where the court upheld suspension of airline pilots’ certificates because they had carelessly and recklessly operated their plane while taxiing on an airport runway, in violation of FAA rules.

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country.

In addition to these general aviation authorities, FAA officials told us Congress specifically intended to authorize regulation of low-altitude UAS operations even if they occur below “navigable airspace.” In support, they noted that FMRA in 2012 and the 2018 FAA Reauthorization Act directed DOT to determine whether UAS may operate safely in the “national airspace system” and if it so determines, to “establish requirements for the safe operation of [UAS] in the national airspace system”¹²⁴ As noted above, although Congress has not defined “national airspace system,” FAA has defined this term in its Pilot/Controller Glossary as a “network” of “U.S. airspace” (an undefined term) and aviation-related facilities, rules, technical information, manpower, and material. As so defined, DOT officials told us, “national airspace system” is “a broader concept than the ‘navigable airspace.’”

The officials also noted that 49 U.S.C. § 44809(a)(6), added by section 349 of the 2018 FAA Reauthorization Act, authorizes recreational UAS operations “from the surface to not more than 400 feet above ground level” in certain airspace, and stated that 49 U.S.C. § 44806(c), added by section 346(a) of the 2018 Act, affirms navigable airspace includes airspace below 150 feet (that provision directs FAA to permit the use of actively tethered public UAS below an altitude of 150 feet under certain circumstances).

Beyond these “navigable airspace,” “air commerce,” and “national airspace system” provisions cited by FAA, FAA refers throughout the preamble of one of its most recently proposed UAS rules to regulation of UAS operations in the “*airspace of the United States*.”¹²⁵ Congress has used the same undefined term in declaring in 49 U.S.C. § 40103(a)(1) that the United States Government has exclusive sovereignty of “*airspace of the United States*.” DOT officials told us, however, that it is not the Department’s position that this “sovereignty” statute provides additional authority to regulate UAS operations down to ground level. Nor does it reflect “national ownership” of the airspace or expressly exclude the sovereign powers of the states, the officials said. Rather, they explained, it is DOT’s and DOJ’s longstanding position that this provision simply excludes the exercise of sovereignty by foreign nations.

To the extent FAA relies on its jurisdiction over “navigable airspace” as authority to regulate low-altitude UAS operations, there may be some question whether FAA has implemented this authority pursuant to statutory requirements. As noted, the definition of “navigable airspace” in 49 U.S.C. § 40102(a)(32) contemplates issuance of regulations prescribing minimum flight altitudes for the relevant aircraft (“airspace above the minimum altitudes of flight *prescribed by regulations*”) (emphasis added). While FAA has issued regulations prescribing explicit minimum flight altitudes for manned aircraft and an explicit *maximum* flight altitude for UAS, it has issued no regulation prescribing an explicit *minimum* flight altitude for UAS. FAA officials declined to indicate to us whether the agency has prescribed a regulatory minimum flight altitude for UAS in accordance with the requirements of 49 U.S.C. § 40102(a)(32); they told us it would be inappropriate to take a position on this until the DOT Preemption Working Group has completed its analysis for DOT policymakers on UAS jurisdiction and related matters. As noted above, however, DOT officials also told us “it is the Department’s stance that, for purposes of the

¹²⁴ 49 U.S.C. § 44807; *see also id.* § 44802.

¹²⁵ *See* 84 Fed. Reg. 72438 (Dec. 31, 2019) (proposed Remote Identification rule) (emphasis added).

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definition of the term *navigable airspace*, zero feet ('the blades of grass') is the minimum altitude of flight for UAS."¹²⁶

(ii) Stakeholder Positions on Property Rights in Airspace, the Fifth Amendment's Takings Clause, and *United States v. Causby*

In addition to these questions about the scope of Congress's Commerce Clause power over low-altitude UAS operations and how much of that power Congress intended to assign to FAA, there is another important factor that may affect FAA's authority to regulate low-altitude UAS operations—whether landowners continue to have property rights in the airspace above their land. The different legal positions about airspace property rights in the UAS context largely reflect different interpretations of the U.S. Supreme Court's 1946 landmark decision in *United States v. Causby*¹²⁷ and *Causby's* statements that a landowner "owns" and has "exclusive control" of his "immediate reaches" airspace. Some consider the decision to be the foundational case confirming the modern scope of landowner airspace property rights, which they believe create a constitutional hurdle to the exercise of Congress's Commerce Clause power, while others consider the case's holding to be limited to property rights in *land*.

As one law firm stakeholder we spoke to has said, however, *Causby* is a "touchstone" that "you can't get around" in the debate over federal versus state authority over low-altitude airspace; "you can't pretend *Causby* doesn't exist." FAA officials also told us the DOT Preemption Working Group is considering the impact of *Causby* on the scope of the agency's authority to regulate low-altitude UAS operations. Because of the central importance of *Causby* and possible airspace property rights to analysis of FAA's jurisdiction over low-altitude UAS operations, we summarize *Causby* and the development of these rights below and provide additional detail in Appendices II and V.

As detailed in those appendices, private property rights in airspace were recognized under Anglo-American common law for centuries. For centuries, disputes over activities occurring in the airspace were generally resolved by reference to the legal doctrine of *cujus est solum, ejus est usque ad coelum et ad inferos*—he who owns the soil, owns upwards unto the heavens and down to the depths.¹²⁸ In the United States, states adopted the doctrine as part of their common law police powers. Airspace property rights enabled landowners to compel neighboring entities to remove "trespassing" structures or tree branches overhanging their property, for example—rights landowners continue to exercise today.

While American courts initially continued to apply the *ad coelum* legal doctrine as technology advanced—for example, ordering the "ejection" of a telephone wire strung across private

¹²⁶ Similarly, an attorney stakeholder we spoke to said FAA has "implicitly" set a UAS minimum flight altitude of zero by setting a 400-foot maximum flight altitude with no prescribed minimum. Another attorney stakeholder we spoke to said that while FAA has not prescribed a UAS minimum flight altitude, because this "can't mean that *no* airspace is navigable" for UAS, this simply means FAA has not "prescribed a minimum different than zero."

¹²⁷ See *Causby*, *supra* note 102.

¹²⁸ See *Causby*, *supra* note 102, 328 U.S. at 260-61, n. 5, 264, n. 9 (1946), citing 1 Coke, *Institutes of the Laws of England* (19th ed. 1832) ch. 1, § 1 (4a); 2 Blackstone, *Commentaries on the Laws of England* (Lewis ed. 1902) at 18; 3 Kent, *Commentaries on American Law* (Gould ed. 1896) at 621; *Baten's Case*, 77 Eng. Rep. 810 (1610).

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property through the overlying airspace “owned” by the landowner¹²⁹—the advent of manned aviation—first by hot-air balloons and dirigibles in the 1800s, then by traditional aircraft in the early 1900s—began to change how the law viewed activities in the airspace. Some aviation proponents suggested resolving the resulting conflicts by enacting federal or state legislation declaring a public right of flight at some minimum altitude, without liability to underlying landowners. Some government attorneys raised concerns that such legislation would be an unconstitutional “taking” of landowners’ property rights in the airspace without “just compensation,” in violation of the Fifth Amendment’s Takings Clause or its state equivalents.¹³⁰

Congress addressed these issues to some extent in 1926 when it enacted the Air Commerce Act. Among other things, the Air Commerce Act authorized the Secretary of Commerce to establish “civil airways” (commercial air routes) within “navigable airspace” and as noted above, declared a “public right of freedom of . . . air navigation” through that space. Also as noted above, Congress defined “navigable airspace” at that time as the airspace above federally prescribed minimum safe flight altitudes.¹³¹ Concerns were again raised that this declaration of a public airspace “easement” might be an unconstitutional taking of underlying landowners’ property rights, and also left unclear what landowners and state and local governments could do about flights *below* navigable airspace.

These issues reached the Supreme Court in 1946 in *Causby*. The Court began its opinion by stating that the *ad coelum* doctrine “has no place in the modern world,” noting that airspace ownership up to the heavens would subject every pilot to aerial trespass suits and “seriously interfere with” the public interest in manned flight.¹³² Nevertheless, the Court said that even though Congress had assigned control of navigable airspace activity to the federal government, private landowners still retained their constitutionally protected property interests in the “*immediate reaches* of the enveloping atmosphere” above their land, where the landowner “must have exclusive control” if he is to have full enjoyment of the land. The Court stated that “[t]he landowner *owns* at least as much of the space above the ground as he can occupy or use in connection with the land. . . . The superadjacent airspace at this low altitude is so close to the land that continuous invasions of it affect the use of the surface of the land itself. We think that the landowner, as an incident to his ownership, has a claim to it and that invasions of it are in the same category as invasions of the surface.”¹³³

Recognizing the continued vitality of low-altitude airspace property rights, the *Causby* Court held that U.S. military flights continuously taking off and landing at very low altitudes above a family-owned commercial chicken farm and residence, which destroyed the business and adversely affected the landowners’ health, was an unconstitutional taking of an interest in the landowners’

¹²⁹ *Butler v. Frontier Telephone Co.*, 79 N.E. 716 (N.Y. 1906).

¹³⁰ The Takings Clause of Fifth Amendment authorizes the federal government to take private property for a public use, provided that it pays just compensation. U.S. Const. Amend. V. These restrictions are imposed on the states through the Fourteenth Amendment. See, e.g., *Palazzolo v. Rhode Island*, 533 U.S. 606, 617 (2001), citing *Chicago B. & Q.R. Co. v. Chicago*, 166 U.S. 226 (1897).

¹³¹ Air Commerce Act of 1926, *supra* note 26, §§ 5, 10, 44 Stat. at 571, 574.

¹³² *Causby*, 328 U.S. at 261.

¹³³ *Causby*, 328 U.S. at 264-65 (emphasis added).

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property—specifically, an “easement of flight”—which required payment of just compensation by the federal government. As the Court explained, “[f]lights over private land are . . . a taking . . . [if] they are so low and so frequent as to be a direct and immediate interference with the enjoyment and use of the land.”¹³⁴ What the “precise limits” of this protected airspace are, “[w]e not determine at this time,” the Court concluded.¹³⁵ The Court rejected the government’s argument that it was not liable because Congress had authorized flight in the landowner’s overlying airspace.¹³⁶

In 1962, the Supreme Court again found an unconstitutional taking of airspace property rights in *Griggs v. Allegheny County*.¹³⁷ Relying on *Causby*, *Griggs* held that the county owner/operator of an airport had—by not acquiring what it called “air easements” and “navigation easements” in neighboring landowners’ overlying airspace and paying them just compensation, resulting in low-flying planes interfering with the use and enjoyment of their land—unconstitutionally taken the landowners’ “private property” in violation of the Fifth Amendment.¹³⁸

As detailed in Appendices II and V, since *Causby* and *Griggs*, the Supreme Court and other courts have continued to recognize airspace property rights at low altitudes, in both the manned aviation context and otherwise and in both the government takings and private aerial trespass contexts. Airspace flight easements, now known as “avigation easements,” continue to be widely recognized in the manned aviation context as a property interest with market value.¹³⁹ The extent to which “immediate reaches” airspace property rights and avigation easements are recognized in the UAS context today and what, if any, impact they have on FAA’s authority to regulate low-altitude UAS operations are subjects of considerable debate.

¹³⁴ *Causby*, 328 U.S. at 266.

¹³⁵ *Id.*

¹³⁶ The Court disagreed with the government’s assertion that its flights had occurred within “navigable airspace” where flight was permitted, because at the time, the statute defined this term as above the safe altitudes of *flight* (which generally had been set at 500 feet), not the safe altitudes of *takeoffs and landings*. But even if Congress had defined the term as including takeoff and landing space (which it later did), and even if the flights were within that airspace in compliance with federal law, the Court said—and the government agreed—that flights so close to private land as to make it uninhabitable would still constitute a taking.

¹³⁷ *Griggs v. Allegheny County*, 369 U.S. 84 (1962).

¹³⁸ *Griggs*, *supra* note 137, 369 U.S. at 90 (“Respondent in designing [the airport] had to acquire some private property. Our conclusion is that by constitutional standards it did not acquire enough.”). The dissenting Justices in *Griggs*—echoing the criticisms of the 1926 Air Commerce Act as an unconstitutional taking—believed it was the federal government, not the county, that had committed the taking. Justice Black, dissenting, reasoned that because a federal agency had approved the county’s airport layout plans and Congress had *already* appropriated the low-altitude airspace needed for takeoffs and landings, “[t]here is no . . . duty on the local community to [again] acquire flight airspace. Having taken the airspace over Griggs’ private property for a public use, it is the United States which owes just compensation.” *Griggs*, 369 U.S. at 92-94 (Black, J., dissenting).

¹³⁹ See, e.g., Wisconsin Dept. of Transportation, *Avigation Easements* (May 2012), available at <https://wisconsin.gov/Documents/doing-bus/aeronautics/resources/av-ease.pdf> (last visited Sept. 1, 2020); Gary David Strauss, *Valuation of Avigation Easements, Right of Way* (March/April 2012); Stephon B. Bagne, *Broad Rights of an Avigation Easement, Right of Way* (May/June 2014).

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For FAA's part, it declined to say, in issuing the final Part 107 rules in 2016, whether it believes UAS operating below 400 feet pursuant to Part 107 are committing a trespass through airspace subject to private property rights. Instead, it stated, "[a]djudicating private property rights is beyond the scope of this rule. . . . With regard to property rights, trespassing *on* property (as opposed to flying in the airspace *above* a piece of property) without the owner's permission may be addressed by State and local trespassing law."¹⁴⁰ FAA officials also declined to provide the agency's position on airspace property rights or its interpretation of *Causby* for this report, noting these are among the issues being considered by the DOT Preemption Working Group that is being coordinated with DOJ.

Nonetheless, it appears FAA has recognized constitutionally protected property rights in low-altitude airspace at least in the context of manned aviation. FAA's directives governing its Airport Improvement Program (AIP) have long required airport sponsor-grantees to acquire "title" to all "real property interests" needed for construction and operation of the grant-assisted airport. FAA explicitly states that these property interests include airspace easements—now known as avigation easements—which it defines as "a conveyance of airspace over another property for use by the airport." FAA states that sponsors generally must obtain a market value appraisal of avigation easements and it requires airport sponsors to pay "just compensation" for this "interest in . . . real property." FAA also notes that sponsors may need to use their "power of eminent domain," and to "institute formal condemnation proceedings" for "the taking of the real property," to acquire such property interests.¹⁴¹

According to FAA,¹⁴² its AIP property acquisition requirements implement 49 U.S.C. § 47016(b)(1), which authorizes DOT to approve airport development grants only if the sponsor, a public agency, or the Government holds or will acquire "good title" to takeoff and landing areas. The statute does not specify that the property to which title must be acquired includes airspace, however. That interpretation, of an earlier codification of the statute, is found in *Griggs*. Relying on *Causby* and seemingly consistent with FAA's present-day AIP requirements, *Griggs* found that air easements were constitutionally protected "private property,"¹⁴³ as noted

¹⁴⁰ 81 Fed. Reg. at 42119 (emphasis added). See also *id.* at 42131 ("Property rights are beyond the scope of this rule.").

¹⁴¹ See, e.g., FAA Advisory Circular 150/5100-17, Change 7, *Land Acquisition and Relocation Assistance for Airport Improvement Program (AIP) Assisted Projects* (July 10, 2017), available at http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC-150-5100-17-Change-7-Land-Acquisition.pdf (last visited Sept. 1, 2020), at pp. 1-9 to 1-10, 2-9 to 2-13, 3-1 to 3-15; FAA Central Region, Airports Division, AIP Sponsor Guide, Sec. 500 Airport Planning (Sept. 1, 2020), available at https://www.faa.gov/airports/central/aip/sponsor_guide/media/0500.pdf (last visited Sept. 1, 2020), at pp. 500-16 (Airport Property Interests), 500-17 (Avigation Easements). See also FAA Order 5100.37B, *Land Acquisition and Relocation Assistance for Airport Projects* (Aug. 1, 2005), available at https://www.faa.gov/documentLibrary/media/Order/environmental_5100_37b.pdf (last visited Sept. 1, 2020), sec. 2-27 (Appraisal of Avigation Easements), 3-5 (Acquisition of Easements or Other Partial Interests in Real Property).

¹⁴² See FAA Order 5190.6B, *Airport Compliance Manual* (Sept. 2009), Part IV, Chapter 6.12.a., Title Requirement (Grant Assurance 4, *Good Title*), available at http://www.faa.gov/documentLibrary/media/Order/5190_6b.pdf (last visited Sept. 1, 2020); FAA Order 5100.38D, Change 1, *Airport Improvement Program Handbook* (Feb. 26, 2019), at pp. 2-15, 2-16, 6-26, available at https://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D-Chg1.pdf (last visited Sept. 1, 2020).

¹⁴³ *Griggs*, *supra* note 137, 369 U.S. at 90. *Griggs* was interpreting former 49 U.S.C. § 1108(d), which authorized the Civil Aeronautics Administration, FAA's predecessor, to approve federal grants for development of public airports only

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above.¹⁴⁴ DOT officials declined to indicate to us whether they agree with *Griggs* or to identify the basis for FAA's inclusion of airspace easements in its AIP property requirements, again explaining that the DOT Preemption Working Group is considering such issues.

Other stakeholders had differing views about the continued recognition of airspace property rights and their impact on FAA's authority. One law firm stakeholder we spoke with has suggested superadjacent airspace property rights are an anachronism and should be reconsidered to allow society to achieve the social and economic benefits of UAS operations. Using the *Boggs v. Merideth/Drone Slayer* case discussed above as an example, the stakeholder said there is an "incompatibility between FAA regulations, which claim jurisdiction over all U.S. airspace, and longstanding common law property rights which state that landowners control the rights to the airspace above their land. Sixty years ago, the Supreme Court established an imprecise definition of the public/private boundary in *United States v. Causby*, but the vague framework is ripe to be challenged. . . . [*Boggs v. Merideth* highlighted] whether there is a limit to a landowner's private interest in airspace, and also whether this public/private separation is reconcilable with 21st century technology."¹⁴⁵ The stakeholder cited the *Haughwout* case discussed above as another example "where the FAA enforces its control over the airspace in Americans' backyards," which "will likewise test the limits of FAA's regulatory regime."¹⁴⁶

Similarly, in comments filed with the Uniform Law Commission on a draft drone aerial trespass law (discussed in Appendix II), a group of 17 UAS industry, technology, media, and other firms (hereafter ULC Industry Commenters Group), including several industry stakeholders we spoke with, also raised questions about whether *Causby* in fact recognized airspace property rights.¹⁴⁷ The Group said *Causby* did not hold that the "immediate reaches" of airspace are subject to a

if a public agency holds or is committed to acquiring "good title" to the airport landing area. See Pub. L. No. 79-377, sec. 9(d), 60 Stat. 170, 175 (1946), formerly codified at 49 U.S.C. § 1108(d). Because *Griggs* ruled that the statute, as so interpreted, imposed responsibility on the county airport sponsor to acquire flight easements in the neighbors' overlying airspace, it held the county's failure to do so, resulting in interference with the neighbors' use and enjoyment of their land, made the county liable for an unconstitutional taking of the neighbors' property.

¹⁴⁴ FAA's AIP property acquisition directives also state that they carry out the Uniform Relocation Assistance and Real Property Acquisition Policies Act, 42 U.S.C. §§ 4601 *et seq.*, and implementing regulations, 49 C.F.R. Part 24. As relevant here, these requirements apply to any federal project or program that requires acquisition of "real property." See FAA Advisory Circular 150/5100-17, *supra* note 141, at page i; FAA Order 5100.37B, *supra* note 141, at page 1. Like the "good title" requirements of 49 U.S.C. § 47016(b)(1), however, these requirements do not specify that the "real property" to which they apply includes airspace or easements in airspace.

¹⁴⁵ Jennifer Trock, Paul Alpern, Christopher Leuchten, Kevin Grover, *The Use of Unmanned Aircraft Systems in the Construction Industry in the United States and Canada: An Overview of the Applicable Frameworks*, 12 J. Amer. Coll. Construction Lawyers (Jan. 2018).

¹⁴⁶ Trock, *supra* note 145.

¹⁴⁷ See Letter to Uniform Law Commission from 17 corporations, UAS recreational user and other organizations, trade associations, manufacturers, mapping, software, and other entities (hereafter ULC Industry Commenters Group), July 1, 2019. The 17 entities comprising this group were the Alliance for Drone Innovation, Amazon, the Academy of Model Aeronautics, the Association for Unmanned Vehicle Systems International, BNSF Railway, Cherokee Nation Technologies, the Commercial Drone Alliance, the Consumer Technology Association, the U.S. Chamber of Commerce Technology Engagement Center, CTIA, DJI Technology, Kittyhawk, NetChoice, PrecisionHawk, Skyward, the Small UAV Coalition, and Verizon.

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landowner's control to the same extent as their land. Those statements were *dicta*,¹⁴⁸ the Group said, and the Court's actual holding was based on damage caused by the overflights to the landowner's use of his *land*, not to the fact that the overflights intruded into airspace close to the land. A law firm stakeholder we spoke to agreed, noting *Causby* focused on traditional property rights in *land* and interference with the landowner's use of his *land*.

The ULC Industry Commenters Group also said states are preempted from recognizing airspace property rights by establishing an altitude-based ceiling below which drones are deemed to be trespassing. As discussed in Appendix II, drawing such a "line in the sky" would create a no-fly zone, the industry group said, in conflict with federal law authorizing only FAA to establish no-fly zones. States likewise are preempted from authorizing landowners to file aerial trespass tort suits to exclude UAS flights over their properties below pre-established altitudes, according to the Industry Commenters Group, because that, too, would have the effect of creating no-fly zones, which only FAA may establish.¹⁴⁹

To suggestions that *Causby* has been misread as recognizing continued airspace property rights, however, an attorney stakeholder we spoke with strongly disagreed. He told us *Causby* remains good law, with the very examples the Supreme Court cited in its opinion establishing that landowners have exclusive control of the "immediate reaches" of the enveloping atmosphere above their land—an undefined amount of airspace that runs with each parcel of land. This stakeholder has also said FAA's Part 107 rules "do not overrule or negate" these rights by virtue of establishing that drones *may* operate at altitudes below 400 feet under specifically enumerated conditions. By its terms, the stakeholder told us, Part 107 neither establishes nor purports to establish nationwide drone flight corridors in all airspace below 400 feet, nor to adjudicate private airspace rights.

To assert otherwise—to say FAA's authorization of specifically enumerated UAS operations below 400 feet *has* adjudicated private airspace rights and abrogated every private landowner's right to control all or at least part of that airspace—may well constitute "a nationwide 'taking' of private property without just compensation that surely raises significant questions about the scope of the Federal Government's authority under the Commerce Clause of the U.S. Constitution, according to this stakeholder."¹⁵⁰ More specifically, this stakeholder told us, if Part 107 *is* understood as authorizing nationwide UAS flight corridors at what he calls "ultra-low altitudes"—at least up to 100 or 125 feet (which he believes "surely constitutes 'immediate reaches' airspace under *Causby*") and perhaps as high as 250 feet—then there is a "serious and compelling argument" that Part 107 has effected an unconstitutional regulatory taking (an

¹⁴⁸ *Dicta* are a court's comments made in a judicial opinion that are not strictly necessary to the decision in the case, and therefore are not binding legal precedent. *Black's Law Dictionary*, 11th ed. (2019) at 569.

¹⁴⁹ See Letters to Uniform Law Commission from ULC Industry Commenters Group, July 5, 2018, June 14, 2019, and July 1, 2019. Allowing states to authorize landowner aerial trespass suits to exclude UAS flights over their private property would "interfere[] with the plenary authority of [FAA] . . . in order to give property owners a right to establish no-fly zones prohibiting any unmanned aircraft from flying below 200 feet," the industry group explained. *Id.*, Letter of July 5, 2018. (As discussed in Appendix II, the ULC Industry Group was commenting on a draft model UAS aerial trespass law setting a 200-foot altitude ceiling below which UAS would be trespassing.)

¹⁵⁰ Letter to Uniform Law Commission from Reginald C. Govan re Proposed Tort Law Relating to Drones Act, July 24, 2018.

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inverse avigation easement) without just compensation.¹⁵¹

An academic stakeholder we spoke with has addressed the impact of such preemption of state and local UAS restrictions more directly. He noted there is a potential for “one of the largest uncompensated transfers of property interests in United States history” if FAA seeks to preempt all state and local drone use restrictions and common law tort claims.¹⁵²

Other stakeholders we spoke with and legal commentators¹⁵³ also believe *Causby* remains good law and clearly recognizes airspace property rights, with some believing these rights may conflict with FAA’s view of its jurisdiction from the ground up. For example, an academic stakeholder told us these airspace property rights include the right, from the traditional property “bundle of rights,” to exclude others and thus entitle a landowner to “eject” a trespassing drone in the same way a landowner may sue to “eject” a trespassing tree branch overhanging his property.

The American Bar Association’s Real Property, Trust and Estate Law Section recently took the same position in proposing a resolution, subsequently adopted by the full ABA House of Delegates in February 2020, that urges the federal, state, and local governments to protect landowners’ property rights in any UAS statutes or regulations. The Section said “[i]t is an open question as to whether the FAA’s authority extends to areas such as one foot above the ground” and whether “FAA preemption authority extends to one (1) foot above the ground.” Citing *Causby*, the Section also asserted that landowners and other legal land occupants must have the right to “prevent UAS from using and crossing airspace over their land in some form or fashion.”¹⁵⁴ Similarly, as discussed in Appendix II, in 2019, the Section opposed a Uniform Law Commission draft drone aerial trespass model act because it did not protect landowners’ *per se*

¹⁵¹ We discuss these and other regulatory takings issues in Appendix II.

¹⁵² Troy A. Rule, *Drone Zoning*, 95 N.C. L.Rev. 133, 171 (2016). In that event, this stakeholder said, “[m]illions of Americans would lose valuable rights to prevent unwanted devices from physically invading the airspace just above their backyards and rooftops, receiving almost nothing in return.”

¹⁵³ See, e.g., Kyle Joseph Farris, *Flying Inside America’s Drone Dome and Landing in Aerial Trespass Limbo*, 53 Val. U. L. Rev. 247, 282-83 (Fall 2018) (“The FAA cannot regulate every inch of airspace because reachable air belongs to the landowner. Above each piece of land sits a block of air for the landowner to use. This block of air, or reachable air, attaches to the land as part of the whole property and absorbs its protections.”).

Cf. Wendie L. Kellington, *Drones*, 49 Urb. Law. 667, 669 (2017) (“The power of Congress and the FAA to declare navigable airspace does not give anyone, including pilots, the right to trespass, create nuisances, unconstitutionally take private property, invade privacy, commit crimes, or commit state law torts. . . . [T]he location of navigable airspace for low flying aircraft, like small drones, potentially has great impact on real property rights and personal rights of privacy.”); Lindsey P. Gustafson, *Arkansas Airspace Ownership and the Challenge of Drones*, 39 U. Ark. Little Rock L. Rev. 245, 276 (2017) (“This once latent question about the extent of federal preemption over airspace is now critically important and still unresolved by a court. That the issue of whether this authority extends the FAA’s exclusive jurisdiction beyond navigable airspace ‘has remained unaddressed is, presumably, a testament to both its difficulty and the fact that courts can easily avoid deciding the issue in a world where commercial air safety generally requires flight . . . [above] 500 feet.’ . . . Despite broad statements from the FAA as to its regulatory authority, Congress has not indicated that it intends to remove from [states their] broad police powers to regulate lower-altitude airspace. This power extends beyond the commerce clause, and properly remains with the states.”).

¹⁵⁴ ABA Section on Real Property, Trust and Estate Law, Report accompanying Resolution 111 (adopted by ABA House of Delegates, Feb. 17, 2020), at 3-5.

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right to prohibit drone trespass into the “near reaches” above their property.¹⁵⁵

The above-noted academic stakeholder also told us the use and control of superadjacent airspace by FAA and other government entities must be viewed through the lens of the Fifth Amendment, as in *Causby* and *Griggs*. The government may decide, for example, that an aviation easement is needed through superadjacent airspace to provide a corridor for UAS operations. In that case, he said, the government may use its eminent domain power to take that private property for a public use but must pay just compensation for it, such as when the Federal Highway Administration wants to construct a highway across private land and must condemn the land and pay just compensation. Accommodating airspace property rights in this way would help states and localities that wish to become early adopters of UAS, the stakeholder believed, because there would be a clear process (eminent domain and just compensation) for them to follow.

Finally, some stakeholders we spoke with were unsure about the meaning of *Causby* and the current legal status of airspace property rights. They said, however, that with the advent of UAS operating at far lower altitudes than manned aircraft, society should reconsider concepts of property rights in airspace as well as the statutory definition of “navigable airspace.” Other stakeholders and legal commentators believed such rights still exist but need to be better defined in the UAS context by FAA, the courts, or Congress or the state legislatures.

The above-noted attorney stakeholder, for example, suggested to us that state and local governments, which have neighborhood-specific information needed to make “micro-decisions” about when and where drones may safely fly, should be authorized to do so subject to guiding principles to be created by FAA. If a UAS operator believes particular state or local restrictions violate those principles, this stakeholder proposed, the operator could appeal to FAA, whose final determination could then be appealed to a federal court under the Administrative Procedure Act.¹⁵⁶ By contrast, two legal commentators have recently proposed that states could create “drone highways” above public rights-of-way that UAS operators could use for parcel delivery and other services.¹⁵⁷ Finally, still other stakeholders believed FAA clearly has sole authority to regulate UAS operations from the ground up.

A common theme from a range of stakeholders, including from law firms, academia, tribes, and states and localities, was that the scope of FAA’s “airspace” authority is uncertain and should be clarified by FAA, Congress, or the courts. Some believed FAA’s regulatory authority should be limited to UAS operations above a certain altitude (500 feet, for example, the general minimum safe altitude for manned aircraft, or perhaps 200 feet or lower), leaving states to regulate UAS operations below that. In such cases, one stakeholder suggested FAA could still retain authority

¹⁵⁵ Memorandum to the Uniform Law Commission from Jo-Ann Marzullo, Chair-Elect, American Bar Association Real Property, Trust and Estate Law Section, June 25, 2019.

¹⁵⁶ The Administrative Procedure Act authorizes a federal court to review “[a]gency action made reviewable by statute and final agency action for which there is no other adequate remedy” 5 U.S.C. § 704.

¹⁵⁷ Brent Skorup and Connor Haddland, *Which States Are Prepared for the Drone Industry? A 50-State Report Card*, Mercatus Center at George Mason University (March 19, 2020), available at <https://www.mercatus.org/publications/technology-and-innovation/which-states-are-prepared-drone-industry> (last visited Sept. 1, 2020).

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to mitigate safety risks, for example by prohibiting UAS operations near airports. Recognizing states have this authority would compensate for FAA's lack of information and resources needed to regulate and enforce UAS requirements in every neighborhood in the country, the stakeholder said. It also would reflect the reality that states have the best understanding of the unique needs of their citizens and should be allowed to use their traditional police powers to regulate what are matters of local public health, safety, and welfare, not interstate commerce, the stakeholder said.

b. Stakeholder Positions on the Scope of Federal Preemption of State, Local and Tribal UAS Regulations

In addition to the scope of FAA's authority to regulate low-altitude UAS operations and the impact of airspace property rights on that question, the other major UAS-related jurisdictional issue that raised questions and concerns for both state, local, and tribal government stakeholders and UAS industry stakeholders we spoke to was federal preemption. As noted, when the federal government acts within its constitutionally enumerated powers, federal law prevails over state and local law if that is what Congress clearly intended, and federal law applies to and may preempt tribal law depending on the text of the federal law. Thus assuming FAA has authority to regulate UAS operations down to the ground (the question addressed above), the issue is whether Congress has clearly manifested its intent that FAA's UAS regulations should preempt state, local, and tribal UAS regulation in this same low-altitude airspace.¹⁵⁸

As noted, it appears only one federal court decision, *Singer v. Newton*, has ruled on federal preemption of state or local UAS regulations; the court there held that a *de facto* city-wide ban on UAS operations was preempted as conflicting with FAA regulations.¹⁵⁹ Also as noted, FAA has said the courts have recognized it exclusively occupies and preempts the field of aviation safety and the efficient use of navigable airspace.¹⁶⁰ Nevertheless, because FAA has acknowledged that states and localities can enact and enforce certain types of general police power laws regarding UAS, it has invited them to make individual inquiries, as part of a consultation process, to determine whether FAA believes their specific regulations raise preemption issues. One local stakeholder who used this consultation process told us it was extremely helpful in ensuring its UAS-specific ordinances did not conflict or interfere with FAA's rules.

It is possible FAA and DOT's position on the scope of preemption and ways to resolve preemption-related concerns about UAS integration may change, influenced by the results of the UAS Integration Pilot Program, as discussed in Part B.2.b. above. Also as noted, the DOT Preemption Working Group, in coordination with DOJ, is expected to provide its analysis and recommendations on DOT's legal position regarding preemption and related UAS jurisdiction matters to DOT leadership in the coming months, with a public announcement of DOT's position

¹⁵⁸ FAA preemption may affect both enactment and enforcement of state and local laws. Because state and local stakeholders expressed additional concerns about their UAS enforcement authority beyond preemption, however, we address all stakeholder enforcement concerns in Part D.2. below.

¹⁵⁹ See *Singer v. Newton*, *supra* note 55.

¹⁶⁰ See 2015 FAA UAS Fact Sheet, *supra* note 61 and accompanying text.

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to occur sometime thereafter.

In the meantime, stakeholders we spoke with had differing views about the scope of FAA preemption in the UAS context. Some UAS industry stakeholders told us there is and should be broad preemption in order to ensure nationwide regulatory consistency and avoid a “patchwork” of state and local laws they believe will stifle technological innovation and the development of the UAS industry. While these stakeholders recognized state, local, and tribal governments have unique needs and concerns, they suggested these concerns can often be addressed using existing legal frameworks rather than enacting UAS-specific laws that risk conflicting with FAA regulations. States and localities should focus on solving problems UAS operations may create in a technology-neutral way rather than addressing UAS as a unique technology, they said. For example, it is unnecessary to enact a state or local law prohibiting UAS from flying over prisons in order to prevent delivery of contraband, they said, because delivering contraband already is illegal.

A UAS industry stakeholder also told us allowing states and localities to enact their own UAS regulations “solves a problem that does not exist yet” and could result in total operational bans in some areas, harming the UAS industry in the U.S.. which the stakeholder said is not “at scale.” In fact, as noted above, according to the ULC Industry Commenters Group, state and local altitude-based operational bans already are preempted because they would conflict with FAA’s exclusive authority to establish no-fly zones. Likewise, the ULC Industry Commenters Group said, states and localities are preempted from allowing landowner aerial trespass suits seeking to exclude UAS below a pre-fixed altitude. Additionally, some UAS industry stakeholders told us that even allowing states and localities to restrict UAS operations in certain locations would unduly burden UAS operators, because it would require them to know local rules and requirements in multiple jurisdictions. Having a single regulator—FAA—establishing flight restrictions will help ensure that UAS operators that fly longer distances will be able to comply with the rules, these stakeholders said.¹⁶¹

Nevertheless, some UAS industry stakeholders told us states and localities should be able to enact reasonable time, place, and manner restrictions, provided the restrictions are technology-neutral rather than specifically targeting UAS. One stakeholder gave the example of a restriction imposed by the city Santa Monica, California, which prohibits model aircraft flights over city beaches. Because the city also prohibits cars and scooters from operating on or near the beaches, the stakeholder believed the restriction on model aircraft was acceptable. Another industry stakeholder, however, expressed concern about adopting the term “reasonable time, place, and manner restrictions” to describe what states and localities may enact with respect to drone operations. The stakeholder noted this comes from First Amendment case law, where the courts have ruled states and localities may enact certain restrictions on an individual’s constitutional right to free speech. But because there is no equivalent compelling constitutional right to operate a UAS, the stakeholder said, *any* restriction of UAS operations might be deemed “reasonable.”

¹⁶¹ As legal commentators representing UAS interests concluded, “state and local authorities should regulate drones with restraint, recognizing the need to encourage, not suffocate, the burgeoning drone industry and the breadth of federal regulatory authority over aviation. . . . [S]tate lawmakers must exercise caution to avoid enacting reactionary, burdensome, and restrictive laws . . . [which] risk alienating the drone industry and impeding economic development.” Mark J. Connot, Jason J. Zummo, *Everybody Wants to Rule the World: Federal vs. State Power to Regulate Drones*, 29 No. 3 Air & Space Law. 1 (2016).

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State, local, and tribal stakeholders, on the other hand, emphasized that because drones can—and, under current federal statute and regulation, must—fly at low altitudes absent a waiver, they present inherently “local” challenges—“from the ground up” and “down to the blades of grass.” These challenges are best resolved by the government entities with first-hand knowledge of their communities who know how to address and balance the needs of their citizens, the stakeholders said. Other states and localities told us they did not object to FAA’s role as the primary regulator on safety matters, but were uncertain what matters FAA believes are within its exclusive jurisdiction and thus preempt state and local regulation.

A number of state and local stakeholders said they believe they should not be preempted from enacting reasonable time, place, and manner restrictions such as permanent restrictions on UAS flights over state capitol buildings, tribal burial grounds, and critical physical infrastructure and temporary restrictions on flights over one-time events such as parades, funerals, and sporting events. These stakeholders believed the current system, under which they can request a Temporary Flight Restriction but must rely on FAA to approve their request, is unworkable because of the time delay. They also noted that while the FAA Extension, Safety, and Security Act of 2016 required FAA to create a process for requesting permanent flight restrictions over fixed sites by 2017, FAA has not yet established this process.¹⁶² The stakeholders believed they should not be preempted from acting directly at least in limited circumstances.

Regarding concerns raised by the UAS industry about the possible impact of a regulatory patchwork created by different state laws, a number of state and local stakeholders believed this position is not based on the public interest but rather on the UAS industry’s economic preference for one-stop approval by a single regulator, FAA. Some state and local stakeholders acknowledged that differing state and local laws could create something of a regulatory patchwork, but said they are not “one size fits all” entities and have unique interests and needs that cannot be adequately addressed by a single regulatory system. Another local stakeholder said patchwork solutions may be needed because localities “need the patches.”

State and local stakeholders also said state and local autonomy is more important than the benefits of a single UAS regulatory system. Some jurisdictions want to help this new technology develop, while others want to substantially limit UAS operations. Jurisdictions at both ends of the spectrum should be given the freedom to do what is best for their community, the stakeholders said. Several state and local stakeholders also questioned the “patchwork” argument by noting that state and local motor vehicle traffic laws have not unduly hindered commerce and the same would be true for drones. A state organization official said there is no evidence that today’s differing laws are in fact stifling innovation, and he stated that an industry capable of developing sophisticated technology to support Remote ID and a UTM traffic control system also is capable of developing technologies, such as geo-fencing, to enable a drone to “know” where it is and comply with any local restrictions. The more technology develops, this official said, the less likely it is that differing state laws will stifle innovation.

Almost all state and local stakeholders we spoke to said there is a need for greater clarity from FAA about the types of laws it believes are preempted, as well as a need for states and

¹⁶² See 2016 FAA Extension, Safety, and Security Act, *supra* note 34, sec. 2209, 130 Stat. at 634 (setting January 2017 deadline for establishment of process). DOT officials told us that FAA currently estimates proposing a rule to implement section 2209 in February 2021.

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localities at least to have a “seat at the table” with FAA in deciding how to approach preemption issues. While having the 2015 FAA UAS Fact Sheet and being able to make individual inquiries to FAA are helpful, the stakeholders said, there is still significant uncertainty.

A final cause of confusion about the scope of FAA preemption cited by local stakeholders are FAA’s statements in its 2015 UAS Fact Sheet and 2018 UAS Press Release that “land use [and] zoning” laws, including laws regulating the location of UAS takeoff and landing locations, likely would not be preempted. While this would appear consistent with court rulings upholding local zoning restrictions on where manned aircraft may land,¹⁶³ one stakeholder said that because UAS can be launched from virtually anywhere, FAA’s guidance might allow localities to use zoning laws to establish *de facto* bans throughout a city, including banning backyard “airports.” The stakeholder was unclear whether that was FAA’s intent, however.

2. Stakeholder Questions and Concerns about UAS Enforcement Authority

State, local, and tribal stakeholders we spoke to identified a number of legal and practical questions and concerns about whether and how they can enforce federal laws and their own laws and take other measures to address what they see as threats posed by UAS operations. A common theme among virtually all state and local stakeholders about these UAS *enforcement* issues, as it was among many state and local stakeholders regarding UAS *regulation* issues as discussed in the previous section, was the need for additional clarity. As one municipality stakeholder group told us, in order to guide their enforcement efforts, they need more clarity on questions such as “when has a UAS committed a trespass through airspace? And where does land stop and aviation start?” In addition, where states and localities currently lack authority in certain areas—notably authority to enforce FAA regulations and to use counter-UAS measures to respond to significant threats—many stakeholders said they wanted to obtain this additional authority.

a. Whether States, Localities, and Tribes Have Authority to Enforce Their Own Laws or Federal Laws to Respond to UAS Incidents

Some state, local, and tribal stakeholders were uncertain whether they have authority to take enforcement action addressing UAS concerns using their own laws. Because FAA has asserted exclusive control over aviation safety and the efficient use of airspace, they told us, it is unclear whether their only option in the event of an incident is to contact FAA. This lack of clarity can put law enforcement in harm’s way, some suggested. For example, if a report is made to police about a UAS flying over critical infrastructure and police go to the scene to investigate, their uncertainty about what if anything they can do (assuming they can locate the UAS operator) could create a dangerous situation, a stakeholder told us. Some stakeholders

¹⁶³ See, e.g., *Hoagland v. Town of Clear Lake*, 415 F.3d 693, 697 (7th Cir. 2005), *cert. denied*, 547 U.S. 1004 (2006) (town ordinance requiring Zoning Board approval of aircraft landing strips and helicopter landing pads not explicitly preempted by Federal Aviation Act provision preempting air carrier routes; court holds the ordinance “is a land use, or zoning, ordinance, not a flight pattern regulation” and notes distinction between local control of flight routes and local control of airport location); *Gustafson v. City of Lake Angelus*, *supra* note 18, 76 F.3d at 783, 789 (city ordinance prohibiting seaplanes from landing on local lake not preempted by broad federal aviation regulatory scheme; although 49 U.S.C. § 40103 authorizes FAA to regulate the “navigable airspace” and the “flight of aircraft” as needed to ensure aircraft safety and efficient use of the airspace, “there is a distinction between the regulation of the navigable airspace and the regulation of ground space to be used for aircraft landing sites.”).

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also told us more clarity is required about whether states and localities can use their general laws to address concerns about UAS operations or instead must enact UAS-specific laws.

Some state and local stakeholders also were uncertain whether they have authority to enforce FAA's UAS regulations. Such uncertainty may explain why at least some law enforcement officials appear to have informed UAS operators they are in violation of federal law, as in the *North Dakota v. Turgeon* case noted above.¹⁶⁴

FAA officials told us the agency is making significant efforts to educate states and localities that they may respond to UAS incidents using either their own general laws or UAS-specific laws, but that they may not enforce federal UAS regulations because in FAA's view, it lacks authority to delegate its UAS enforcement powers.¹⁶⁵ FAA has conveyed this message through issuance of guidance to state and local law enforcement agencies, for example,¹⁶⁶ as well as through interactive webinars.¹⁶⁷ In a March 2019 webinar, for instance, FAA stressed that states and localities retain their traditional police powers including law enforcement powers,¹⁶⁸ and noted the same conduct may violate both FAA's statute and regulations as well as state and local law.¹⁶⁹

A number of state and local stakeholders told us they would like a change in the law to enable FAA to delegate its enforcement authority to them. This stems in part from concern about what these stakeholder's view as FAA's limited resources to take UAS enforcement action across the country. One stakeholder told us it is difficult to see how FAA will be able to "micro-regulate"

¹⁶⁴ See *Turgeon*, *supra* note 56.

¹⁶⁵ As FAA officials explained to us, Congress directed that FAA "shall" promote safe flight of civil aircraft and develop plans, policy, regulations, and orders for the use of navigable airspace necessary to ensure the safety of aircraft and the efficient use of airspace, see 49 U.S.C. §§ 44701, 40103, and provided no express discretion to FAA to delegate its overall regulation of aviation safety and efficiency in the navigable airspace to state or local governments. FAA officials also noted courts have validated the principle that specific grants of authority, absent express authorization permitting delegation of such authority, are not delegable. *Cf.* 49 U.S.C. § 44702(d) (authorizing FAA to delegate its authority to conduct aviation-related testing and inspections to issue airworthiness and production certificates, among other things); 49 U.S.C. § 60106(b)(1) (authorizing DOT to allow state participation in general oversight of interstate pipeline transportation).

¹⁶⁶ See, e.g., 2018 FAA Law Enforcement Guidance, *supra* note 71.

¹⁶⁷ FAA Webinar, *Drone Safety: It's the Law—What Public Safety Officials Need to Know about Drones* (March 6, 2019), available at <https://www.youtube.com/watch?v=zez bqGiSP5c> (last visited Sept. 1, 2020).

¹⁶⁸ As noted above, for example, in the Drone Slayer case, see *supra* note 79 and accompanying text, the state of Kentucky (unsuccessfully) charged the landowner who shot down the drone with felony wanton endangerment and criminal mischief. In the *New York v. Beesmer* case, New York authorities (unsuccessfully) brought state misdemeanor attempted unlawful surveillance charges against a UAS videographer, and in the *Utah v. Foote* case, Utah authorities (successfully) charged a UAS operator under the state's "voyeurism by electronic equipment concealed or disguised" law. We discuss the *Beesmer* and *Foote* cases in Appendix III.

¹⁶⁹ For example, it would appear that a UAS being operated recklessly might violate both 14 C.F.R. § 91.13(a) (FAA's regulation prohibiting operation of an aircraft in a "careless or reckless manner so as to endanger the life or property of another," which FAA cited in *Huerta v. Pirker* (*supra* note 43) and *Huerta v. Haughwout* (*supra* note 72)), as well as a state or locality's reckless endangerment law (such as the local law cited in *North Dakota v. Turgeon* (*supra* note 56)).

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and “micro-enforce” UAS regulations in every neighborhood in the country as UAS proliferate; another stakeholder said there isn’t an “FAA patrol car” to ensure UAS requirements are locally enforced.

FAA has recognized that state and local law enforcement agencies “are often in the best position to deter, detect, immediately investigate, and, as appropriate [under state or local law], pursue enforcement actions in response to unauthorized or unsafe UAS operations.”¹⁷⁰ FAA therefore has established a Law Enforcement Assistance Program (LEAP) to ensure communication and coordination between federal, state, and local law enforcement agencies on a variety of public safety issues, including those related to UAS. FAA’s LEAP agents may obtain evidence from state and local law enforcement agencies to support federal enforcement actions and FAA has developed resources and information for law enforcement agencies about FAA’s UAS regulations and advises how they can help FAA deter, detect, investigate, and enforce its UAS regulations.¹⁷¹ A number of state, local, and tribal government stakeholders told us, however, that they view this approach as both costly—they compared it to an unfunded mandate—and frustrating—because FAA is seeking their assistance in enforcing FAA’s UAS rules at the same time FAA is preempting them from enacting their own UAS rules and not delegating federal enforcement authority to them.

b. What Enforcement Measures States, Localities, and Tribes Have Authority to Use

As discussed below, state, local, and tribal stakeholders expressed uncertainty about whether they have authority to take three particular types of actions in responding to UAS concerns: (i) requesting a UAS operator to produce their federal registration; (ii) ordering a UAS operator to land their drone; and (iii) using “counter”-UAS (C-UAS) measures to divert or take down a drone such as shooting it down or jamming its radio signals. If they lack such authority under current law, stakeholders generally wanted to obtain it.

(i) Requesting UAS Registration

FAA regulations require all UAS weighing more than 0.55 pounds to be registered and the registration number to be marked on the device.¹⁷² Several state and local stakeholders told us they are uncertain whether law enforcement may ask a UAS operator to show their registration. This is, in fact, required by law: UAS operators must have their FAA registration certificate in their possession when flying the UAS and both recreational and commercial UAS operators must show their certificate to federal, state, or local law enforcement upon request.¹⁷³ FAA officials told us they are making efforts to educate state and local law enforcement officials about this requirement.

¹⁷⁰ 2018 FAA Law Enforcement Guidance, *supra* note 71, at 1.

¹⁷¹ See generally [GAO-20-29](#), *supra* note 71. GAO recommended in this recent report that FAA develop an approach to more effectively communicate key information to local law enforcement agencies regarding their expected role in oversight and investigations regarding small-UAS safety.

¹⁷² 14 C.F.R. § 48.15.

¹⁷³ See 49 U.S.C. §§ 44103, 44809(a)(8).

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(ii) Ordering UAS Operators to Land

According to FAA, state and local law enforcement officials do not have authority to order a UAS to land pursuant to FAA's regulations or authority. As noted above, FAA believes it may not delegate its UAS enforcement powers. By contrast, FAA officials told us they have explained to public audiences that depending on the facts and circumstances, state and local law enforcement may be able to order a UAS operator to land their device pursuant to their own authority.

A single citizen complaint about a drone simply flying in the area likely will not support a directive to land, the FAA officials told us; because drones are still a relatively new and potentially confusing technology, law enforcement may receive more complaints "than are warranted," they said. If, however, a drone is posing a threat to public safety in some way, they said, law enforcement can reasonably respond as they normally would to any public safety threat, for example by using the state or locality's imminent harm or reckless endangerment powers. The fact that the threat is being created by a drone generally would not limit the locality's authority to order the drone to land. The officials told us how state and local officials use their own authorities is not within FAA's purview, unless enforcement of those laws creates preemption issues.

Whether such state or local authority extends to the use of force to shoot down or take other active measures regarding the drone is a different question, however, FAA officials told us. Those actions might constitute a federal crime or violate other federal law. Whether such actions would be authorized would be a determination for DOJ, not FAA, the officials told us; as discussed in the next section, DOJ officials told us there are very few circumstances at this time in which state or local law enforcement might be authorized to take down or disrupt a drone.

(iii) Using Counter-UAS (C-UAS) Measures

One of the most technically and legally complex UAS enforcement issues is whether state, local, and tribal governments have or should have authority to shoot down, disable, or take other measures to "counter" a UAS that poses a threat to individuals or infrastructure (referred to as "C-UAS" measures).¹⁷⁴ A number of local government stakeholders told us they believed they have at least some inherent authority under their traditional police powers to counter a drone posing an imminent risk of harm to public health or safety. If a locality were faced with a UAS-related safety emergency, some stakeholders also said they likely would take an "act first, ask forgiveness later" approach. Other local government stakeholders who were unclear about their authority, however, did not want to use it even assuming they had such authority, because of the dangers that downing or disabling a drone could pose to individuals on the ground.

One law firm stakeholder we spoke to has suggested there are two legal reasons why states and localities might be precluded from exercising their police powers to use C-UAS measures: (1) preemption, based on a conflict between federal criminal laws or other laws prohibiting such actions, on the one hand, and local police power laws allowing them, on the other hand; and

¹⁷⁴ See generally Cybersecurity & Infrastructure Security Agency, *Unmanned Aircraft Systems (UAS)—Critical Infrastructure*, available at <https://www.cisa.gov/uas-critical-infrastructure> (last visited Sept. 1, 2020); Congressional Research Service, *In Focus: Protecting Against Rogue Drones*, IF 11550 (May 14, 2020).

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(2) the fact that such actions might themselves violate these federal laws absent a legal “safe harbor” or exemption to take such measures.¹⁷⁵ FAA officials told us they believe the governing legal principle is not preemption but rather the fact that C-UAS actions may violate federal criminal or other law.

DOJ officials told us that in determining whether state and local law enforcement, airports, or other entities not explicitly exempted from liability may use C-UAS measures, there are two basic types of measures to consider: UAS “detection” and UAS “mitigation.”¹⁷⁶ UAS detection is accomplished either by radio frequency (RF)-based or non-RF based technologies. According to these officials, use of some detection technologies may violate the Pen/Trap Act,¹⁷⁷ the Wiretap Act,¹⁷⁸ or the Communications Act of 1934.¹⁷⁹ UAS mitigation measures also may violate various laws, according to these officials. Shooting down a drone may violate the Aircraft Sabotage Act, for example,¹⁸⁰ and jamming the UAS’s RF spectrum or hacking its computer (UAS are considered “computers in the sky”) may violate the Wiretap Act, Federal Communications Commission regulations,¹⁸¹ or the Computer Fraud and Abuse Act.¹⁸²

According to the DOJ officials, there are some UAS detection methods using technology that does not involve RF-interception or over-the-air collection of data to or from UAS (e.g., radars, electro-optical/infrared cameras, and acoustic sensors) that likely do not violate these laws. The officials emphasized, however, that a state or local government (or other entity) should consult a skilled C-UAS operator and a lawyer experienced in both federal and state electronic surveillance laws to ensure that the technology being used does not violate any of these laws.

¹⁷⁵ See, e.g., Trock, *supra* note 145 (suggesting Utah statute authorizing law enforcement to shoot down or jam signals of UAS operating near wildfires may be preempted by the Aircraft Sabotage Act).

¹⁷⁶ According to FAA, C-UAS technically refers only to systems used to disrupt, disable, take control of, or destroy a UAS (versus to detect a UAS). Letter from John R. Dermody, FAA Director, Office of Airport Safety and Standards, to Airport Sponsors (May 7, 2019), Attachment 2 (Frequently Asked Questions, Question 5), available at https://www.faa.gov/airports/airport_safety/media/Attachment-2-FAQS-UAS-Detection-Systems.pdf (last visited Sept. 1, 2020).

¹⁷⁷ 18 U.S.C. §§ 3121-3127 (prohibiting the use of “a pen register or a trap and trace device” to collect routing, addressing, signaling and other information for wire and electronic communications).

¹⁷⁸ 18 U.S.C. §§ 2510-2522 (prohibiting an individual from “intentionally intercept[ing], endeavor[ing] to intercept, or procur[ing] any other person to intercept or endeavor to intercept, any wire, oral, or electronic communication”).

¹⁷⁹ 47 U.S.C. § 333 (prohibiting willful interference, including RF interference, with radio communications of any FCC-licensed or authorized radio station or U.S. Government operated station).

¹⁸⁰ 18 U.S.C. § 32(a) (prohibiting setting fire to, damaging, destroying, disabling, or wrecking “aircraft” used, operated, or employed interstate, overseas, or foreign air commerce). DOJ officials declined to say whether the landowner who shot down the drone in the Drone Slayer case noted above would be in violation of this or any of the other statutes they discussed. They observed, however, that because DOJ itself believed it was subject to these restrictions, it spent enormous resources over 3 years to obtain legislative relief in 2018 (*see infra* note 185). DOJ officials also told us that as of August 1, 2020, DOJ had not filed criminal charges against individuals who had shot down drones.

¹⁸¹ 47 C.F.R. § 2.803 (prohibiting manufacture, import, marketing, sale or operation of jamming devices).

¹⁸² 18 U.S.C. § 1030 (prohibiting unauthorized access to and use of certain computers).

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FAA has similarly said most UAS mitigation methods are prohibited or subject to compliance with Communications Act requirements.¹⁸³

Currently only four government entities (and no private entities) have received statutory exemptions from these prohibitions and thus may use C-UAS detection and mitigation measures under certain circumstances: the Departments of Defense and Energy, which received statutory exemptions in 2016 (in what DOJ officials referred to as the Phase I exemptions),¹⁸⁴ and the Departments of Justice and Homeland Security, which received statutory exemptions in 2018 (in what DOJ referred to as the Phase II exemptions).¹⁸⁵ As FAA has explained, this authority was granted with strict requirements for testing and use in protection of specific missions, facilities, and assets and only after close coordination with FAA, reflecting the potential for C-UAS measures to cause unintended and significant impacts on the safety and efficiency of the national airspace system.¹⁸⁶

DOJ officials told us they expect Congress may ultimately grant what they termed “Phase III” exemptions, possibly on a trial basis. These might include, for example, exemptions for other federal agencies, state and local governments, and/or operators of airports and other critical infrastructure. Yet the officials stressed C-UAS mitigation measures must always supplement, not supplant, other means of UAS control such as education, FAA regulatory or civil enforcement (including mitigation), and criminal prosecution where merited. They also stressed that C-UAS detection is an essential part of any comprehensive C-UAS system because “you cannot stop what you cannot see,” they said. Once a UAS is detected, they explained, the operator can be approached to seek voluntary compliance. In the same vein, the DOJ officials said intercepting the UAS operator after detection should always, if possible, be the first

¹⁸³ 2018 FAA Law Enforcement Guidance, *supra* note 71, at 5-6. In August 2020, DOJ, FAA, FCC, and DHS issued a comprehensive advisory guidance document describing C-UAS detection and mitigation technologies and the federal civil and criminal laws and regulations that may restrict or prohibit their use. DOJ, FAA, FCC, and DHS, *Advisory on the Application of Federal Laws to the Acquisition and Use of Technology to Detect and Mitigate Unmanned Aircraft Systems*, 9.95.300-UAS (Aug. 17, 2020), available at <https://www.justice.gov/file/1304841/download> (last visited Sept. 1, 2020). DHS has issued guidance detailing C-UAS detection and mitigation technologies. DHS, *Counter-Unmanned Aircraft Systems, Technology Guide*, CUAS-T-G-1 (Sept. 2019), available at https://www.dhs.gov/sites/default/files/publications/c-uas-tech-guide_final_28feb2020.pdf (last visited Sept. 1, 2020).

¹⁸⁴ National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, §§ 1697, 3112, 130 Stat. 2000, 2639, 2756 (2016).

¹⁸⁵ 2018 FAA Reauthorization Act § 1602(a), 132 Stat. at 3522.

¹⁸⁶ Dermody Letter, *supra* note 176. In April 2020, DOJ issued guidance to its various law enforcement agencies, prepared in coordination with DOT and FAA, outlining the process for these agencies to seek approval to use C-UAS technologies and to request designation of high-risk facilities or other assets for protection. The guidance also stresses the need to coordinate with FAA when any C-UAS action might affect aviation safety, operations, aircraft airworthiness, or use of the national airspace system. See Memorandum from the Attorney General, *Guidance Regarding Department Activities to Protect Certain Facilities or Assets from Unmanned Aircraft and Unmanned Aircraft Systems* (April 13, 2020), available at <https://www.justice.gov/ag/page/file/1268401/download> (last visited Sept. 1, 2020). In July 2020, DHS issued a Privacy Impact Assessment discussing measures taken by the Department to mitigate privacy risks and protect personally identifiable information during its use of C-UAS measures. DHS, *Privacy Impact Assessment for the Counter-Unmanned Aircraft Systems (C-UAS)*, DHS/ALL/PIA-085 (July 15, 2020), available at https://www.dhs.gov/sites/default/files/publications/privacy-pia-dhsall085-c-uas-july2020_updated.pdf (last visited Sept. 1, 2020).

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mitigation step, which is why development of Remote ID capability (discussed in Part D.2.c. below) will, in their view, be “foundational”—provided that measures recommended by the defense, public safety, and law enforcement sectors are incorporated.

Local government stakeholders we spoke with from large cities told us they believe they require some type of C-UAS authority because of their dense urban environment and, in the case of New York City, a high threat of terrorism. While states and localities receive the benefit of some C-UAS protection because the above-noted authorized federal agencies can—and have—provided protection at certain large gatherings such as two Super Bowls, a World Series, and the New York City Marathon rated under DHS’s Special Event Assessment Rating system, some said this framework is unworkable because federal agencies do not have the resources to safeguard every mass gathering that merits protection. Those stakeholders favored delegating C-UAS authority to state entities with appropriate responsibilities and expertise.

Nevertheless, even local government stakeholders who wanted C-UAS authority recognize that C-UAS measures can create risks to individuals on the ground—for example, if the drones crash—and can, depending on the technology used, disrupt nearby RF signals such as those used by cell phones. Given that C-UAS technologies may require extensive training and are in the early stages of development, some of these stakeholders believed legal authority to use them should be delegated to state and local governments carefully and only after further study and experience at the federal level.¹⁸⁷ DOJ officials told us they share this concern about the need for extensive training, including training on operational, legal, and privacy and civil liberties issues. The officials strongly recommended that prior to any such delegation, state and local partners be required to complete a DOJ certification course, and also be required to operate consistent with best practices developed on federal study and experience.

A congressionally mandated study about C-UAS legal authorities, currently being conducted by DHS, should further inform lawmakers about key issues in this fast-changing area. Section 1602 of the 2018 FAA Reauthorization Act provides for DHS, in coordination with DOJ and DOT, to evaluate current federal, state, local, territorial, and tribal enforcement authorities to counter UAS threats to U.S. critical infrastructure and domestic large hub airports, and to recommend possible changes to those authorities needed to assist federal law enforcement to counter such threats. DHS officials told us they expect to report to Congress on the results of their evaluation in the coming months.

c. Stakeholder-Identified Need for Requirement to Identify UAS in Flight (Remote ID)

The final questions and concerns state and local stakeholders identified to us regarding UAS enforcement matters involved the current lack of a legal requirement to install and use technology that provides real-time access to information identifying and tracking a UAS while it is in flight, as well as information identifying the UAS operator and owner. These stakeholders explained that such technology is needed because even if a UAS incident is immediately reported to law enforcement, by the time officers arrive, the UAS likely will be out of view and

¹⁸⁷ In October 2019, a task force of U.S. and Canadian airport authority officials, former U.S. federal aviation safety officials, and others made similar recommendations. See Blue Ribbon Task Force on UAS Mitigation at Airports, *Final Report* (Oct. 2019), available at <https://uasmitigationatairports.org/> (last visited Sept. 1, 2020). Among other things, the task force recommended that Congress authorize state and local law enforcement agencies to take down drones that intrude into commercial airspace and establish a training program for airports and local law enforcement.

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the operator may have left the scene. Being unable to identify the UAS operator also can create difficulties for private citizens, who may wish to seek legal redress for UAS privacy, trespass, or other concerns, these stakeholders told us.

Congress has mandated development of such remote identification requirements¹⁸⁸ and as noted above, FAA has now issued a proposed Remote Identification (Remote ID) rule to address these and other issues,¹⁸⁹ receiving over 53,000 public comments. In addition to assisting with law enforcement, public safety, and national security efforts, FAA expects that a Remote ID system will advance UAS integration into the national airspace system by supporting authorization of routine flights beyond the operator's visual line of sight and over people. This, in turn, is expected to support expanded commercial UAS uses and to lay the groundwork for a future UAS traffic management system (UTM).¹⁹⁰ Because increased flights over people and at night may pose risks to public safety and national security, however, FAA has said it will not finalize its proposed rules regarding these subjects until it finalizes the Remote ID rule.¹⁹¹

From a federal law enforcement perspective, DOJ officials told us they are extremely supportive of the basic concept of a Remote ID system, provided that measures recommended by the defense, public safety, and law enforcement communities are incorporated. They told us "it is impossible to overstate the importance of Remote ID" as part of what DOJ refers to as "the 3 A's of sustainable UAS security": **A**irspace awareness (Remote ID), **A**uthority to counter malicious UAS operators (counter-UAS), and **A**irspace and operational limitations (including possible additional restrictions FAA announced in February 2019).¹⁹² The DOJ officials explained that even if bad actors disable their UAS Remote ID systems, they will stand out from other UAS as

¹⁸⁸ Section 2202 of the FAA Extension, Safety, and Security Act of 2016, *supra* note 34, directed FAA, in consultation with DOT, the National Institute of Standards and Technology, and others to convene industry stakeholders to facilitate development of UAS Remote ID consensus standards and then to issue regulations or guidance based on such standards. Section 349 of the 2018 FAA Reauthorization Act, codified in relevant part at 49 U.S.C. § 44809(f), authorized FAA to require remote identification for drones used for recreational purposes.

¹⁸⁹ 84 Fed. Reg. 72438 (Dec. 31, 2019). The proposed rule would create requirements for both UAS operators and manufacturers and would require virtually all UAS to transmit location and identification information. The proposal establishes design and production requirements for "standard Remote ID" and "limited remote ID." UAS equipped with standard Remote ID capability would be required to broadcast identification and location information directly from the device and to transmit that same information through an Internet network connection. UAS equipped with limited Remote ID capability, by contrast, would only have to transmit information through the Internet. UAS without any Remote ID capability could operate, but only within FAA-Recognized Identification Areas, and only amateur-built devices or devices manufactured before the compliance dates could use this option. Finally, manufacturers would be required to equip each UAS with Remote ID capability, issue a serial number to each UAS, and label the device with its Remote ID capability.

¹⁹⁰ *Id.*, 84 Fed. Reg. at 72488. Although UTM is sometimes referred to as "air traffic control for drones," FAA has clarified that UTM is a "'traffic management' ecosystem for uncontrolled operations that is separate from, but complementary to, the FAA's Air Traffic Management (ATM) system. . . . UTM is how airspace will be managed to enable multiple drone operations conducted beyond visual line-of-sight (BVLOS), where air traffic services are not provided. . . . The FAA will provide real-time constraints to the UAS operators, who are responsible for managing their operations safely within these constraints without receiving positive air traffic control services from the FAA." FAA, *Unmanned Aircraft System Traffic Management (UTM)*, available at https://www.faa.gov/uas/research_development/traffic_management/ (last visited Sept. 1, 2020).

¹⁹¹ *Id.*, 84 Fed. Reg. at 72450, 72495.

¹⁹² See 84 Fed. Reg. 3732 (Feb. 13, 2019).

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non-compliant.

Virtually all stakeholders we spoke with, including those from state, local, and tribal governments as well as from industry, law firms, the public safety community, privacy groups, and UAS user groups, also favored some type of Remote ID system. Entities who filed public comments on FAA's specific proposed rule expressed a range of views, however. For example, some commenters said the proposal will facilitate expanded commercial UAS operations (e.g., allowing flights beyond visual line of sight); some said it will provide a means to quickly identify "rogue" UAS; some said it is overly prescriptive and costly, particularly for recreational UAS operators; some believed it may compromise the privacy and security of UAS operators; and some believed the rule's implementation timeline is too long.

DOT officials told us FAA plans to complete its analysis of public comments on the proposed Remote ID rule by December 2020 and FAA officials have recently said the agency plans to issue the final rule by that time. Until the final rule's compliance date (which, under the proposed rule, is three years after the final rule's effective date), FAA is considering ways to incentivize UAS manufacturers and users to install and use Remote ID systems voluntarily.

APPENDIX II: ADDITIONAL CONSIDERATIONS INVOLVING UAS-RELATED PROPERTY RIGHTS IN AIRSPACE: POTENTIAL CLAIMS UNDER STATE AND FEDERAL LAW

As discussed in Appendix I, the federal, state, local, and tribal governments have regulated or are seeking to regulate UAS operations in low-altitude airspace in order to protect the public interest. Private individuals also may have legal rights to seek redress for what they believe are UAS-related harms particularized to them. This appendix discusses one category of these potential private causes of action, to the extent they have been recognized under state or federal law: claims involving UAS-related interference with property rights in airspace.¹ Just as property rights in airspace—assuming they continue to be recognized—could have a significant impact on federal and state authority over low-altitude airspace as discussed in Appendix I, these rights also could have a significant impact on private property claims.

As discussed below, current law, developed in the context of manned aircraft, recognizes two basic types of private “airspace rights” claims: state tort law claims for traditional and “aerial trespass” and federal constitutional law claims for a government taking of private property (the claim upheld by the Supreme Court in *United States v. Causby* as discussed in Appendix I).² Whether and how the elements of these claims will apply in the context of low-altitude UAS operations remains to be seen.

Some UAS industry stakeholders have challenged the continued recognition of airspace property rights, as discussed in Appendix I, and even if they still exist, the stakeholders have said at least some types of UAS aerial trespass claims would be federally preempted. By contrast, a number of state government stakeholders and others have said such airspace property rights remain in full force, as discussed in Appendix I, and some stakeholders and legal commentators have said preemption of state laws and private causes of action based on those rights would itself be an unconstitutional taking. The law in this area, now in considerable flux, is expected to continue to develop as UAS operations continue to be integrated into the national airspace system.

A. Stakeholder Positions on Potential Landowner UAS-Related Aerial Trespass Claims under State Law

1. Trespass by “Aircraft” (Restatement (Second) of Torts § 159)

a. Traditional Trespass and Development of Special Rules for Trespass by Aircraft

Under traditional common law tort rules, a trespass occurs when a person or object physically enters either onto land owned or possessed by another person or entity or into the airspace above that land.³ Objects such as tree branches, telephone wires, or gunshots, for example, that enter into a landowner’s overlying airspace are considered to be a trespass, consistent with the historic *ad coelum* doctrine discussed in Appendix I that recognizes a landowner’s property rights in that airspace. Regardless of whether the trespass is onto land or into the overlying

¹ Appendix III discusses a second category of these potential private causes of action, again, to the extent they have been recognized under state or federal law: claims involving UAS-related interference with personal privacy rights.

² See Appendix I, Part D.1.a., for a discussion of *United States v. Causby*, 328 U.S. 256 (1946).

³ Restatement (Second) of Torts §§ 158, 159(1).

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airspace, there is no requirement that harm or damage must have occurred; the mere intrusion is considered to be a “trespass *per se*” unless there is an applicable privilege or exception. The common law tort of nuisance, by contrast, which can be brought by anyone lawfully occupying property, not just the landowner, requires that there be substantial interference with the land occupant’s use and enjoyment of the property—for example, from noise, odors, light, vibration, dust or, in some cases, disturbing “peace of mind.”⁴

Just as the advent of manned aviation narrowed the scope of airspace property rights in the context of what constituted a taking of property by the government—as discussed in Appendix I, the Supreme Court in *Causby* stated that landowners no longer own the airspace up to the heavens under the *ad coelum* doctrine but only up to their “immediate reaches” airspace—manned aviation also narrowed airspace property rights in the context of what constituted a common law trespass by private actors. The first civil trespass-by-airplane lawsuit in the United States appears to be *Johnson v. Curtiss Northwest Airplane Co.*, decided in 1923.⁵ The court in *Curtiss Northwest* determined whether planes had committed a trespass through a landowner’s overlying airspace by using an altitude-based “line in the sky.” Relying on a state statute setting a 2,000-foot minimum flight altitude in the area where the landowner lived, the court prohibited planes from flying below that altitude as would-be trespassers. The court explained that although “[t]he air, so far as it has any direct relation to the comfort and enjoyment of the land, is appurtenant to the land, and [is] no less the subject of protection than the land itself,” “[t]he upper air is a natural heritage common to all of the people, and its reasonable use out not to be hampered by an ancient artificial maxim of law.”

A different approach to analyzing airplane trespass was developed at about the same time by the National Conference of Commissioners on Uniform State Laws, known then and today as the Uniform Law Commission, now a leading state-law drafting advisory organization.⁶ In an effort to achieve uniformity in state aviation laws nationwide, the Uniform Law Commission approved a model law in 1922 known as the Uniform Aeronautics Act. The model law explicitly recognized that landowners “own” the airspace above their land. For there to be a trespass in the case of an “aircraft,” however, the model law required not only that the aircraft physically intrude into the airspace but also that there be “interference” with the landowner’s use of his land. The model act stated in part:

“Section 3. Ownership of Space—The ownership of the space above the lands and waters of this State is declared to be vested in the several owners of the surface beneath, subject to the right of flight described in Section 4.

“Section 4. Lawfulness of Flight—Flight in aircraft over the lands and waters of this State is lawful, unless at such a low altitude as to interfere with the then existing use to which the land or water, or the space over the land or water, is put by the owner, or unless so conducted as to be imminently dangerous to persons or property lawfully

⁴ Restatement (Second) of Torts §§ 821D, 827, 828.

⁵ *Johnson v. Curtiss Northwest Airplane Co.* (Minn. Dist. Ct. 1923), reprinted in *Current Topics and Notes*, 57 Am. L. Rev. 905, 908-911 (1923).

⁶ The American Bar Association established the Uniform Law Commission in the late 1800s. Today, Uniform Law Commissioners, who are private and government lawyers, judges, law professors, and legislators, are appointed by their states to draft and promote model laws that state legislatures are then urged to enact.

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on the land or water beneath.”⁷

Twenty-three states ultimately enacted the model Uniform Aeronautics Act⁸ and as of 2017, the law’s declaration that landowners own the airspace above their property was still in force in at least 22 states.⁹

There have been two other “codifications” of trespass by aircraft, both “restatements” of the common law (law as found by courts) issued by the American Law Institute (ALI).¹⁰ Both restatements have included an interference requirement—not just “interference” as in the 1922 model Uniform Aeronautics Act but “unreasonable” and then “substantial” interference. ALI’s first Restatement, issued in 1934, recognized a land possessor’s airspace property rights but said aircraft pilots had a “privilege” to travel through that airspace if the flight was conducted “in a reasonable manner,” “at such a height as not to interfere unreasonably” with the possessor’s enjoyment of his land “and the air space above it,” and was in compliance with state and federal aviation regulations.¹¹ ALI’s second aerial trespass Restatement, Restatement (Second) of Torts § 159, was issued in 1965 and took a slightly different approach. We discuss the elements of this 1965 restatement, still in use today, in the following section.

b. Current Elements of Trespass by Aircraft

Restatement (Second) of Torts § 159, issued in 1965 following the Supreme Court’s 1946 decision in *United States v. Causby* discussed in Appendix I, is said to be based on *Causby*.¹² Section 159 begins with the traditional common law rule of trespass *per se* and then states the exception for trespass by “aircraft” (which is not defined):

“(1) Except as stated in Subsection (2), a trespass may be committed on, beneath, *or above* the surface of the earth.

“(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.”

(Emphasis added.) The Restatement’s commentary explains that § 159(1)—the general rule that trespass may be committed “on, beneath, *or above* the surface of the earth”—refers back to

⁷ See *Braniff v. Nebraska State Bd. of Equalization and Assessment*, 347 U.S. 590, 595, n. 11 (1954).

⁸ *Braniff*, *supra* note 7, 347 U.S. at 595; Stuart Banner, *Who Owns the Sky? The Struggle to Control Airspace from the Wright Brothers On* (Harvard Univ. Press 2008) at 127-30.

⁹ *Braniff*, *supra* note 7, 347 U.S. at 596; Stephen J. Migala, *UAS: Understanding the Airspace of States*, 82 J. Air. & Com. 3, 60-61 (Winter 2017).

¹⁰ ALI’s restatements of the law are considered syntheses of the common law in various subject areas and are relied upon as authoritative by many courts and practitioners. Restatements are not the law, however, and have no independent legal effect.

¹¹ Restatement (First) of Torts § 194 (1934).

¹² Restatement (Second) of Torts § 159, cmts. i-k; Reporter’s Notes (“Subsection (2) is based primarily on *United States v. Causby*”) (citations omitted).

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Restatement § 158, the traditional trespass *per se* rule. Section 159(2), applicable to trespass by “aircraft,” is the exception to the general rule in § 159(1).¹³

How Restatement § 159 may apply in determining whether a drone—versus a manned aircraft—has trespassed through a landowner’s airspace is subject to considerable debate. The threshold question is whether drone trespass is governed by §§ 158 and 159(1)—the traditional trespass *per se* test for persons or airborne objects—or instead by § 159(2)—the aircraft trespass test. UAS industry stakeholders have taken the position that § 159(2) is the relevant provision because Congress has defined UAS as “aircraft” for purposes of federal aviation safety regulation.¹⁴ Under the § 159(2) test, a landowner would have to show a drone both entered the landowner’s “immediate reaches” airspace and caused “substantial interference.” As discussed in Appendix I, *Causby* left open the “precise limits” of immediate reaches airspace—the particular flights in *Causby* caused interference at 83 feet above the ground, for example. As Comment “f” to § 159(2) explains, “immediate reaches” is a case-by-case determination and courts have reached different conclusions in different cases: “[i]n the ordinary case, flight at 500 feet or more above the surface is not within the ‘immediate reaches,’ while flight within 50 feet, which interferes with actual use, clearly is, and flight within 150 feet, which also interferes, may present a question of fact.”

As to how § 159(2)’s substantial interference requirement would apply to drones, some stakeholders we spoke with believed this could be difficult to demonstrate because drones are relatively small and quiet. The Congressional Research Service has suggested that if drones ultimately take off and land primarily from drone “airports,” for example, such centralized activity might create substantial interference for nearby landowners, although they noted this might be mitigated because of drones’ vertical launch and landing capabilities.¹⁵

Other stakeholders we spoke with, however, and a number of legal commentators have taken the position that drone trespass should be governed by the traditional trespass *per se* test for airborne objects in §§ 158 and 159(1). For example, we spoke with a Uniform Law Commissioner who was a member of a Uniform Law Commission Drafting Committee tasked with developing a model drone aerial trespass law (as discussed below). He stated that using § 159(2), said to be based on *Causby*, to determine whether a drone has committed a trespass is a misreading of *Causby*. *Causby* involved the government’s unconstitutional *taking* of private property, he noted, which requires direct and immediate harm to the landowner’s use of his land, not *trespass*, which traditionally requires no harm at all.¹⁶

Similarly, legal commentators have said that using the § 159(2) aircraft trespass test to determine drone trespass would both inappropriately incorporate the *Causby* takings/interference requirement into a trespass tort and conflate trespass with nuisance—

¹³ See Restatement (Second) of Torts § 159, cmt. a.

¹⁴ See 49 U.S.C. §§ 44801(11), (12) (defining “unmanned aircraft” and “unmanned aircraft system” as “aircraft”).

¹⁵ Congressional Research Service, *Integration of Drones into Domestic Airspace: Selected Legal Issues*, CRS Report 42940 by Alissa Dolan and Richard M. Thompson II (April 4, 2013) (2013 CRS Drones Report) at 9-12.

¹⁶ Letter to Uniform Law Commission from Commissioner D. Joe Willis, Schwabe Williamson & Wyatt, July 10, 2019 (“[I]mporting a takings standard into a trespass statute dealing with drones in the immediate reaches of airspace is the wrong thing to do.”).

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effectively creating a new tort of “aerial nuisance.”¹⁷ One commentator observed that “[d]rones do not fit into the aircraft trespass test because the test derives from a takings test that was first applied to a manned aircraft. Thus, [under § 159(2)] aircraft trespass requires a taking. [But a] trespass is not a taking. Property owners should not lose the right to keep drones off their property merely because a drone has not seriously and frequently invaded the property to the point that the invasion rises to a constitutional taking. . . . [In addition,] substantial interference blends nuisance with trespass—two claims that protect completely different property rights.”¹⁸

Other commentators have explained why they believe the §§ 158/159(1) traditional trespass *per se* test is the suitable test for drones. One commentator cited § 158’s commentary which explains that the test it is intended to cover “causing the entry of a thing” into the airspace above another person’s land, with “things” consisting of such objects as projectiles, advertising kites, and balloons.¹⁹ Small drones flying at low altitudes are far closer to these low-flying small “things” than to the manned “aircraft” for which § 159 was developed based on *Causby*, the commentator said.²⁰

The Reporter for an ongoing effort to issue the Restatement (Fourth) of Property likewise has said drone trespass should be governed by §§ 158 and 159(1). This commentator emphasized that § 159(2) was developed to address concerns raised by high-flying fixed-wing manned aircraft that require contiguous flight routes and an airspace “highway,” not low-flying, potentially stationary (hovering) drones.²¹ An attorney stakeholder we spoke to also has stated that using the § 159(1) trespass *per se* rule for drone intrusions through immediate reaches airspace will ensure that FAA requires drones to be equipped with appropriate navigation technology and encourage UAS operators to respect private property rights. “[T]he property owner should not have to also establish that the drone is noisy, has toxic emissions or appears to be out of the operator’s control,” the stakeholder said.²²

We note another aspect of the § 159(2) aircraft trespass rule, which the Restatement indicates is based on *Causby* as noted above, that may be important in the drone context. Although it is commonly said—and comment “k” to § 159(2) states²³—that *Causby* held there is a taking when

¹⁷ See, e.g., A. Michael Froomkin and P. Zak Colangelo, *Self-Defense Against Robots and Drones*, 48 Conn. L. Rev. 1, 28 and n. 129 (2015) (Restatement § 159(2) “superimposes a requirement of actual harm, thus conflating the normal strict-liability rule of trespass with the rule of nuisance” and “effectively swallow[ing] the aerial trespass action.”).

¹⁸ Kyle Joseph Farris, *Flying Inside America’s Drone Dome and Landing in Aerial Trespass Limbo*, 53 Val. U. L. Rev. 247, 273-74 (Fall 2018) (citation omitted).

¹⁹ Restatement (Second) of Torts § 158, cmt. i.

²⁰ Testimony of James Grimsley to the Oklahoma House of Representatives on Drone Issues, Sept. 18, 2017.

²¹ Memorandum to Uniform Law Commission from Henry E. Smith, Fessenden Professor of Law, Harvard Law School, and Reporter for the Restatement (Fourth) of Property, June 20, 2019.

²² Letter to Uniform Law Commission from Reginald C. Govan re Proposed Tort Law Relating to Drones Act, July 24, 2018.

²³ Comment “k” states: “The actual holding in the *Causby* Case was that the rights of the landowner were invaded, and there was a wrongful ‘taking’ of his property, when the flights into the ‘immediate reaches’ of the air space *substantially* interfered with his use of the land.” (Emphasis added.)

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an aircraft causes “substantial” interference, this was not the actual language of the Supreme Court’s holding regarding aircraft. The opinion’s only use of the word “substantial” was in quoting an earlier Supreme Court takings decision involving “substantial” physical damage caused by government construction-induced flooding.²⁴ On the facts of *Causby*, however, which involved aircraft overflights, the Court said there is a taking when flights “are so low and so frequent as to be a direct and immediate interference”—not “substantial interference”—“with the enjoyment and use of the land.”²⁵ This language mirrored the state aerial trespass statute then in effect for the plaintiff’s property in North Carolina, and that aerial trespass statute, in turn, was a verbatim enactment of the Uniform Law Commission’s 1922 model act. As noted above, the model act only required “interference.” The *Causby* Court also noted its holding was “not inconsistent with” that North Carolina statute.²⁶ A requirement that drone flights must cause substantial rather than some interference to constitute aerial trespass might prove significant in practice, because of the operational and size differences between drones and airplanes.²⁷

Whether courts will analyze drone intrusions into a landowner’s overlying airspace using the § 159(1) traditional trespass *per se* test or the § 159(2) aircraft trespass test remains to be seen. It is also possible that both tests could be superseded by an alternative legal framework to be developed specifically for drones. A drone-specific trespass test could be created by courts, as a matter of common law, or by state legislatures. A major effort to facilitate the state legislation approach has been undertaken by the Uniform Law Commission, although that effort has been suspended as of January 2020. We discuss this initiative in the following section.

2. Trespass by Drones (Uniform Law Commission Draft Model Act)

With increased integration of UAS into the national airspace system and the corresponding increased possibility that states may take differing approaches to UAS-related concerns, a Uniform Tort Law Relating to Drones Act Drafting Committee of the Uniform Law Commission (ULC) began work in late 2017 to draft a model act²⁸ specifically addressing aerial trespass by

²⁴ *Causby*, 328 U.S. at 266, quoting *United States v. Cress*, 243 U.S. 316, 328 (1917).

²⁵ *Causby*, 328 U.S. at 266-67. In finding “interference” sufficient to cause a taking, the Court noted the planes had “frequently” flown over the property and came “close enough at times to appear to barely miss the tops of the trees.” The overflights also “frequently deprived [the landowners] of their sleep” and caused “destruction of the use of the property” for its existing commercial use. *Id.* at 259.

²⁶ *Causby*, 328 U.S. at 266.

²⁷ Although some post-*Causby* takings cases have added the judicial gloss of a “substantial” interference requirement, many of those cases cite *Causby* (which did not explicitly state such a requirement) and other cases that in turn cite *Causby*. See, e.g., *Brown v. United States*, 73 F.3d 1100, 1102 (Fed. Cir. 1996), citing *A.J. Hodges Indus., Inc. v. United States*, 355 F.2d 592 and *Speir v. United States*, 485 F.2d 643 (Ct. Cl. 1973). *Hodges* and *Speir*, in turn, cite *Causby* and other cases citing *Causby*.

²⁸ The Uniform Law Commission describes a uniform act as one that seeks to establish the same law on a subject among the various jurisdictions. The Commission designates an act as “uniform” Act if there is substantial reason to anticipate enactment in a large number of jurisdictions, and uniformity of the provisions of the act among the various jurisdictions is a principal objective. It designates an act as a “model” act if uniformity may be a desirable objective but is not a principal objective, and a significant number of jurisdictions may not adopt the act in its entirety. Although the Commission designated its draft drone aerial trespass act as a “uniform” act, we use the term “model” act in this report as a less technical, more encompassing term.

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drones.²⁹ The Drafting Committee issued nine public drafts between March 2018 and June 2019, with the June 2019 draft originally scheduled to be voted on by state representatives at the ULC’s July 2019 annual meeting. The draft act was withdrawn, however, reportedly due to disagreements over the status of property rights in airspace and other matters, and ULC leadership, in consultation with Drafting Committee and outside participants, decided to suspend this effort in January 2020.

Although the future of the ULC’s drone tort law drafting efforts is uncertain at this time, we describe below some of the key legal issues and positions the Drafting Committee and outside participants debated for over two years. A number of these issues are also being debated in discussions regarding federal versus state authority over low-altitude UAS operations, as described in Appendix I. Challenges in resolving these issues—such as the relevance of *Causby*, the preemptive effect of federal law, and the government’s potential liability for regulatory takings, all discussed below—illustrate some of the complexities and challenges of integrating UAS into the national airspace system.

a. Altitude-Based Bright Line Approach

The first four of the Drafting Committee’s nine drafts had similarities to the traditional trespass *per se* test for airborne objects in Restatement §§ 158 and 159(1) and rejected the “substantial interference” approach for aircraft in Restatement § 159(2). The Committee rejected the “substantial interference” approach essentially for the reasons noted above: that § 159(2) reflects a mis-application of *Causby*’s more stringent constitutional takings test to trespass and that it is a conflation of nuisance and takings with trespass. Instead, the initial drafts established a tort of drone aerial trespass *per se* based intrusion into a landowner’s “immediate reaches” airspace, defined in different drafts as either 100 feet or 200 feet above the land and any surface improvements. Consistent with the traditional trespass rule, UAS flights over private property below those altitudes generally would constitute trespass without a showing of interference or other harm.³⁰

As the commentary to the Drafting Committee’s March 2018 draft explained, the altitude-based bright line approach “clarif[ied] the unresolved question [left open by *Causby*] regarding at what altitude private property rights and the established yet undefined ‘public highway’ in the sky begins.”³¹ The commentary also noted the approach protects “property interests, a right of quiet solitude, and a right to be left alone. [Although p]rivacy interests are not directly addressed . . . a collateral benefit of a right to exclude nonconsensual entry . . . may be some incremental gains to privacy.”³² Finally, the commentary noted, while Restatement § 159(2)’s aerial trespass elements “made sense in an era when aircraft were rarely operating close to the ground,

²⁹ As discussed in Appendix III, the Drafting Committee also worked to draft UAS privacy provisions as part of the model act.

³⁰ The commentary to the drafts setting a 200-foot threshold noted some states already have enacted even higher limits, citing Oregon (Or. Rev. Stat. § 837.380, setting 400-foot threshold) and Nevada (Nev. Rev. Stat. § 493.103, setting 250-foot threshold).

³¹ National Conference of Commissioners on Uniform State Laws, Tort Law Relating to Drones Act, Discussion Draft for March 9-11, 2018 Meeting.

³² ULC Discussion Draft for March 9-11, 2018 Meeting, *supra* note 31.

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people, and structures,” “that doctrine no longer makes sense in an era in which drones already number in the millions and operate closer to the ground than manned aircraft”³³

Several stakeholders we spoke to believed the general approach of the altitude-based bright line approach was conceptually sound but thought the altitude should be well below 200 feet. One academic stakeholder, for example, suggested the line should be somewhere “below the treetops” of a landowner’s property. An attorney stakeholder we spoke to agreed and said that—in the interest of compromise and final resolution of an issue which, if unresolved, will significantly impede realization of the full potential of the drone economy through regulatory authorization of robust drone operations—the line should be something “significantly more modest,” in the vicinity of 150 feet.

Other commenters supported use of a bright line approach as serving the interests of both the UAS industry—which would gain clarity and acceptance from a skeptical public—and landowners—whose traditional right to exclude others from their property would be protected. According to one commenter, not having such protections in the law “may well transform backyard airspace into the type of public highway described in *Causby*, which any drone operator has a legal right to enter.” That such an outcome could actually occur, the commenter said, was illustrated by an industry representative’s response to what altitude they believed would be acceptable to define a landowner’s right to exclude a drone: reportedly the response was “zero.”³⁴

The altitude-based bright line approach was sharply criticized by UAS industry stakeholders, however, who participated in the process as observers (as any member of the public could do). For example, as stated in comments submitted by the ULC Industry Commenters Group described in Appendix I,³⁵ the bright line approach “fail[ed] both to adequately account for the exclusive role of the federal government in safeguarding aviation safety and air navigation and to strike the proper balance between innovation and personal privacy, and accordingly may stifle the development of this nascent industry across the United States and undermine the [Uniform Law Commission’s] core objective of promoting legislative uniformity.”³⁶

The Industry Group also said the approach reflected a misreading of *Causby* because in their view, the Supreme Court’s statement that “immediate reaches” airspace is subject to a landowner’s exclusive control was not part of the Court’s actual holding that there had been a taking of property. Rather, they said, the Court held there was a taking based on harm to use of the *land*.³⁷ The Industry Group also criticized establishment of an altitude-based “line in the sky” because as noted in Appendix I, it believed this would be federally preempted as conflicting

³³ National Conference of Commissioners on Uniform State Laws, Tort Law Relating to Drones Act, Discussion Draft for April 20, 2018 Conference Call and accompanying memorandum from Gregory S. McNeal, Reporter. See also *id.*, Discussion Draft for July 20-26, 2018 Annual Meeting and accompanying memorandum from Paul Kurtz, Chair, and Gregory S. McNeal, Reporter.

³⁴ Letter to Uniform Law Commission from Jason Snead, Senior Policy Analyst, The Heritage Foundation, July 18, 2018.

³⁵ See Appendix I, Part D.1.a.(ii).

³⁶ Letter to Uniform Law Commission from ULC UAS Industry Commenters Group), July 5, 2018.

³⁷ Letter to Uniform Law Commission from ULC UAS Industry Commenters Group), July 1, 2019.

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with FAA’s exclusive authority to approve no-fly zones. Finally, a UAS industry stakeholder we spoke to said the altitude-based approach would be impractical because it is difficult to judge a drone’s altitude by sight, especially over varying terrain—they asked if anyone can really tell the difference between 200 feet (flight permissible under the Drafting Committee’s later drafts) and 100 feet (impermissible under those drafts), for example.

FAA did not take an official position on the altitude-based bright line approach or any of the Drafting Committee’s other approaches, nor did it indicate whether it agreed with the ULC Industry Commenters Group that the agency’s no-fly zone authority would preempt any state altitude-based bright line. The DOT General Counsel and FAA Chief Counsel did, however, respond to the Drafting Committee’s suggestion that FAA had agreed with creation of what those counsel called a 200-foot altitude “exclusion zone.” The DOT General Counsel and FAA Chief Counsel stated that neither FAA’s 2015UAS Fact Sheet nor any other official DOT or FAA position supports “the novel premise of the draft statute that a State or municipality may establish by law a *per se* exclusion zone of up to 200 feet, below which UAS operations would constitute a trespass upon land . . . Such a rule would be in tension with decades of established precedent in the Federal courts, which have rejected the notion of applying the traditional elements of basic trespass law to aircraft overflight of private property.”³⁸

In response to these criticisms, the Drafting Committee Chair proposed other alternatives that also included an altitude-based bright line,³⁹ but these, too, received sharp criticism. The Committee then changed course.

b. Multi-Factor Substantial Interference Approach

Starting in early 2019, the Drafting Committee produced a series of drafts that returned to the basic aerial trespass approach taken by Restatement § 159(2) developed for manned aircraft. Like § 159(2), these ULC drafts all required “substantial interference,” which the Committee stated follows *Causby*. The June 2019 draft, the last draft issued before the Committee’s work was suspended in 2020, would make a UAS operator liable for trespass if he intentionally flies into airspace above a land possessor’s property and causes substantial interference with the use and enjoyment of the property. “Substantial interference” is to be determined based on the totality of the circumstances using a list of 12 factors and “any other factor relevant to the determination of substantial interference with the use and enjoyment of land.”⁴⁰

³⁸ Letter to Uniform Law Commission from Steven G. Bradbury, DOT General Counsel, and Charles M. Trippe, Jr., FAA Chief Counsel, re Tort Law Relating to Drones Act – Comments Section, July 11, 2018.

³⁹ One alternative was a rebuttable presumption that UAS operations below the altitude-based ceiling constitute trespass. A second alternative was to allow each state to set its own altitude-based ceiling(s) based on state law principles and practices. The Drafting Committee Chair acknowledged the second alternative could, if the ceiling were set “too low,” create FAA, state, or local government takings liability to landowners. See Memorandum to Uniform Law Commission Drafting Committee from Paul Kurtz, Chair, and Robert Heverly, Associate Reporter, Oct. 19, 2018. We discuss such potential “regulatory takings” liability in Part B. below.

⁴⁰ National Conference of Commissioners on Uniform State Laws, Uniform Tort Law Relating to Drones Act, Draft for Approval at Annual Meeting, July 12-28, 2019, and accompanying memorandum to Uniform Law Commission from Paul M. Kurtz, Chair, Mark Glaser, Vice Chair, and Robert A. Heverly, Reporter. The 12 factors included how the property is being used and enjoyed; whether individuals on the property saw or heard the drone; the purpose, altitude, duration, time of day, and frequency of the flights; and whether the flights caused physical or emotional injury, direct economic damage, or harassment of persons, livestock, or wildlife.

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The Drafting Committee explained this approach would help eliminate a “patchwork quilt of regulatory and legal requirements” developing among the states, which “promises to inhibit the appropriate and beneficial development of [UAS] for the variety of uses to which such technologies are suited.” Overall, the Drafting Committee said, this draft “provides a uniform state-level response to the development and utilization of unmanned aircraft in a variety of circumstances within the context of federal control over aviation as well as the important advances promised by unmanned aircraft use.”⁴¹ The ULC Industry Commenters Group also supported this approach, explaining that it represents a “thoughtful, reasoned set of compromises” in balancing the “serious and legitimate concerns with UAS overflights” and the “legitimate, beneficial drone flights that do not substantially interfere with the use of private property.”

The multi-factor substantial interference approach, like the altitude-based bright line approach, also was sharply criticized. One stakeholder we spoke to, a ULC Commissioner and member of the Drafting Committee, said requiring evidence of substantial interference would mean landowners will be forced to file suit because of the complexity of the substantial interference test; they will then have to demonstrate to a court precisely how the flights interfered with the use and enjoyment of their property based on the 12 identified factors and any additional factor the court believes relevant. Landowners also will have to file suit because otherwise, their failure to object could be deemed as implicit consent to future overflights, according to this stakeholder.

The multi-factor approach also received extremely strong criticism from three national bar organizations specializing in property law and real estate matters and from the Reporter for the pending Restatement (Fourth) of Property. Several of these organizations said that if a model act were approved by the Uniform Law Commission and recommended to the states for enactment, they would actively oppose it. Their comments included the following:

- The American Bar Association’s (ABA) Real Property, Trust and Estate Law Section stated the multi-factor approach is contrary to current real estate law and landowners’ expectations; does not protect personal privacy; and applies an “unworkable balancing test” to determine a drone operator’s trespass liability, even though landowners should be able to prohibit a trespass onto their land and the near reaches above it. A law professor’s analysis enclosed with the Section’s comments stated the draft’s approach relegates airspace property rights largely to nuisance remedies and “justifies denial of property owners *per se* dominion over *any* airspace” by providing “additional clarity” through a non-exclusive list of potential factors for courts to consider.⁴²

(In February 2020, the ABA House of Delegates adopted a related resolution that had been proposed by the Real Property, Trust and Estate Law Section, urging federal, state, local, and tribal governments to protect real property interests, including common law trespass

⁴¹ ULC Draft for July 2018 Annual Meeting, *supra* note 40.

⁴² Memorandum to the Uniform Law Commission from Jo-Ann Marzullo, Chair-Elect of the American Bar Association’s Real Property, Trust and Estate Law Section, June 25, 2019, enclosing Memorandum from Steven J. Eagle, Professor Emeritus of Law, Antonin Scalia Law School at George Mason University, June 6, 2019.

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and privacy rights, in any statutes or regulations addressing UAS operations over private property.⁴³)

- The Joint Editorial Board for Uniform Real Property Acts stated the multi-factor approach should be changed either to treat drone overflights below a certain altitude as a *per se* trespass or to create a rebuttable presumption of substantial interference below a certain altitude. The draft substantially restricts a landowner’s control of the airspace above his property in a manner inconsistent with law and landowners’ expectations of safety and privacy, the Board said.⁴⁴ The American College of Real Estate Lawyers made similar comments.⁴⁵
- The Reporter for the pending Restatement (Fourth) of Property stated the multi-factor approach is a “radical departure from existing law [which] is being justified as applying, or at most extending, the ‘aerial trespass’ doctrine to drones . . . [but] the Draft winds up replacing trespass doctrine with a regime denominated ‘trespass’ that bears no resemblance to any existing law . . . [and invites] courts to balance away owners’ rights. . . . The idea that one inch above the land would not count as part of the ‘land’ rather than the ‘air space’ and that a flight by any object would not count as a regular trespass at an altitude of one inch are absurdities . . . [The multi-factor test] in effect extends the navigable airspace down to the grass tops of land across the entirety of any state that enacts it. In effect it imposes a presumptive navigation servitude on every cubic centimeter of space above the surface of the land”⁴⁶

(A recent draft of the Restatement (Fourth) of Property includes a new provision, “Trespass by Overflight,” which would apply to intrusions by drones, manned aircraft, and other “aerial objects” into a landowner’s overlying airspace.⁴⁷)

As noted, the multi-factor substantial interference approach was withdrawn from consideration in July 2019 and the ULC has suspended the Drafting Committee’s work as of January 2020.

⁴³ See ABA Resolution 111, adopted Feb. 17, 2020. The report accompanying the resolution stated there was no minority view or opposition within the ABA. Citing *Causby*, the report declared that landowners and other legal land occupants must have the right to “prevent UAS from using and crossing airspace over their land in some form or fashion. The degree to which a landowner or legal occupant can prevent UAS from using the airspace over their land is the issue.” ABA Section on Real Property, Trust and Estate Law, Report accompanying Resolution 111 at 4.

⁴⁴ Memorandum to Uniform Law Commission from the Joint Editorial Board for Uniform Real Property Acts, June 5, 2019.

⁴⁵ Memorandum to Uniform Law Commission from the American College of Real Estate Lawyers, July 3, 2019.

⁴⁶ Memorandum to Uniform Law Commission from Professor Henry E. Smith, *supra* note 21.

⁴⁷ Under § 1.2A of the draft Restatement (Fourth) of Property, intentional intrusions into a landowner’s “actually possessed” overlying airspace would be subject to the traditional land trespass *per se* rule, while intentional intrusions into overlying airspace the landowner only has the “right to possess” would be deemed a trespass only if the flight “interferes substantially with the [landowner’s] use and enjoyment of the land.” As the Reporter’s Note to this draft provision explains, the provision relies on *Causby* to the extent that it affirms a landowner’s continued property interests in his overlying airspace, but does not adopt *Causby*’s “immediate reaches” formulation because it is unduly vague and insufficiently protective of landowner rights.

B. Stakeholder Positions on Landowner UAS-Related Takings Claims under the Constitution

Several stakeholders we spoke to, the Chair of the ULC Drone Aerial Trespass Model Act Drafting Committee, and legal commentators have identified several types of potential UAS-related constitutional takings claims by private landowners against the government. Although these claims are based on established Supreme Court constitutional takings precedents, including some involving takings caused by manned aircraft, it appears no court has yet ruled on how these precedents and principles would apply to UAS operations.

1. Potential Claims Based on Federal, State, Local, and Tribal Government Direct Actions

As described by the Congressional Research Service and legal commentators,⁴⁸ there are two sets of circumstances in which UAS-related direct government actions (versus regulatory actions discussed in the next section) might give rise to takings liability to landowners. These are where the government conducts UAS operations itself and where the government affirmatively authorizes or approves specific UAS operations.

A UAS-related claim of the first type might arise, one legal commentator said, if, for example, the U.S. Postal Service began drone delivery of mail and packages and this caused interference with a landowner's use and enjoyment of his land. This might resemble *Causby*, where the Supreme Court held the federal government liable for a taking when U.S. military planes conducted continuous low-altitude flights above a landowner's farm. A UAS-related claim of the second type might arise, another legal commentator said, if, for example, a county "drone airport" owner/operator approves low-altitude flight paths without acquiring neighboring air easements and thereby causes such interference. This might resemble *Griggs v. Allegheny County*,⁴⁹ where the Supreme Court, relying on *Causby*, held a county airport owner/operator liable for a taking when planes continuously flew directly over private residences and the county had not paid just compensation for air easements through their overlying airspace.

Courts since *Causby* have determined manned aircraft-related takings liability by applying three factors: (1) whether the planes flew directly over the claimant's land; (2) whether the planes flew frequently and at low altitudes; and (3) whether the flights directly and immediately interfered with the claimant's use and enjoyment of the land.⁵⁰ In addition, even though *Causby* required "interference" rather than "substantial interference" as discussed above, some courts have required the interference to be "substantial."⁵¹ Assuming the same factors would be applied to

⁴⁸ See, e.g., 2013 CRS Drones Report, *supra* note 15, at 8-9; Wendie L. Kellington, *Federal Laws, Regulations, and Programs Affecting Local Land Use Decision-Making: Drones*, American Bar Association Annual Meeting (July 30, 2015) at 8 (governmental entities that establish drone airports "may well have exposure for 'taking' private property in the context of repeated nuisance activities allowed by the location of such 'airports' under local regulations."), 11 (localities that designate downtown areas as UAS air routes without acquiring aviation easements would raise "the taking question" as might designating UAS air routes that foreclose vertical additions to buildings); Troy A. Rule, *Airspace in an Age of Drones*, 95 B. U. L. Rev. 155, 171-72 (2015).

⁴⁹ *Griggs v. Allegheny County*, 369 U.S. 84 (1962).

⁵⁰ See, e.g., *Andrews v. United States*, 108 Fed. Cl. 150, 155-56 (2012); *Adaman Mutual Water Co. v. United States*, 181 F. Supp. 658 (Ct. Cl. 1958).

⁵¹ See cases cited *supra* note 27.

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determine government takings liability related to UAS operations, the Congressional Research Service and legal commentators have said a landowner likely would need to show there were frequent government or government-directed UAS flights above the landowner's property within their particular low-altitude "immediate reaches" airspace and that the flights caused direct and immediate—possibly "substantial"—interference with the use and enjoyment of their land.

Regarding what constitutes "immediate reaches" airspace, *Causby* and subsequent cases suggest the landowner should not need to show he was literally using or occupying the airspace. Rather, in *Causby's* words, the landowner may prove "use" of the airspace "in somewhat the same sense that space left between buildings for the purpose of light and air is used."⁵² *Griggs* and subsequent cases also have made clear a landowner's immediate reaches airspace may include space FAA has declared as "navigable airspace."⁵³ This is important in the UAS context because as discussed in Appendix I, FAA has said "navigable airspace" may extend from the ground up. If a landowner's immediate reaches airspace excluded all navigable airspace, this would mean the landowner would have no immediate-reaches airspace at all.

Finally, regarding the harm or "interference" a landowner would need to demonstrate from the UAS operations, *Causby* and *Griggs* suggest that impairment of the landowner's business or livelihood, rendering the property unsuitable for residential use likely would be sufficient, or physical damage should be sufficient.⁵⁴ *Griggs* also suggests UAS operations that render the land surface impractical for its intended use by the current landowner also may suffice. Courts in manned aviation takings cases also have recognized a reduction in a property's fair market value as "interference,"⁵⁵ but limitations imposed on a property's use by future owners that does not affect its fair market value may not.⁵⁶

2. Potential Claims Based on Federal, State, Local, and Tribal Government Regulatory Actions (Regulatory Takings)

In addition to government actions that directly take private property, the Supreme Court has long recognized that the government's exercise of its regulatory authority in a way that diminishes or eliminates private property rights may constitute a taking. This is commonly known as a "regulatory taking."⁵⁷ According to stakeholders we spoke to and a number of legal

⁵² *Causby*, 328 U.S. at 264-65.

⁵³ See, e.g., *Branning v. United States*, 654 F.2d 88, 99 (1986) (government may be liable for taking even if its aircraft were within "what Congress has declared to be navigable airspace and subject to its regulation"); *Palisades Citizens Ass'n Inc. v. CAB*, 420 F.2d 188, 192 (D.C. Cir. 1969) (same).

⁵⁴ See generally 2013 CRS Drones Report, *supra* note 15, at 8-10.

⁵⁵ See *Brown*, *supra* note 27; *Branning*, *supra* note 53.

⁵⁶ *Stephens v. United States*, 11 Cl. Ct. 352 (1986).

⁵⁷ See generally GAO, *Regulatory Takings: Implementation of Executive Order on Government Actions Affecting Private Property Use*, [GAO-03-1015](#) (Washington, DC: Sept. 19, 2003). As explained in our 2003 report, Executive Order 12630, *Governmental Actions and Interference with Constitutionally Protected Property Rights*, 53 Fed. Reg. 8859 (March 18, 1988), requires executive branch agencies to consider the potential regulatory takings implications of their proposed actions and to document significant implications in notices of proposed and final rulemaking, among other things. In response to our question to FAA officials whether the agency has reviewed any of its proposed or final UAS regulations or other UAS-related actions in accordance with Executive Order 12630, the officials stated that they consider the issues raised in the Executive Order in all of their rulemakings.

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commentators, possible UAS-related regulatory action by FAA and by state or local governments in the future—and perhaps even actions taken to date—might constitute a regulatory taking under these regulatory takings precedents. We summarize the case law cited by these stakeholders and commentators below, followed by their analyses about how this case law might apply in the UAS context.

As Justice Holmes declared in the often-cited maxim from the Supreme Court’s first regulatory takings decision, *Pennsylvania Coal Co. v. Mahon*, “while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking.”⁵⁸ Although the Supreme Court has acknowledged there is “no ‘set formula’” to determine when a regulation “goes too far,”⁵⁹ the Court’s analysis has focused on the economic impact of a regulation as well as on the “character” of the governmental action. As the Court explained in its seminal decision in *Penn Central Transp. Co. v. City of New York*,⁶⁰ “[a] taking may more readily be found when the interference with property can be characterized as a physical invasion by government, than when interference arises from some public program adjusting the benefits and burdens of economic life to promote the common good.”⁶¹ As examples of government “physical invasions” that constituted takings, the *Penn Central* Court cited its previous aircraft takings decisions in *Causby* and *Griggs*.

Another example of a government-related physical invasion of property that was held to constitute a regulatory taking is the Supreme Court’s decision in *Loretto v. Teleprompter Manhattan CATV Corp.*⁶² *Loretto* involved the “extreme” case of a government regulation that compelled the permanent physical occupation of private property. The Court said this was “determinative” of a taking regardless of other impact on the landowner.⁶³ But the Court recognized that even a “more temporary invasion”—“a direct invasion of [a landowner’s] domain” such as planes flying through overlying airspace as in *Causby* and *Griggs*—could (and did) constitute a taking.⁶⁴

Finally, as the Supreme Court recognized in *Loretto* and *Lucas v. South Carolina Coastal Council*,⁶⁵ the federal government may commit a regulatory taking by imposing a “navigational

⁵⁸ *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 415 (1922).

⁵⁹ *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1014-15 (1992).

⁶⁰ *Penn Central Transp. Co. v. City of New York*, 438 U.S. 104 (1978). *Penn Central* involved whether a New York City landmark designation ordinance constituted a regulatory taking of a landowner’s airspace property rights.

⁶¹ *Penn Central*, *supra* note 60, 438 U.S. at 124. We discuss *Penn Central*’s recognition of landowner airspace property rights in Appendix V.

⁶² *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982).

⁶³ *Loretto* held that a New York City regulation requiring landlords to allow installation of a 1-1/2 cubic foot cable TV box on the rooftops of their buildings was a taking. We discuss *Loretto*’s recognition of landowner airspace property rights in Appendix V.

⁶⁴ *Loretto*, 458 U.S. at 426, 430-31.

⁶⁵ *Lucas v. South Carolina Coastal Council*, *supra* note 59.

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servitude” on private property as in *Kaiser Aetna v. United States*.⁶⁶ In *Kaiser Aetna*, the Army Corps of Engineers asserted that a privately owned marina, connected through a channel to a bay leading to the Pacific Ocean, was part of the “navigable waters of the United States” subject to a navigational servitude imposed pursuant to the Rivers and Harbors Appropriation Act. As a result, the Corps argued, the public must be given access to the private marina.⁶⁷ The Supreme Court agreed the Corps was authorized to impose the servitude under the statute, which the Court found to be a valid exercise of Congress’s Commerce Clause power to promote navigation. However, citing *Causby*, the Court ruled the servitude on the private marina was a taking of that private property requiring just compensation. The Court emphasized that the servitude took away the landowner’s right to exclude, which is “one of the most essential sticks in the bundle of rights that are commonly characterized as property.”⁶⁸ The Court explained:

“[T]his Court has never held that the navigational servitude creates a blanket exception to the Takings Clause whenever Congress exercises its Commerce Clause authority to promote navigation. . . . [W]e hold that the ‘right to exclude,’ so universally held to be a fundamental element of the property right, falls within this category of interests that the Government cannot take without compensation. . . . And even if the Government physically invades only an easement in property, it must nonetheless pay compensation. See *United States v. Causby*”⁶⁹

As the *Kaiser Aetna* Court recognized, however, in many cases, exercise of the public right of navigation over interstate waters “that constitute highways for commerce,” and the federal navigational servitude, does not constitute a taking requiring compensation.⁷⁰

Relying on the foregoing case law, the Chair of the Uniform Law Commission’s Uniform Drone Tort Law Act Drafting Committee, a member of the Drafting Committee we spoke to, another attorney stakeholder we spoke to, and other legal commentators have stated that FAA and state or local governments might be liable for a regulatory taking in connection with their actions regarding UAS operations. With respect to FAA’s potential liability, as discussed in Appendix I and noted above, the ULC Industry Commenters Group asserted that FAA’s exclusive right to create Temporary Flight Restrictions barring flights in certain circumstances would preempt state-law altitude-based limits imposing a ceiling below which UAS flights would be deemed to be trespassing. State-law landowner trespass suits to exclude drone flights below such pre-established altitudes within the landowner’s immediate reaches airspace also would be federally preempted, according to the ULC Industry Group.

⁶⁶ See *Loretto*, 458 U.S. at 433, and *Lucas*, 505 U.S. at 1015, citing *Kaiser Aetna v. United States* 444 U.S. 164 (1979).

⁶⁷ The Corps had consented to the owner converting his previously land-locked private fishing pond into a marina and constructing the channel out to the bay.

⁶⁸ *Kaiser Aetna*, 444 U.S. at 176.

⁶⁹ *Kaiser Aetna*, 444 U.S. at 172, 180. See also *Nollan v. California Coastal Comm’n*, 83 U.S. 825, 831 (1987) (finding a taking based on a “permanent physical invasion” where an easement was imposed giving the public “a permanent and continuous right to pass to and fro, so that the real property may continuously be traversed, even though no particular individual is permitted to station himself permanently upon the premises.”).

⁷⁰ *Kaiser Aetna*, 444 U.S. at 175, citing *United States v. Chandler-Dunbar Co.*, 229 U.S. 53 (1913).

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Yet federal preemption in that context might itself constitute a nationwide taking of private property without just compensation. According to an attorney stakeholder we spoke to, FAA's Part 107 rules authorizing UAS operations below 400 feet do not constitute a taking because they do *not* abrogate private landowners' rights to control the low-altitude airspace above their land, are *not* an adjudication of private airspace property rights, and do *not* establish nationwide low-altitude flight corridors for drones. Rather, Part 107 represents FAA's determination that drones may be safely operated below 400 feet. If, however, Part 107 *is* understood as FAA's authorization of nationwide UAS flight paths and corridors below 400 feet—more specifically, below what the stakeholder calls “ultra-low altitudes,” which are certainly up to 125 or 150 feet (this “surely constitutes ‘immediate reaches’ airspace under *Causby*,” the stakeholder told us) and perhaps as high as 250 feet—then there is a “serious and compelling argument” that Part 107 has effected an unconstitutional taking (an inverse avigation easement) without just compensation, according to this stakeholder.

An academic stakeholder we spoke with has addressed the impact of preempting state and local UAS restrictions more directly. He has noted the potential for “one of the largest uncompensated transfers of property interests in United States history” if FAA seeks to preempt all state and local drone use restrictions and common law tort claims.⁷¹ Even more broadly, another legal commentator has said authorization by FAA or a state or local government of UAS flights at very low altitudes, such as a “non-invitee hovering drone,” could be an unconstitutional taking regardless of whether the activity occurs within navigable airspace.⁷² Takings liability for a state would be even more likely, according to this commentator, if it authorized such flights and precluded the landowner from suing the drone operator for trespass.⁷³ The Uniform Law Commissioner stakeholder we spoke to agreed that states could have takings liability in these circumstances.⁷⁴

The ULC Drafting Committee Chair outlined similar arguments regarding potential UAS-related federal, state, and local government regulatory takings liability. One of the drone aerial trespass model law alternatives proposed in a 2018 memorandum from the Chair was that each state would establish its own altitude-based “trespass” limits pursuant to state law property principles and practices. If a state were to set its ceiling “too low,” however—that is, within landowners' constitutionally recognized immediate-reaches airspace—it “risks a finding that a taking has

⁷¹ Troy A. Rule, *Drone Zoning*, 95 N.C. L.Rev. 133, 171 (2016). In that event, this stakeholder said, “[m]illions of Americans would lose valuable rights to prevent unwanted devices from physically invading the airspace just above their backyards and rooftops, receiving almost nothing in return.”

⁷² Wendie L. Kellington, *Drones*, 49 Urb. Law. 667, 676 (2017).

⁷³ Kellington, ABA materials, *supra* note 48, at 13.

⁷⁴ Willis Letter, *supra* note 16 (“What right does a land owner retain to protect the right of exclusive possession to their property [under the 12-factor substantial interference test for drone aerial trespass]? Almost nothing and as a practical matter nothing. All those problems increase the probability of bringing an inverse condemnation [takings] case against the State. It is the State that expressly allows all the drone operators to do this with impunity.”). The same stakeholder said the Supreme Court's June 2019 decision in *Knick Twp. of Scott, Pennsylvania*, 139 S.Ct. 2162 (U.S. June 21, 2019), underscores states' potential takings liability because in the Court's words, it “restor[es] takings claims to the full-fledged constitutional status the Framers envisioned when they included the other protections in the Bill of Rights.” 139 S.Ct. at 2170.

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occurred, while it risks having the state recognized height abrogated by federal use if it sets the limit too high,” the Chair explained.⁷⁵

In addition to this potential state takings liability, the Chair described FAA’s potential takings liability:

“It is important to recognize . . . that the federal government would likewise be bound by a well-founded and defended state determination of landowner rights. If the United States granted rights to drone operators to operate within the airspace that a state has recognized as belonging to the landowner, such a grant would be a taking of property under the Fifth Amendment. Thus, the federal government could, in effect, preempt the state determination, but in doing so would authorize a physical intrusion that would violate the Fifth Amendment and that would thus trigger the duty to pay for that intrusion. . . . Any federal attempts to preempt [a state’s] lower limit, even though they may fall within the federal government’s Commerce Clause power, would violate the Takings Clause, requiring payment to landowners of just compensation.”⁷⁶

In support of his analysis of FAA’s and states’ potential takings liability, the Chair cited the Supreme Court’s rulings in *Penn Central*, *Loretto*, and *Lucas*, discussed above.

Finally, another legal commenter on the ULC multi-factor substantial interference drone aerial trespass model act, relying on *Kaiser Aetna* and *Nollan*, indicated that states adopting such a law could be liable for a taking.⁷⁷ And as noted above, the Reporter for the pending Restatement (Fourth) of Property concluded the multi-factor substantial interference test “in effect extends the navigable airspace down to the grass tops of land across the entirety of any state that enacts it. *In effect it imposes a presumptive navigation servitude on every cubic centimeter of space above the surface of the land,*” in his view.⁷⁸ As discussed in Appendix I, FAA’s position—based on its authority and responsibility under the Federal Aviation Act and the Commerce Clause to regulate aviation safety and the efficient use of airspace within that navigable airspace—is that “navigable airspace” may extend down to the ground,

Whether such UAS-related constitutional takings claims against FAA or state or local governments would succeed remains to be seen. The arguments for such claims are based on established Supreme Court case takings jurisprudence, but courts have not yet ruled on how the principles established by these cases apply in the context of UAS operations and the UAS regulatory framework.

⁷⁵ 2018 Kurtz and Heverly Memorandum, *supra* note 39. See also Robert A. Heverly, *The State of Drones: State Authority to Regulate Drones*, 8 Albany Gov’t L. Rev. 29, 46 (2015) (“*Causby* may . . . be read to allow states to step in and set navigable airspace for drones below that limit set by the FAA for other aircraft, though if such a determination ends with drones interfering with the use and enjoyment of land it would likely be held to constitute a taking of property under the Fifth Amendment.”).

⁷⁶ 2018 Kurtz and Heverly Memorandum, *supra* note 39.

⁷⁷ Letter to Uniform Law Commission from Daniel Ortner, Pacific Legal Foundation, July 10, 2019.

⁷⁸ Memorandum to Uniform Law Commission from Professor Henry E. Smith, *supra* note 21 (emphasis added).

APPENDIX III: CONSIDERATIONS INVOLVING UAS-RELATED PERSONAL PRIVACY RIGHTS UNDER FEDERAL AND STATE LAW

In the FAA Reauthorization Act of 2018, Congress declared that “the operation of any unmanned aircraft or unmanned aircraft system shall be carried out in a manner that respects and protects personal privacy consistent with the United States Constitution and Federal, State, and local law.”¹ As discussed below, concerns about what is commonly referred to as “UAS privacy”—protecting the physical privacy of individuals on the ground from surveillance by UAS, and protecting data that UAS collect about those individuals—stem from a combination of drones’ small size, their virtually universal use of cameras and other sensors, their ability to fly at ground level and hover in place, and their ability to be remotely piloted.²

Pursuant to our 2018 FAA Reauthorization Act mandates, our focus in this Appendix is on privacy concerns arising from commercial and recreational UAS use rather than government UAS use, which raises somewhat different legal issues such as the Fourth Amendment’s³ protection against unreasonable searches and seizures by the government.⁴ But while Fourth

¹ FAA Reauthorization Act of 2018, Pub. L. No. 115-254, § 357, 132 Stat. 3186, 3305 (2018 FAA Reauthorization Act).

² See generally GAO, *FAA Should Improve Its Management of Safety Risks*, [GAO-18-110](#) (Washington, DC: May 24, 2018) at 10, 14; *Unmanned Aerial Systems: FAA Continues Progress toward Integration into the National Airspace*, [GAO-15-610](#) (Washington, DC: July 16, 2015) at 19; *Unmanned Aircraft Systems: Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System*, [GAO-12-981](#) (Washington, DC: Sept. 14, 2012) at 32-36; *Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses within the National Airspace System*, [GAO-08-511](#) (Washington, DC: May 15, 2008) at 24. See also GAO, *Unmanned Aerial Systems: Department of Homeland Security’s Review of U.S. Customs and Border Protection’s Use and Compliance with Privacy and Civil Liberty Laws and Standards*, [GAO-14-849R](#) (Washington, DC: Sept. 30, 2014).

³ The Fourth Amendment provides that “[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.” U.S. Const., Amend. IV.

⁴ The Congressional Research Service, privacy and civil liberties groups, and legal commentators have described how Fourth Amendment protections may apply to the government’s use of drones for surveillance, law enforcement, and other purposes. See, e.g., CRS, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, CRS Report 24701, by Richard M. Thompson II (April 3, 2013); CRS, *Integration of Drones into Domestic Airspace: Selected Legal Issues*, CRS Report 42940, by Alissa Dolan and Richard M. Thompson II (April 4, 2013) (2013 CRS Drones Report) at 12; CRS, *Domestic Drones and Privacy: A Primer*, CRS Report 43965, by Richard M. Thompson II (March 30, 2015) (2015 CRS Drones Privacy Report) at 11-14; Jay Stanley and Catherine Crump, *Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drone Aircraft* (American Civil Liberties Union, Dec. 2011) at 15; M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 Stan. L. Rev. Online 29 (Dec. 12, 2011).

As these analyses have explained, the following key Supreme Court Fourth Amendment cases involving the use of manned aircraft and new technologies provide insights into how the courts may address the government’s use of drones: *California v. Ciraolo*, 476 U.S. 207 (1986) (no reasonable expectation of privacy and thus no Fourth Amendment “search” where police flying in private plane saw activity in defendant’s backyard); *Florida v. Riley*, 488 U.S. 445 (1989) (same; no “search” where police flying in helicopter saw evidence through missing greenhouse roof panels); *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986) (same; no “search” where EPA contractor flying in plane within “navigable airspace” took photos of open areas of chemical manufacturing complex using precision aerial mapping camera); *Kyllo v. United States*, 533 U.S. 27 (2001) (reasonable expectation of privacy in interior of the home; government’s use of sense-enhancing thermal imaging device not in general public use to detect interior heat images was a “search”); and *United States v. Jones*, 565 U.S. 400 (2012) (reasonable expectation of privacy in

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Amendment protections apply only to government UAS operations, the Fourth Amendment principle of an individual having a “reasonable expectation of privacy” is relevant to non-government UAS operations as well. This is because, as discussed below, a number of states and localities have incorporated the same “reasonable expectation of privacy” language into their privacy laws applicable to private actors.⁵ It is also because the common law privacy tort most likely to apply in the UAS context—intrusion upon seclusion—requires the surveilled person to show they had an objectively reasonable expectation of seclusion or solitude, sometimes phrased as a “reasonable expectation of privacy” even though that tort addresses different harms caused by different actors than the Fourth Amendment.⁶

In addition to the potential impact of Fourth Amendment principles on protecting the privacy of individuals on the ground, First Amendment protections may be relevant as well—to protect the rights of UAS operators. As discussed below, the First Amendment protects certain rights to gather and publicize information about others, thus creating a potential conflict between news organizations and information gatherers who take photographs and collect other personal information using a drone, on the one hand, and those whose personal information is collected and may believe these activities violate their personal privacy rights, on the other.⁷ As one legal commentator has observed, “[t]he potential for [UAS] functionality to run afoul of speech, search and seizure, and privacy rights loom[s] as the greatest impediment to [national airspace] integration and commercial operations.”⁸

We begin this discussion of UAS privacy with a note about the terminology we use and the UAS privacy interests we address. We address both the privacy of an individual in their person (sometimes referred to as “physical privacy” or “personal privacy”) and the privacy of UAS-collected data about a person, e.g., photographs, videos, sound recordings, thermal images, and other data (sometimes referred to as “data privacy”). We use the broad term “personal privacy” to encompass both concepts and use the more specific terms “physical privacy” and “personal data privacy,” respectively, to refer to these concepts individually.⁹

In practice, however, there is not a sharp dividing line between UAS physical and personal data privacy because today, many drones of all sizes can both view individuals in real time (e.g., by

personal vehicle; government’s attachment of a GPS device to vehicle and extended monitoring of vehicle’s movements was a “search”).

⁵ See Parts D.1.a. and c. and D.2. below.

⁶ See Part D.1.b. below.

⁷ See Part B. below.

⁸ Timothy M. Ravich, *Commercial Drones and the Phantom Menace*, 5 J. Int’l Media & Ent. L. 175, 196 (2015).

⁹ FAA has sometimes used these terms differently. In the preambles to its final Part 107 rule and proposed flights-over-people and nighttime flights rules, for instance, FAA appears to have used the terms “personal privacy” and “individual privacy,” respectively, to mean both UAS real-time viewing of persons and UAS collection of information about persons. See 81 Fed. Reg. 42063, 42190, 42192 (June 28, 2016) (final Part 107 rule); 84 Fed. Reg. 3856, 3893 (Feb. 13, 2019) (proposed “flights over people” and nighttime flight rules). By contrast, FAA appears to have used the term “data privacy” in the final Part 107 rule preamble to mean UAS collection of business intellectual property information or proprietary data. See 81 Fed. Reg. at 42190, 42192. By whatever name, business-data privacy issues are beyond the scope of this report, as are personal privacy issues related to UAS operators’ or manufacturers’ submission of personally identifiable information to FAA, also discussed in the final Part 107 rule preamble. Rather, our focus is on the privacy of persons not involved in the UAS operation and the UAS-collected information about them.

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using a camera) and collect data about those individuals (e.g., by recording or transmitting images of what the camera views). Indeed, collecting data is one of drones' most common purposes and may be necessary for navigational purposes. As one legal commentator has observed, "[t]he innovation of . . . [UAS] is not flight but information. . . . [UAS] represent data in action."¹⁰ UAS operations therefore may be subject both to physical privacy laws, such as so-called "Peeping Tom" laws discussed in Part D.1.a. below (some of which also prohibit the recording of photographs or other personal data), and personal data privacy laws, such as those restricting the recording of photographs or other data about a person. The subsequent use, retention, and dissemination of UAS-collected personal data also may be seen as an aspect of both physical privacy and personal data privacy.

In short, physical and personal data privacy interests in the UAS context are intertwined and on a continuum—from the "pure" invasion of a person's physical privacy (without collection of personal data), to invasion of their physical privacy combined with collection of personal data, to post-collection activities such as the use, retention, and dissemination of personal data. Most of the public debate to date about UAS privacy has focused on protecting personal data privacy rather than "pure" physical privacy.¹¹

A. The Right to Be Let Alone (Beginnings of the Right to Privacy)

To understand what UAS privacy rights the law may protect today and what factors Congress may wish to consider if it decides to enact additional protections, it is necessary to understand the origins of the legal right to privacy. For centuries, protection of personal privacy was not recognized as an independent legal right but rather was an aspect of property rights. As Lord Coke famously declared in 17th century England, "the house of everyone is to him as his castle and fortress, as well for his defence against injury and violence, as for his repose[.]"¹²

The expectation of privacy in one's home carried over into early American case law, both through prohibitions against physical trespass into the home and then prohibitions against eavesdropping on private conversations in the home. As one Pennsylvania court explained in an 1831 case holding that eavesdropping was an indictable offense, "[e]very man's home is his castle, where no man has a right to intrude for any purpose whatever."¹³ The protection of privacy as a corollary of property rights also was reflected in the text of the Fourth Amendment, ratified in 1791, and in how the Supreme Court interpreted Fourth Amendment protections until

¹⁰ Timothy M. Ravich, *Courts in the Drone Age*, 42 N. Ky. L. Rev. 161, 162 (2015). The commentator further stated, "[f]undamentally, then, [UAS] are aerial platforms on which to deploy the latest and most sophisticated hardware and software information-gathering gadgets." *Id.*

¹¹ See, e.g., 2015 CRS Drones Privacy Report, *supra* note 4, at 1, 6-11 ("what the chameleon phrase 'privacy' means in the context of aerial surveillance" is a combination of the initial UAS collection of personal information and the subsequent aggregation, use, and retention of that UAS-collected information, omitting mention of protecting an individual's "pure" physical privacy without collection of data); Presidential Memorandum to Heads of Executive Departments and Agencies, *Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems*, 80 Fed. Reg. 9355, 9355 (Feb. 20, 2015) (2015 UAS Privacy Presidential Memorandum) (directing NTIA to convene multi-stakeholder UAS privacy process limited to UAS data privacy). We discuss this NTIA multi-stakeholder UAS privacy process in Part E. below.

¹² 2013 CRS Drones Report, *supra* note 4, at 13, quoting *Semayne's Case*, 5 Co. Rep. 91 (K.B. 1604).

¹³ 2013 CRS Drones Report, *supra* note 4, at 13, quoting *Commonwealth v. Lovett*, 4 Pa. L.J. Rpts. (Clark) 226, 226 (Pa. 1831).

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the latter half of the 20th century.¹⁴

Privacy rights independent of property began to evolve in the late 19th and early 20th centuries. In 1890, advances in technology and an inquisitive press led to the writing of a groundbreaking law review article, *The Right to Privacy*, by then private lawyer, later U.S. Supreme Court Justice Louis Brandeis and his former law partner Samuel Warren.¹⁵ Brandeis and Warren’s article, widely cited as the beginning of the legal right to privacy,¹⁶ was a response to the fast-paced “Yellow Press” newspaper coverage of society figures of the day, which included intimate personal details and photographs made possible by the invention of portable cameras and so-called “instantaneous photography.”¹⁷ Reacting to what they saw as the negative personal and societal impacts of such coverage, Brandeis and Warren declared that “[t]he intensity and complexity of life . . . have rendered necessary some retreat from the world . . . solitude and privacy have become more essential to the individual.”¹⁸

Noting the law already had evolved from protecting against physical harm and harm to property to recognizing the “legal value of sensations,”¹⁹ Brandeis and Warren concluded that “[r]ecent inventions and business methods call attention to the next step which must be taken for the protection of the person and for securing to the individual what Judge Cooley calls the right ‘to be let alone.’”²⁰ That next step was recognition of a “right to privacy, as part of the more general right to the immunity of the person, the right to one’s personality”—“a general right of the individual to be let alone.”²¹ Such a right would be violated by publication of a private individual’s photograph, for example, as well as by publication of one’s private affairs, with details about how to balance “the dignity and convenience of the individual” against “the

¹⁴ See *United States v. Jones*, *supra* note 4, 565 U.S. at 405 (“The text of the Fourth Amendment reflects its close connection to property, since otherwise it would have referred simply to ‘the right of the people to be secure against unreasonable searches and seizures’; the phrase ‘in their persons, houses, papers, and effects’ would have been superfluous. Consistent with this understanding, our Fourth Amendment jurisprudence was tied to common-law trespass, at least until the latter half of the 20th century.”).

¹⁵ Samuel D. Warren and Louis D. Brandeis, *The Right to Privacy*, 4 Harv. L. Rev. 193 (1890).

¹⁶ See, e.g., William L. Prosser, *Privacy*, 48 Cal. L. Rev. 383 (1960); Dorothy J. Glancy, *The Invention of the Right to Privacy*, 21 Ariz. L. Rev. 1 (1979); Benjamin E. Bratman, *Brandeis and Warren’s The Right to Privacy and the Birth of the Right to Privacy*, 69 Tenn. L. Rev. 623 (2002).

¹⁷ See, e.g., 2013 CRS Drones Report, *supra* note 4, at 13; Neil M. Richards, *The Puzzle of Brandeis, Privacy, and Speech*, 63 Vanderbilt L. Rev. 1295, 1300-302 (2010); Amy Gajda, *What if Samuel D. Warren Hadn’t Married a Senator’s Daughter?: Uncovering the Press Coverage that Led to the Right to Privacy*, 2008 Mich. St. L. Rev. 35 (2008).

¹⁸ Warren and Brandeis, *supra* note 15, at 196.

¹⁹ *Id.* at 193. As examples, Brandeis and Warren cited recognized legal causes of action such as assault (putting someone in fear of physical injury), nuisance (creating offensive noise, odors, vibrations), and libel and slander (harming someone’s reputation).

²⁰ For this now-famous phrase, Warren and Brandeis quoted from Judge Thomas M. Cooley’s *A Treatise on the Law of Torts or the Wrongs Which Arise Independent of Contract* (Callaghan & Co. 1879), Ch. II. General Classification of Legal Rights, at 29 (“Personal Immunity. The right to one’s person may be said to be a right of complete immunity: to be let alone.”).

²¹ Warren and Brandeis, *supra* note 15, at 205-07. See also *id.* at 211 (“the right to an inviolate personality, affords alone that broad basis upon which the protection which the individual demands can be rested.”).

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demands of the public welfare” to be determined by the courts.²² Brandeis and Warren concluded by asking whether the law, having protected personal privacy as an aspect of the property rights inherent in one’s “castle,” should leave the back door of the castle open by failing to recognize the right to personal privacy as an independent legal right.²³

Some courts adopted Brandeis and Warren’s concept of an independent right to privacy not long after their article was published, while other courts rejected it. A number of courts had adopted a right to privacy in some form by 1939, when the Restatement (First) of Torts recognized a general right to privacy, and a majority of states had done so by 1960.²⁴ In 1960, noted legal scholar Dean William Prosser published a survey analyzing the more than 300 right to privacy court cases decided by that time, concluding they fell into four basic categories.²⁵ In 1965, the Restatement (Second) of Torts adopted these four categories as four invasion of privacy torts, two of which (discussed in Part D.1.b.below) are highlighted by legal commentators today as being potentially most relevant in addressing UAS-related invasions of privacy.²⁶ In 1967, the Supreme Court recognized the distinction between privacy rights and property rights in the Fourth Amendment context by expanding its protections to cover “people, not places”²⁷ based on where a person has a “reasonable expectation of privacy.”²⁸

Two final points are warranted about this evolution of the legal right to privacy. First, the “right to be let alone” declared by Brandeis and Warren more than a century ago continues to be invoked by federal privacy officials today. In remarks at a 2019 Federal Trade Commission (FTC) public hearing, for example, FTC Commissioner Noah Phillips referenced this “right” as one of the options that Congress could consider in enacting comprehensive consumer data privacy legislation. Commissioner Phillips explained:

“Privacy is a nebulous concept, and different people can and do conceive quite differently how individuals are harmed by a privacy ‘violation.’ They also differ whether and to what extent they experience a given kind of conduct as a violation . . . Are consumer data privacy harms limited to physical injury and financial loss? Do they include emotional distress? Is a sense of surveillance or creepiness characteristic of an eggshell plaintiff, or something Congress needs to prevent? What about a lack of

²² *Id.* at 214.

²³ “The common law has always recognized a man’s house as his castle, impregnable, often, even to its own officers engaged in the execution of its commands. Shall the courts thus close the front entrance to constituted authority, and open wide the back door to idle or prurient curiosity?” *Id.* at 220.

²⁴ Prosser, *supra* note 16, at 384-88, citing cases and Restatement (First) of Torts § 867 (1939).

²⁵ Prosser, *supra* note 16, at 389.

²⁶ These four privacy torts are Restatement (Second) of Torts §§ 652B (intrusion upon seclusion) and 652D (public disclosure of private facts) (discussed in Part D.1.b. below), and §§ 652C (appropriation of name or likeness) and 652E (publicity placing person in false light).

²⁷ *Katz v. United States*, 389 U.S. 347, 351 (1967).

²⁸ *Katz*, *supra* note 27, 389 U.S. at 360 (Harlan, J., concurring). *Katz* overruled *Olmstead v. United States*, 277 U.S. 438 (1928), in which Justice Brandeis, dissenting, had declared the Fourth Amendment “conferred, as against the government, the right to be let alone—the most comprehensive of rights and the right most valued by civilized men. To protect that right, every unjustifiable intrusion by the government upon the privacy of the individual . . . must be deemed a violation of the Fourth Amendment.” *Olmstead*, 277 U.S. at 478.

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empowerment or a loss of control? And how, if at all, do these things take us back to Brandeis and Warren’s famous ‘right to be let alone’? The decision as to which harms deserve vindication by Congress is the predicate for deciding how any law should look. . . . As a practical and legal matter, . . . rights flow either from the Constitution or the laws Congress makes pursuant to it. . . . Congress needs to make those rights”²⁹

Second, while privacy rights are now recognized as legally independent of property rights, in practice the two remain closely connected because excluding others from one’s property increases privacy. Thus as illustrated by the “Drone Slayer” case discussed in Appendix I, UAS flights in low-altitude airspace over private property have prompted claims of both aerial trespass and invasion of privacy for the same incident.³⁰ Resolving how the Supreme Court’s decision in *United States v. Causby* and possible airspace property rights apply to UAS operations, as discussed in Appendices I and II, therefore could also affect UAS privacy—potentially increasing or decreasing privacy rights along with property rights.

B. The Potential Impact of the First Amendment on Legal Rights to Privacy

The First Amendment provides in relevant part that “Congress shall make no law . . . abridging the freedom of speech, or of the press”³¹ Federal and state protections of UAS physical and personal data privacy of individuals on the ground must be balanced against the First Amendment rights of UAS operators. One legal commentator has described this balance in the context of UAS operations as what occurs “when privacy law . . . collides with the First Amendment.”³² More broadly, the late U.S. Supreme Court Justice Stevens has described the balance of privacy and First Amendment interests as a “conflict between interests of the highest order—on the one hand, the interest in the full and free dissemination of information concerning public issues, and, on the other hand, the interest in individual privacy”³³

The courts have interpreted the First Amendment as creating certain rights to gather news and information as well as to publish it.³⁴ With respect to gathering news and information—the right most directly implicated by UAS because of their common usage in taking photos and collecting other information—in *Branzburg v. Hayes*, the Supreme Court stated in *dicta*³⁵ that “[n]ews

²⁹ Prepared Remarks of FTC Commissioner Noah Joshua Phillips, *FTC Hearing # 12: The FTC’s Approach to Consumer Privacy*, April 9, 2019, at 2-5.

³⁰ See Appendix I, Part C.1.

³¹ U.S. Const., Amend. I. The First Amendment’s protections have been extended to the states through the Fourteenth Amendment. See, e.g., *Spence v. State of Washington*, 418 U.S. 405 (1974).

³² Margot Kaminski, *Drone Federalism: Civilian Drones and the Things They Carry*, 4 Cal. L. Rev. Circuit 57, 66 (May 2013).

³³ *Bartnicki v. Vopper*, 532 U.S. 514, 518 (2001). See also *Shulman v. Group W Productions, Inc.*, 955 P.2d 469, 474 (Cal. 1998), quoting *Time, Inc. v. Hill*, 385 U.S. 374, 388 (1967) (“Exposure of the self to others in varying degrees is a concomitant of life in a civilized community. The risk of this exposure is an essential incident of life in a society which places a primary value on freedom of speech and of press.”).

³⁴ The Supreme Court has also long recognized the First Amendment’s freedom of speech and of the press include a right to *receive* information and ideas. See, e.g., *Stanley v. Georgia*, 394 U.S. 557, 564 (1969); *Kleindienst v. Mandel*, 408 U.S. 753, 762-63 (1972) (citation omitted).

³⁵ *Dicta* are a court’s comments made in a judicial opinion that are not strictly necessary to the decision in the case, and therefore are not binding legal precedent. *Black’s Law Dictionary*, 11th ed. (2019) at 569.

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gathering is not without its First Amendment protections” and that “without some protection for seeking out the news, freedom of the press could be eviscerated.”³⁶ Lower courts also have held there is a right to gather news and information by taking photographs in certain circumstances, based on Supreme Court precedent that freedom of speech includes a right to carry out certain “communicative” conduct, that is, conduct intended to communicate a particularized message or idea for which there is an intended audience.³⁷ A number of courts have held this includes “communicative photography” both by the press and the public,³⁸ such as filming intended for television or print news³⁹ and filming of police and other public officials on public property.⁴⁰

The Supreme Court has made clear, however, that there is no First Amendment right to gather news and information in a way that violates generally applicable civil or criminal laws. In *Branzburg*, for example, the Court ruled that “[n]ewsmen have no constitutional right of access to the scenes of crime or disaster when the general public is excluded,” nor do rights of the press and other information gatherers “reach so far as to override the interest of the public in ensuring [the news gatherers are not] . . . invading the rights of other citizens through reprehensible conduct forbidden to all other persons.”⁴¹

³⁶ *Branzburg v. Hayes*, 408 U.S. 665, 681, 707 (1972). The *Branzburg* Court did not elaborate on what these news-gathering protections are.

³⁷ See, e.g., *Hurley v. Irish-American Gay, Lesbian & Bisexual Group of Boston*, 515 U.S. 557 (1995); *Texas v. Johnson*, 491 U.S. 397 (1989).

³⁸ See, e.g., *Bery v. City of New York*, 97 F.3d 689 (2d Cir. 1996); *Porat v. Lincoln Towers Community Ass’n*, 2005 WL 646093 (S.D.N.Y. 2005), *aff’d per curiam*, 464 F.3d 274 (2d Cir. 2006); *Krukowski v. Swords*, 15 F. Supp.2d 188 (D. Conn. 1998); *Lambert v. Polk County*, 723 F. Supp. 128 (S.D. Iowa 1989). See generally Bill Kenworthy, *Photography & First Amendment* (Freedom Forum Institute April 2012) and cases cited therein, available at <https://www.freedomforuminstitute.org/first-amendment-center/topics/freedom-of-the-press/photography-first-amendment/> (last visited Sept. 1, 2020); 2013 CRS Drones Report, *supra* note 4, at 17-19 and cases cited therein; Kaminski, *supra* note 32, at 61-64 and cases cited therein; Marc Jonathan Blitz, James Grimsley, Stephen E. Henderson, Joseph Thai, *Regulating Drones Under the First and Fourth Amendments*, 57 Wm. & Mary L. Rev. 49, 80-109 (2015) and cases cited therein.

³⁹ See, e.g., *Demarest v. Athol/Orange Community Television*, 188 F.Supp.2d 82 (D. Mass. 2002); *Lambert v. Polk County*, *supra* note 38.

⁴⁰ See, e.g., *Smith v. City of Cumming*, 212 F.3d 1332 (11th Cir. 2000); *Fordyce v. City of Seattle*, 55 F.3d 436 (9th Cir. 1995). The federal appeals courts are not entirely in agreement regarding the right to film police activity, however. See cases cited in Kaminski, *supra* note 32; Kenworthy, *supra* note 38; and Blitz *et al.*, *supra* note 38.

Some courts have ruled that recreational photography conducted solely for one’s personal use is not constitutionally protected “communicative photography,” however, because there is no intent to communicate a message and no identified audience. See, e.g., *Porat*, *supra* note 38; *Larsen v. Fort Wayne Police Dept.*, 825 F.Supp.2d 965 (N.D. Ind. 2010). In addition, as with all constitutionally protected speech, the right to gather news and information by taking communicative photographs is subject to reasonable restrictions on their time, place, and manner, provided the restrictions are “justified without reference to the content of the regulated speech, . . . narrowly tailored to serve a significant governmental interest, and . . . leave open ample alternative channels for communication of the information.” *Clark v. Community for Creative Non-Violence*, 468 U.S. 288, 293 (1984).

⁴¹ *Branzburg*, *supra* note 36, 408 U.S. at 681, 684 (citing *Zemel v. Rusk*, 381 U.S. 1, 17 (1965) (“The right to speak and publish does not carry with it the unrestrained right to gather information.”), 685, 691-92. See also *Cohen v. Cowles Media Co.*, 501 U.S. 663, 669-70 (1991) (“generally applicable laws do not offend the First Amendment simply because their enforcement against the press has incidental effects on its ability to gather and report the news. . . . [The press] ‘has no special immunity from the application of the general laws. [It] has no special privilege to invade the rights and liberties of others.’”); *Dietemann v. Time, Inc.*, 449 F.2d 245, 249 (9th Cir. 1971) (First Amendment provides no immunity from “torts or crimes committed during the course of newsgathering”).

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The right to publish or publicize news and information also may limit UAS-related privacy rights. In fact at least where information is “newsworthy,” the Supreme Court has found the First Amendment’s rights of freedom of speech and freedom of the press outweigh the right to privacy and effectively immunize newsmen and other information publishers from liability for, among other things, the common law tort of public disclosure of private facts (discussed below in the UAS context).⁴² Based on this case law, the Restatement of Torts explains, “[i]t seems clear that the common law restrictions on [public disclosure of private facts] will now become part of the constitutional law of freedom of the press and freedom of speech. To the extent the constitutional definition of a matter that is of legitimate concern to the public is broader than the definition [in the public disclosure tort] given in any State, the constitutional definition will of course control.”⁴³

How these First Amendment principles will apply in the UAS context will be highly fact-dependent, and a complete analysis is beyond the scope of this report. We describe stakeholder and legal commentator views about how they may apply in Part D.1.b. below.

C. Federal Laws That May Protect UAS-Related Personal Privacy

1. Limited Federal Laws Applicable to UAS-Related Personal Privacy and Administration Approaches to Protecting Consumer Data Privacy

As one legal commentator has observed, “[t]he federal protections of privacy are underwhelming to date”⁴⁴ It appears that just one federal statute, 18 U.S.C. § 1801, protects against invasion of a person’s physical privacy, and potentially their personal data privacy, by a private actor. The statute establishes the crime of “video voyeurism” (a common name for a “Peeping Tom” law), but it is limited to voyeurs located within “the special maritime and territorial jurisdiction of the United States.”⁴⁵ Thus unless a UAS operator invades a person’s privacy from this type of specialized location, this law would not appear to protect against UAS invasions of privacy.⁴⁶

⁴² See, e.g., *Cox Broadcasting v. Cohn*, 420 U.S. 469, 487, 489, 492 (1975) (although “powerful arguments can be made . . . [that] there is a zone of privacy surrounding every individual,” in the “face-off” between privacy and freedom of the press, the press has a right to publish true information about “events of legitimate concern to the public” that appears in public records). See also *Shulman v. Group W Productions*, *supra* note 33 (upholding news organization’s airing of documentary featuring accident victim’s statements and images taken in medical evacuation helicopter, based on First Amendment privilege to publish truthful, newsworthy material).

⁴³ Restatement (Second) of Torts § 652D cmt. d.

⁴⁴ Wendie L. Kellington, *Drones*, 49 Urb. Law. 667, 678 (2017).

⁴⁵ Video voyeurism is the sole crime listed in the “Privacy” chapter of the federal criminal code. Enacted in 2004, this law makes it a crime for anyone “in the special maritime and territorial jurisdiction of the United States” to intend “to capture an image of a private area of an individual without their consent” and “knowingly does so under circumstances in which the individual has a reasonable expectation of privacy.” We discuss the apparent basis for this law—the Constitution’s Federal Enclave Clause—in note [189] below. Also as discussed below, it appears that virtually all states have enacted some type of Peeping Tom or other criminal surveillance law.

⁴⁶ There is also a federal anti-stalking/anti-harassment statute, 18 U.S.C. § 2261A, that might potentially apply to the use of an electronics-bearing drone. The statute makes it a crime to use—with the intent to kill, injure, harass, intimidate, or place under surveillance with intent to kill, injure, harass, or intimidate—“any interactive computer service or electronic communication service or electronic system of interstate commerce, or any other facility of interstate . . . commerce to engage in a course of conduct that (A) places that person in reasonable fear of death or of serious bodily injury . . . or (B) causes, attempts to cause, or would reasonably be expected to cause substantial emotional distress.”

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Nor is there a comprehensive federal law protecting the privacy of personal data collected by private actors, whether collected by drones or otherwise. Rather, as we have reported, consumer data privacy is currently protected by statutes and rules pertaining to certain types of entities and certain personal data in certain circumstances (none specific to UAS), and by the Federal Trade Commission Act, which, as discussed in Part C.3. below, authorizes FTC to protect the privacy of personal information in the context of prohibiting unfair or deceptive trade practices.⁴⁷ Finally, as we have reported, there is currently no single federal agency with statutory responsibility to regulate UAS privacy matters for the entire federal government.⁴⁸

In the absence of comprehensive federal legislation addressing either UAS physical or personal data privacy in particular or consumer data privacy in general, the previous and current Administrations have issued statements and taken certain actions with respect to these matters. During the Obama administration, the President issued a Presidential Memorandum in February 2015 (2015 UAS Privacy Presidential Memorandum) announcing that as UAS are integrated into the national airspace system, the federal government will take steps to ensure this integration accounts for “the privacy, civil rights, and civil liberties concerns [UAS] may raise,” as well as economic competitiveness and public safety.⁴⁹ One of the steps called for by the 2015 UAS Privacy Presidential Memorandum was for the Department of Commerce’s National Telecommunications and Information Administration (NTIA) to convene a multi-stakeholder engagement process to develop best practices for protecting the privacy of personal data collected by non-government UAS operators. We discuss this NTIA effort in Part E. below.

The 2015 UAS Privacy Presidential Memorandum also set forth UAS privacy policies and procedures to be followed by the federal government itself when it operates UAS, such as for law enforcement and national security purposes. Those requirements include establishing policies, available to the public, that minimize unnecessary UAS-collection of personal information and minimize the subsequent use, retention, and dissemination of that information; ensuring those activities comply with the U.S. Constitution and applicable laws such as the Privacy Act;⁵⁰ providing public notice of where each agency is authorized to conduct UAS operations; and issuing annual summaries, available to the public, of the agency’s UAS operations.

More recently, the Trump administration has focused on the broader topic of consumer data privacy, not limited to UAS-collected data. In September 2018, NTIA requested public comment on ways to advance consumer data privacy while protecting prosperity and innovation.⁵¹ Depending on the scope of policies and laws that might be developed under the Administration’s approach, the privacy of UAS-collected personal data may or may not be

⁴⁷ GAO, *Internet Privacy: Additional Federal Authority Could Enhance Consumer Protection and Provide Flexibility*, [GAO-19-52](#) (Washington, DC: Jan. 15, 2019) (recommending Congress consider developing comprehensive legislation to protect the privacy of Internet users’ personal information collected online). By contrast, there are several federal laws protecting personal information collected and used by the *federal government*, principally the Privacy Act, 5 U.S.C. § 552a, and the privacy provisions of the E-Government Act of 2002, Pub. L. No. 107-347, 116 Stat. 2899 (2002). See generally [GAO-12-981](#), *supra* note 2, at 34-35.

⁴⁸ See [GAO-12-981](#), *supra* note 2, at 35.

⁴⁹ See 2015 UAS Privacy Presidential Memorandum, *supra* note 11.

⁵⁰ See *supra* note 47 regarding the Privacy Act.

⁵¹ See NTIA, *Developing the Administration’s Approach to Consumer Privacy*, 83 Fed. Reg. 48600 (Sept. 26, 2018).

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included. NTIA has stated there is currently a nationally and globally fragmented regulatory privacy landscape, which it believes disincentivizes innovation by increasing regulatory costs. It therefore requested comment on, among other things, harmonizing the regulatory landscape to avoid “a patchwork of competing and contradictory baseline [privacy] laws.” NTIA also sought comment on whether FTC, given its history of effectiveness in protecting privacy, should be the agency responsible for enforcing whatever new consumer data privacy protections are developed.⁵² Over 200 organizations and individuals submitted comments on these questions, including FTC staff (see Part C.3. below).⁵³

2. FAA Authority and Actions to Date

FAA officials told us the agency lacks authority to regulate UAS operations to address privacy concerns. In issuing the Part 107 rules in 2016, FAA stated that privacy concerns are beyond the scope of its mission to ensure the safety and efficiency of aviation operations in the airspace. It explained that because “the use of cameras and other sensors [is] extraneous to the airworthiness or safe operation of the aircraft . . . , it would be overreaching for the FAA to enact regulations concerning privacy rights.”⁵⁴ FAA reiterated this point in its Part 107 “flights over people” proposed rulemaking last year and also observed that cameras and other sensors have long been used on manned aircraft such as news helicopters, aerial surveyors, and film and production crews.⁵⁵

Further, FAA observed in the Part 107 preamble, when Congress enacted the FAA Modernization and Reform Act (FMRA) in 2012, mandating the safe integration of UAS operations into the national airspace system,⁵⁶ it did not direct the agency to address privacy issues. Reading privacy requirements into the FMRA mandate would be a significant expansion of the agency’s longstanding authority as a safety agency, in FAA’s view. Nor did Congress require regulation of UAS privacy in its 2016 or 2018 FAA reauthorization acts,⁵⁷ FAA officials noted to us. Finally, FAA officials told us, the agency’s rulemaking authority neither mandates nor permits it to issue or enforce regulations specifically aimed at protection privacy interests between private parties.

A privacy group stakeholder we spoke to has disagreed with FAA’s legal analysis and believes FAA has authority to regulate UAS privacy,⁵⁸ as does a leading civil liberties organization.⁵⁹

⁵² *Id.*, 83 Fed. Reg. at 48602.

⁵³ The public comments submitted in response to NTIA’s request are available at <https://www.ntia.doc.gov/other-publication/2018/comments-developing-administration-s-approach-consumer-privacy> (last visited Sept. 1, 2020).

⁵⁴ 81 Fed. Reg. 42064, 42190-92 (June 28, 2016) (final Part 107 rules).

⁵⁵ 84 Fed. Reg. 3856, 3893-94 (Feb. 13, 2019).

⁵⁶ FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 332, 126 Stat. 11 (2012).

⁵⁷ See 2018 FAA Reauthorization Act, *supra* note 1; FAA Extension, Safety, and Security Act of 2016, Pub. L. No. 114-190, 130 Stat. 615 (2016).

⁵⁸ The Electronic Privacy Information Center (EPIC) sued FAA following issuance of the proposed and final Part 107 regulations, asserting the agency had authority and an obligation to regulate UAS privacy but had not done so. The court did not reach the merits of either challenge, dismissing both on procedural grounds. See *EPIC v. FAA*, 821 F.3d 39 (D.C. Cir. 2016); *EPIC v. FAA*, 892 F.3d 1249 (D.C. Cir. 2018). EPIC has since filed suit against FAA and its Drone Advisory Committee seeking records related to any Committee deliberations that may relate to UAS privacy; the suit was largely dismissed on procedural grounds and is currently on appeal. *EPIC v. Drone Advisory Committee*,

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The Congressional Research Service has said it would be reasonable to interpret FAA's authority as including UAS privacy matters.⁶⁰

Even though FAA believes it lacks authority to regulate UAS privacy matters, it has recognized that “unique characteristics and capabilities of UAS may pose uncertainties with regard to individual privacy” and acknowledged the public’s “concerns regarding the use of small UAS to collect information about individuals.”⁶¹ FAA’s Privacy Impact Assessment for its proposed “flights over people” rule, which also notes public concerns about UAS surveillance and data collection, provides multiple examples of currently prohibited UAS operations that would now be permitted under the rule.⁶²

FAA has acted to address these concerns “through engagement and collaboration with the public, stakeholders, and other agencies with authority and subject matter expertise in privacy law and policy.”⁶³ For example, FAA participated as an observer in the 2015-2016 NTIA-convened multi-stakeholder process to develop UAS privacy voluntary best practices, discussed in Part E. below. FAA also has emphasized the need for UAS operators to be mindful of privacy matters in its informational and training materials.⁶⁴

In addition, FAA officials told us that in the context of policies and procedures for the federal

369 F. Supp. 3d 27 (D.D.C. 2019), *appeal pending*, No. 19-5238 (D.C. Cir.).

⁵⁹ The American Civil Liberties Union (ACLU) has stated FAA has authority to regulate UAS privacy pursuant to its authority under 49 U.S.C. § 40103(b)(2)(B). As discussed in Appendix I, Part D.1.a., that provision directs FAA to prescribe air traffic regulations for the purpose of “protecting individuals and property on the ground.” The ACLU believes this FAA obligation “should include protecting the privacy that Americans have traditionally enjoyed and rightly expect.” Stanley and Crump, *supra* note 4, at 2.

⁶⁰ See 2013 CRS Drones Report, *supra* note 4, at 22-25 (concluding that if FAA interpreted FMRA as authorizing the agency to regulate UAS-related privacy issues, a court likely would uphold this interpretation as reasonable and thus entitled to judicial deference under *Chevron v. Natural Resources Defense Council*, 467 U.S. 837 (1984)). See also David E. Schaffer, *Is Legislation Needed to Prevent Invasions of Privacy by Unmanned Aircraft? The Law and Some Modest Legislative Proposals*, *The Federal Lawyer* 53, 55 (July 2015) (“The FAA could issue a safety rule for UAS that would have the effect of addressing the privacy issue. For example, it could . . . establish minimum safe altitudes of flight for UAS . . . [which would] have the effect of keeping UAS above a specified level and away from homes and other congested areas. However, it is unclear whether the FAA would take such action without a clear safety justification, especially since it is likely to undermine the business case for the small UAS.”).

⁶¹ 81 Fed. Reg. at 42190; see also 84 Fed. Reg. 3856, 3893 (Feb. 13, 2019).

⁶² FAA’s proposed flights-over-people rule would authorize routine UAS flights over individuals not participating in the UAS operation. 84 Fed. Reg. 3856 (Feb. 13, 2019). FAA’s Privacy Impact Assessment for the proposal includes a “not exhaustive” list of 17 UAS uses that “could occur under this proposed framework without first clearing people from the area.” DOT and FAA, *Privacy Impact Assessment, Small Unmanned Aircraft Systems Over People, Notice of Proposed Rulemaking*, March 2019 (2019 FAA Privacy Impact Assessment) at 2-3, available at <https://www.regulations.gov/document?D=FAA-2018-1087-0068> (last visited Sept. 1, 2020).

⁶³ 81 Fed. Reg. at 42190.

⁶⁴ See, e.g., FAA, *Getting Started*, available at https://www.faa.gov/uas/getting_started/ (last visited Sept. 1, 2020) (“Drone Safety Tips: . . . Respect privacy”); 2019 FAA Privacy Impact Assessment, *supra* note 62, at 2 (noting FAA has added information about the 2016 UAS Privacy Voluntary Best Practices (discussed in Part E. below) to its Part 107 training course and guidance materials for new UAS remote pilots).

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government's own use of drones,⁶⁵ as well as DOT's policies for protecting personal information privacy as required by the Privacy Act and other statutes,⁶⁶ FAA has included privacy-related terms and conditions in its agreements with Lead Participants in DOT's UAS Integration Pilot Program (IPP), discussed in Appendix I, Part B.2.b., and in agreements with Lead Participants in its UAS Test Site Program.⁶⁷ In issuing the final Part 107 rule, FAA also cited its "broad contracting authority" in 49 U.S.C. § 106(l)(6), which it said "allows the Administrator to enter into contracts under 'such terms and conditions as the Administrator may consider appropriate,'" as enabling it to require privacy-related terms in its UAS Test Site agreements. This general contracting authority contrasts with the agency's rulemaking authority, FAA said, which "is specifically tied to its critical safety mission."⁶⁸

Finally, with respect to individuals who believe they have suffered a UAS-related invasion of their personal privacy, FAA has noted that "certain federal, state, local, and common law protections of individual privacy . . . exist. Such protections may provide recourse for any potential invasion of privacy that might result from third party use of a UAS."⁶⁹ According to FAA, such state and local privacy protections generally would not be subject to federal regulation and thus would not be federally preempted.⁷⁰ We discuss federal laws that may protect personal privacy from civil UAS operations in Part C.1. above and C.3. below, and discuss examples of such state, local, and common law privacy laws in Part D. below.

⁶⁵ Section 1 of the 2015 UAS Privacy Presidential Memorandum, *supra* note 11, specifies tenets for federal agencies in protecting the privacy of UAS-collected data, ensuring civil rights and civil liberties protections, and ensuring accountability and transparency to the public about their UAS operations.

⁶⁶ See DOT Order 1351.18, *Privacy Risk Management Policy*, Sections 18.4.8.5, 18.4.8.6 (Contracts), available at <https://www.transportation.gov/sites/dot.gov/files/docs/DOT%20Order%201351.18%20Privacy%20Risk%20Management%20Policy.pdf> (last visited Sept. 1, 2020).

⁶⁷ FMRA section 332(c) directed FAA to establish six UAS test sites to research certification and operational requirements to integrate UAS into the national airspace system. FAA selected six public-entity test sites in December 2013, which became operational in 2014. See generally GAO, *Unmanned Aircraft Systems: FAA Could Better Leverage Test Site Program to Advance Drone Integration*, GAO-20-97 (Washington, DC: Jan. 9, 2020); *Unmanned Aerial Systems: Status of Test Sites and International Developments*, GAO-15-486T (Washington, DC: March 24, 2015). FAA required test site participants (located in Alaska, Nevada, New York, North Dakota, Texas, and Virginia) to comply with all federal, state, and other laws protecting an individual's right to privacy; to have publicly available privacy policies and a written plan for the use and retention of any UAS-recorded data; and to conduct annual reviews of their privacy practices including an opportunity for public comment. See FAA, *UAS Test Site Program, Notice of Availability of Final Privacy Requirements for UAS Test Site Program*, 78 Fed. Reg. 68360 (Nov. 14, 2013). The privacy policies of a number of the test site participants are available at <https://www.ntia.gov/other-publication/2016/multistakeholder-process-unmanned-aircraft-systems> (last visited Sept. 1, 2020). (see "Privacy Policies for FAA Test Sites").

⁶⁸ 81 Fed. Reg. at 42191 (Part 107 rule).

⁶⁹ 2019 FAA Privacy Impact Assessment, *supra* note 62, at 2; see also 81 Fed. Reg. at 42192 (Part 107 final rule) (same).

⁷⁰ FAA Office of the Chief Counsel, *State and Local Regulation of Unmanned Aircraft Systems (UAS) Fact Sheet* (Dec. 17, 2015) (2015 FAA UAS Fact Sheet) at 3, available at https://www.faa.gov/uas/resources/policy_library/media/UAS_Fact_Sheet_Final.pdf (last visited Sept. 1, 2020); FAA, *Federal vs. Local Drone Authority* (July 20, 2018) (2018 FAA UAS Press Release), available at https://www.faa.gov/news/press_releases/news_story.cfm?newsId=22938&omniRss=press_releasesAoc&cid=102_P_RPress (last visited Sept. 1, 2020).

3. FTC Authority and Actions to Date

The Federal Trade Commission is the federal entity primarily responsible for protecting consumers' privacy and data security in the United States. In addition to its authorities under statutes pertaining to specific types of entities and personal data (none specific to UAS), FTC has broad authority under section 5(a)(1) of the Federal Trade Commission Act⁷¹ to protect individuals from “unfair or deceptive acts or practices in or affecting commerce.”⁷² Although the FTC Act is not a privacy statute *per se*, the Commission has successfully used its section 5 “unfairness” authority against, for example, companies that enabled exposure of videos or photographs of consumers taken or made accessible without their knowledge.⁷³ FTC officials told us the Commission could use section 5 in this same way against a business that transmits photographs or other personal data using a UAS.

FTC also has used its section 5 authority to protect the privacy of individuals' personal information where companies commit to following specific data privacy policies but then fail to abide by those commitments.⁷⁴ Congress confirmed FTC's authority to use its section 5 authority in this manner with respect to UAS-collected personal information in section 375 of the 2018 FAA Reauthorization Act. Section 375 states that a “violation of a privacy policy by a person that uses a UAS for compensation or hire, or in furtherance of a business enterprise, in the national airspace system shall be an unfair and deceptive practice in violation of section 5(a) of the Federal Trade Commission Act”⁷⁵ Thus, FTC officials told us, if a UAS operator tells the public it will protect their UAS-collected personal information (e.g., photographs, video, or other personal data) in a certain way but then fails to comply with that commitment, this might violate section 5 as an “unfair” or “deceptive” practice and FTC could take enforcement action.

The FTC officials told us the data privacy policies contained in the UAS Voluntary Best Practices, discussed in Part E. below, could potentially be used in this way. Even though the UAS Voluntary Best Practices are not legally binding in themselves, once a commercial UAS operator or other business announces it is abiding by them, FTC can enforce *that* promise, the officials explained. Enforcing a promise to comply with the UAS Voluntary Best Practices might

⁷¹ 15 U.S.C. § 45(a)(1).

⁷² An act or practice is “unfair” under the FTC Act if it “causes or is likely to cause substantial injury to consumers which is not reasonably avoidable by consumers themselves and not outweighed by countervailing benefits to consumers or to competition.” 15 U.S.C. § 45(n). An act or practice is “deceptive,” according to FTC, if there is a representation, omission, or practice that is likely to mislead the consumer acting reasonably in the circumstances, to the consumer's detriment. FTC, *Policy Statement on Deception* (Oct. 14, 1983), available at https://www.ftc.gov/system/files/documents/public_statements/410531/831014deceptionstmt.pdf (last visited Sept. 1, 2020). See generally GAO-19-52, *supra* note 47, at 9-12.

⁷³ See *In the Matter of TRENDnet, Inc.*, Complaint and Decision and Order, FTC No. C-4426, Jan. 16, 2014 (involving third-party access to live audio and video feeds of private interactions captured through Internet-connected home security cameras); *In the Matter of Designerware, LLC*, Complaint and Decision and Order, FTC No. C-4390, April 11, 2013 (involving third-party access to photographs of private interactions captured through webcams of leased computers).

⁷⁴ See generally FTC, *FTC's Use of Its Authorities to Protect Consumer Privacy and Security*, June 19, 2020, at 2-4, available at <https://www.ftc.gov/system/files/documents/reports/reports-response-senate-appropriations-committee-report-116-111-ftcs-use-its-authorities-resources/p065404reportprivacydatasecurity.pdf> (last visited Sept. 1, 2020); GAO-19-52, *supra* note 47, at 9-12.

⁷⁵ 2018 FAA Reauthorization Act, *supra* note 1, § 375, 132 Stat. at 3314.

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be difficult, however, the officials acknowledged, because the Practices include a number of exceptions and caveats. The officials also told us FTC has not yet filed a UAS data privacy enforcement action, and one legal commentator has observed that “[m]ost citizens . . . can’t successfully call the [FTC] and get any help with a problem of a drone collecting personal data.”⁷⁶

FTC’s ability to protect the privacy of UAS-collected personal data might increase if Congress enacts comprehensive data privacy legislation. In that event, the FTC Chairman has testified, the Commission would benefit from receiving traditional “notice-and-comment” rulemaking authority⁷⁷ to implement the substantive privacy standards that Congress establishes.⁷⁸ Relatedly, in 2018, FTC staff commented that the Commission would be the appropriate agency to enforce any new consumer data privacy protections. The staff stated that the Commission is “uniquely situated to balance consumers’ interests in privacy, innovation, and competition” and noted it has used its existing section 5 authority to enforce against, among others, those who “intrude on the sanctity of people’s homes . . . by spying on people”⁷⁹

Until such time as federal data privacy legislation may be enacted, FTC has sought to promote debate and engagement among stakeholders and the public on UAS privacy matters. In October 2016, for example, the Commission convened a workshop to explore issues such as whether drones raise unique privacy concerns and what legal frameworks should be used to address privacy concerns raised by drones.⁸⁰ We discuss the positions expressed at that workshop by UAS industry representatives, privacy advocates, and others, several of whom we spoke with, in Part F. below.

D. State and Local Laws That May Protect UAS-Related Personal Privacy

Some states have used their general privacy laws or common law causes of action not specific to UAS to protect against UAS-related privacy harms. Other states have enacted UAS-specific privacy laws. Still other states appear to have no privacy laws that would clearly apply to the kinds of activities that can be conducted by UAS.⁸¹ We discuss below examples of general

⁷⁶ Kellington, *supra* note 44, at 678.

⁷⁷ Rather than having authority to issue regulations implementing its FTC Act authority using the traditional notice-and-comment rulemaking process under section 553 of the Administrative Procedure Act, 5 U.S.C. § 553, FTC generally must use a more elaborate process established by the Magnuson-Moss Warranty Act amendments to the Act. FTC may use the APA § 553 process only where specifically authorized by Congress, such as by the Children’s Online Privacy Protection Act (COPPA). See [GAO-19-52](#), *supra* note 47, at 11-13.

⁷⁸ Prepared Remarks of FTC Chairman Joseph J. Simons, *Hearing on Oversight of the Federal Trade Commission: Strengthening Protections for American’s Privacy and Data Security*, House Committee on Energy and Commerce, Subcommittee on Consumer Protection and Commerce, May 8, 2019, at 2-3.

⁷⁹ Comments of FTC Staff, *In re Developing the Administration’s Approach to Consumer Privacy*, NTIA Docket No. 180821780-8780-01 (Nov. 9, 2018), at 9, 11.

⁸⁰ See *generally* Agenda for FTC Fall Technology Series: Drones (Oct. 13, 2016), available at https://www.ftc.gov/system/files/documents/public_events/942753/falltech-series-drones_agenda.pdf (last visited Sept. 1, 2020).

⁸¹ See Memorandum to the Uniform Law Commission from Paul M. Kurtz, Chair, Mark Glaser, Vice Chair, Robert A. Heverly, Reporter, Uniform Tort Law Relating to Drones Act Drafting Committee, June 10, 2019, at 4. See *also* Wells C. Bennett, *Civilian Drones, Privacy, and the Federal-State Balance* (Brookings Inst. Sept. 2014) at 3-7.

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state privacy laws and common law private causes of action that have or, according to stakeholders and legal commentators, may potentially be used to address UAS-related privacy concerns. We then discuss examples of UAS-specific privacy laws that states and localities have enacted.

1. State and Local General Privacy Laws

a. Criminal “Peeping Tom” Laws

One type of general privacy law that some states have sought to use to address UAS privacy concerns is a criminal “Peeping Tom” law. Depending on the specific law, it protects an individual’s physical privacy and may also protect their personal data privacy. As of 2010 (the most recent year for which information was available), almost all states had enacted some version of this type of law, generally prohibiting the intentional viewing and/or recording of physically private areas of a person under certain circumstances.⁸² Some of these laws are called “Peeping Tom” laws; others have names such as “video voyeurism,” “unlawful surveillance,” “indecent viewing,” and “criminal invasion of privacy.” One legal commentator has noted that because these laws require the defendant to have intended to view or record private aspects about the surveilled person, it may be difficult to prove a drone operator violated the law if he could not see what he was viewing or recording until after the flight concluded.⁸³

An example of such a practical difficulty is a local New York case, *People v. Beesmer*.⁸⁴ cited to us by a UAS industry stakeholder. That case involved an individual who flew his drone close to the outside windows of a hospital’s examination rooms. In what is said to be the first prosecution of a drone operator for unlawful surveillance, authorities charged him with misdemeanor attempted unlawful surveillance in the second degree. The state law under which he was charged prohibited an individual from “*intentionally* us[ing] . . . an imaging device to surreptitiously view, broadcast, or record a person dressing or undressing or the . . . intimate parts of [a] person at a place and time when such person has a reasonable expectation of privacy, without such person’s knowledge or consent.”⁸⁵ The UAS operator argued he could not have intended to view persons inside the building because its windows were treated to prevent outsiders from looking in, and he was found not guilty.

Different facts produced a different result in another case cited to us by stakeholders, *Utah v. Foote*.⁸⁶ In *Foote*, a UAS operator who flew close to multiple persons’ homes and filmed inside was apprehended by police. He was charged with two misdemeanors—“voyeurism by electronic equipment concealed or disguised” and attempts of the same conduct. At the time, the law prohibited an individual from “*intentionally* us[ing] a . . . photographic camera of any type, or other equipment that is concealed or disguised to secretly or surreptitiously videotape, film, photograph, record, or view by electronic means” any part of a person’s body as to which

⁸² See Nat’l Dist. Attorneys Ass’n, *NDAA Voyeurism Compilation* (July 2010), available at <https://ndaa.org/wp-content/uploads/Voyeurism-2010.pdf> (last visited Sept. 1, 2020).

⁸³ Hillary B. Farber, *Keep Out! The Efficacy of Trespass, Nuisance, and Privacy Torts as Applied to Drones*, 33 Ga. L. Rev. 359, 373 (2017).

⁸⁴ *People v. Beesmer*, No. 14070635 (Town of Ulster, N.Y. Crim. Dist. Ct. 2015).

⁸⁵ New York Penal Law § 110/250.45 (emphasis added).

⁸⁶ *Utah v. Foote*, No. 171300054 (Spanish Fork, UT Crim. Dist. Ct. 2017).

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they have “a reasonable expectation of privacy” without the person’s knowledge or consent.⁸⁷ Stakeholders told us the UAS operator pleaded no contest to one count of attempted voyeurism and was ordered to pay a \$500 fine and serve a one-year term of probation.

b. State Common Law Privacy Torts

A second type of general state law protection that may provide recourse for UAS-related invasions of privacy are common law privacy torts. As noted, since Brandeis and Warren’s 1890 *Right to Privacy* article, courts have recognized four basic torts to address different types of invasion of privacy, now adopted in the Restatement (Second) of Torts. The two torts most commonly cited by legal commentators as potentially relevant to UAS privacy are intrusion upon seclusion and public disclosure of private facts, which we discuss below.⁸⁸ As detailed below, because some elements of these torts may be difficult to prove in the UAS context, some legal commentators have suggested they may provide little practical relief,⁸⁹ while others are more optimistic.⁹⁰

(i) Intrusion Upon Seclusion (Restatement (Second) of Torts § 652B)

The basic elements of the tort of intrusion upon seclusion are: (1) a person intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another person or his private affairs; and (2) the intrusion would be highly offensive to a reasonable person.⁹¹ There is no requirement that the “intruder” take photographs or collect other personal data or that any data collected be made public. This is a tort that protects a person’s “pure” physical privacy and, if personal information about them is captured, their personal data privacy as well. As the California Supreme Court explained in *Shulman v. Group W Productions, Inc.*, this tort “is perhaps the one that best captures the common understanding of an ‘invasion of privacy.’ . . . It is . . . that invasion of privacy [that] is most clearly seen as an affront to individual dignity.”⁹²

As a practical matter, many intrusion upon seclusion cases turn on where the surveilled person was located and whether they had a “reasonable expectation of privacy” in that setting.⁹³ Courts generally have interpreted the “solitude or seclusion” requirement to mean a person must be in a private rather than a public setting. Physically intruding into someone’s home, using binoculars or a camera or peering through a window to see into the home, or using

⁸⁷ Utah Code Ann. § 76-9-702.7 (emphasis added). This law has since been amended.

⁸⁸ See, e.g., 2013 CRS Drones Report, *supra* note 4, at 14; Farber, *supra* note 83, at 396; John Villasenor, *Observations From Above: Unmanned Aircraft Systems and Privacy*, 36 Harv. J.L. & Pub. Pol’y 457, 500-01 (2013); Benjamin D. Mathews, *Potential Tort Liability for Personal Use of Drone Aircraft*, 46 St. Mary’s L.J. 573, 586-88 (2015); Schaffer, *supra* note 60, at 55.

⁸⁹ See, e.g., Farber, *supra* note 83, at 402; Calo, *supra* note 4, at 31.

⁹⁰ See, e.g., Villasenor, *supra* note 88, at 500-03. See also Testimony of John Villasenor before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Aviation Operations, Safety, and Security, March 24, 2015 (same).

⁹¹ Restatement (Second) of Torts § 652B.

⁹² *Shulman*, *supra* note 33, 955 P.2d at 489.

⁹³ See 2013 CRS Drones Report, *supra* note 4, at 15 and cases cited therein; Farber, *supra* note 83, at 397, 399 and cases cited therein.

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mechanical aids or eavesdropping to hear conversations inside a home, typically suffices.⁹⁴ By contrast, a person in public is generally not deemed to be in seclusion because his appearance is “public and open to the public eye.”⁹⁵ Even parts of a person’s private property, including the outside of the house, may be deemed public if they can be seen from a public vantage point such as the street or a neighboring property.⁹⁶

Moreover, proving an intrusion in public was intentional rather than inadvertent may be challenging. The intruder must be shown either to have desired the intrusion to occur or knew with substantial certainty it would result from his actions.⁹⁷ Even in a public setting, however, there may be matters about a person that are protected because they are not subject to “the public gaze,”⁹⁸ and some settings have been deemed secluded from the public at large even though the person may be seen or heard by others.⁹⁹ Finally, to prove the intrusion would be “highly offensive to a reasonable person,” courts look to whether the intrusion would offend the “ordinary reasonable man,” rather than someone with extraordinary sensibilities; whether that ordinary person would “strongly object”¹⁰⁰; and whether the intrusive conduct was repugnant or “outrageously unreasonable,”¹⁰¹ with a single incident sometimes but not usually being sufficient.¹⁰²

The involvement of the press or other legitimate information gatherers might affect whether a court finds liability. In *Shulman*, the California Supreme Court held “the media enjoy some degree of *favorable* treatment under the California intrusion tort.”¹⁰³ Among other things, the

⁹⁴ Restatement (Second) of Torts § 652B cmt. b; 2013 CRS Drones Report, *supra* note 4, at 15 and cases cited therein; Farber, *supra* note 83, at 397-98 and cases cited therein.

⁹⁵ Restatement (Second) of Torts § 652B cmt. c. See 2013 CRS Drones Report, *supra* note 4, at 15-16 (citing cases involving individuals photographed in a race track winner’s circle, on line at an airport, in combat, and walking on a public sidewalk, as well as the recording of vehicle license plate numbers in a public parking lot); Farber, *supra* note 83, at 400 and cases cited therein.

⁹⁶ 2013 CRS Drones Report, *supra* note 4, at 16 and cases cited therein; Farber, *supra* note 83, at 397, 400-01 and cases therein.

⁹⁷ 2013 CRS Drones Report, *supra* note 4, at 14-15 and cases cited therein; Farber, *supra* note 83, at 396-97 and cases therein.

⁹⁸ Restatement (Second) of Torts § 652B cmt. c (giving the often-cited example of a woman in an amusement park fun house whose skirt is blown over her head, revealing her underwear, based on *Daily Times Democrat v. Graham*, 12 So. 2d 474 (Ala. 1964)).

⁹⁹ See, e.g. *Shulman*, *supra* note 33; *Huskey v National Broadcasting Co., Inc.*, 632 F. Supp. 1282, 187-88 (N.D. Ill. 1986) (denying motion to dismiss prisoner’s suit against television crew that filmed him in prison exercise yard; “the mere fact a person can be seen by others does not mean that person cannot legally be ‘secluded.’ Indeed, one paradigm case of the tort is the Peeping Tom (see Restatement § 652B comment b, illustration 2). Further, Huskey’s visibility to some people does not strip him of the right to remain secluded from others.”).

¹⁰⁰ Restatement (Second) of Torts § 652B cmt. d.

¹⁰¹ Farber, *supra* note 83, at 398-99 and cases cited therein; 2013 CRS Drones Report, *supra* note 4, at 14-15 and cases cited therein.

¹⁰² *Id.*; Restatement (Second) of Torts § 652B cmt. d. See, e.g., *Miller v. National Broadcasting Co.*, 232 Cal. Rptr. 668 (Cal. Ct. App. 1986) (single instance of filming man in his home while being resuscitated after heart seizure held sufficient).

¹⁰³ *Shulman*, *supra* note 33, 955 P.2d at 495 (emphasis in original).

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court held a television crew’s intrusions into the privacy of a car accident victim at the scene and inside a medical evacuation helicopter may or may not be found “highly offensive” as a matter of law; the “motives or justification of the intruder” (the film crew) must be considered in making that determination, the court found.¹⁰⁴ Although the court acknowledged that the First Amendment does not “immunize the press” from liability for committing torts (such as trespassing) or crimes (such as wiretapping) in gathering the news, it concluded that “strong societal interest in effective and complete reporting of events” reflected in the First Amendment “may—as a matter of tort law—justify an intrusion that would otherwise be considered offensive.”¹⁰⁵

How these common law tort elements would apply in the UAS context remains to be seen and will be highly fact-dependent. With respect to cases involving UAS operations at or near one’s home, one legal commentator has stated that just as proving drone aerial trespass may be difficult because many states have adopted the “substantial interference with the use and enjoyment of property” test (as discussed in Appendix II)—which may make it relatively easy for drone operators to capture images inside and outside the home without “trespassing”¹⁰⁶—proving intrusion upon seclusion also may be difficult because of the need to prove intent to intrude. A court might find intent based on drone-captured images of a person inside their home, the commentator stated, assuming the person was not in public view or visible from neighboring property.¹⁰⁷ A court also might find intent if the drone was hovering outside a residential window, another legal commentator has observed,¹⁰⁸ although even this may not be dispositive.¹⁰⁹ But “if the drone flies over someone’s fenced-in backyard and records him,” according to the first commentator, “the tort may offer no relief” because the person might be deemed to be in public view.¹¹⁰

With respect to cases involving UAS operations away from the home, proving UAS intrusion upon seclusion might be even more challenging because as noted, persons in public settings are generally not deemed to be in solitude or seclusion. As one legal commentator observed, “[FAA] rules impede the use of drones for now; United States privacy law does not. . . . Citizens do not generally enjoy a reasonable expectation of privacy in public, nor even in the portions of

¹⁰⁴ *Shulman*, *supra* note 33, 955 P.2d at 493.

¹⁰⁵ *Shulman*, *supra* note 33, 955 P.2d at 493-95, citing *Cohen v. Cowles Media* and *Dietemann*, *supra* note 41, and *Branzburg*, *supra* note 36.

¹⁰⁶ Farber, *supra* note 83, at 383-84, 402.

¹⁰⁷ Farber, *supra* note 83, at 402. See also 2015 CRS Drones Privacy Report, *supra* note 4, at 16 (using drone to peer inside home using camera or extra-sensory technology likely would be found to be intrusion upon seclusion).

¹⁰⁸ Villasenor, *supra* note 88, at 501-03 (“The potential of a UAS to intrude upon seclusion in the home is obvious. A person who is unwillingly photographed in his or her own home by a UAS hovering just outside an otherwise inaccessible window would have strong grounds for a valid cause of action, . . . [However] courts will be very unlikely to consider a fleeting, accidental capture of imagery of a home’s curtilage or (through a window) interior acquired by a passing UAS to be an invasion of privacy.”).

¹⁰⁹ A UAS operator hovering close to a high-rise residence window in Seattle explained he was an aerial photographer taking photographs of nearby property for new construction and had no intention of using his UAS to look inside the apartment. See Farber, *supra* note 83, at 385, n. 207, citing Christina Sterbenz, *Should We Freak Out About Drones Looking in Our Windows?*, *Bus. Insider* (Sept. 24, 2014), <https://www.businessinsider.com/privacy-issues-with-commercial-drones-2014-9> (last visited Sept. 1, 2020).

¹¹⁰ Farber, *supra* note 83, at 402.

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their property visible from a public vantage.”¹¹¹ Another legal commentator observed that proving intent to intrude by recreational drone users could be difficult because they may “capture images inadvertently. Thus a question for juries, and eventually lawmakers, will be whether the intentional act of flying a drone is sufficient to give rise to a claim of intrusion upon seclusion”¹¹² However, another legal commentator observed that “[a]lthough privacy expectations are greatly reduced outside the home, the non-governmental use of a UAS to capture images and other information taken while the individual is in a public setting could nevertheless constitute an invasion of privacy.”¹¹³

Finally, in cases involving UAS operations in both public and private settings, Fourth Amendment protections might come into play, according to legal commentators. The Supreme Court’s Fourth Amendment aerial surveillance precedents, if applied in the privacy tort context, suggest that the more common it becomes to have drones operating in the national airspace, the more difficult it will be to bring an intrusion upon seclusion claim. As noted, the Supreme Court has held that for Fourth Amendment search-and-seizure purposes, there is no reasonable expectation of privacy in backyards and other fenced-in areas where those areas can be seen from above by the common technology of planes and helicopters.¹¹⁴

This same reasoning might be applied to government searches by drone as drones become more common, one legal commentator has stated—and a court might then apply the same reasoning to a private actor in an intrusion upon seclusion case, given the common borrowing of Fourth Amendment case law in determining privacy expectations for common law torts.¹¹⁵ Yet according to the commentator, drones in fact warrant more, not less, legal privacy protection because of their greater technological capabilities to capture images, geo-location data, and other personal information. “A reasonable person does not expect to be under constant surveillance within and outside their home,” according to the commentator,¹¹⁶ echoing a similar statement by U.S. Supreme Court Justice Sotomayor.¹¹⁷

¹¹¹ Calo, *supra* note 4, at 31. See also 2015 CRS Drones Privacy Report, *supra* note 4, at 16-17 (likelihood of successfully claiming intrusion upon seclusion of individual in a public space or private space visible from public vantage point is “significantly diminished.”).

¹¹² Mathews, *supra* note 88, at 587.

¹¹³ Villasenor, *supra* note 88, at 501.

¹¹⁴ See cases cited at *supra* note 4.

¹¹⁵ See, e.g., Veronica E. McKnight, *Drone Technology and the Fourth Amendment: Aerial Surveillance Precedent and Kyllo Do Not Account for Current Technology*, 51 Calif. Western L. Rev. 263, 282 (May 2015). See also Farber, *supra* note 83, at 399 (courts’ determinations of what constitutes a reasonable expectation of privacy change over time and are significantly affected by technology); Chris Schlag, *The New Privacy Battle: How the Expanding Use of Drones Continues to Erode Our Concept of Privacy and Privacy Rights*, 13 U. Pitt. J. Tech. L. & Pol’y 1, 21-22 (2013) (“Absent some baseline mechanism for control, drone use may become so commonplace that it dissolves current privacy expectations to the degree that individuals will have no reasonable expectation to privacy.”).

¹¹⁶ McKnight, *supra* note 115, at 289.

¹¹⁷ McKnight, *supra* note 115, at 288 (quoting public remarks by Justice Sotomayor, who observed, “There are drones flying over the air randomly that are recording everything that’s happening on what we consider our private property. That type of technology has to stimulate us to think about what is it that we cherish in privacy and how far we want to protect it and from whom.”) (citation omitted)).

(ii) Public Disclosure of Private Facts (Restatement (Second) of Torts § 652D)

The tort of public disclosure of private facts, also known as publicity given to private life, also might provide a common law remedy for UAS-related invasions of privacy, according to legal commentators. This is a tort that protects an individual's personal data privacy. The basic elements are: (1) a person gives publicity to a matter concerning the private life of another person; (2) the matter is of a kind that would be highly offensive to a reasonable person; and (3) the matter is not of legitimate public concern.¹¹⁸ When the publicized matter *is* of legitimate public concern, there is no liability for this tort and First Amendment rights also might be implicated.

The “publicity” requirement means the matter must be communicated not just to one person or a small group but to the public at large or to so many persons that it is substantially certain to become public knowledge.¹¹⁹ The “private facts” or “private life” requirement excludes information that is already public. This means what a person exposes to “the public eye,” such as their personal appearance or the outside of their house, likely would not be deemed private.¹²⁰

The requirement that the publicity would be “highly offensive to a reasonable person” means only “unreasonable publicity” that would make a reasonable person feel “highly aggrieved,” not just “moderate[ly] annoyed,” is actionable. As the Restatement explains, “[c]omplete privacy does not exist in this world except in a desert, and anyone who is not a hermit must expect and endure the ordinary incidents of the community life of which he is a part.”¹²¹ Thus homeowners whose home and swimming pool were photographed from their private roadway by Google’s Street View program, with the photographs posted online, lost a suit against Google for public disclosure of private facts because the court found “[n]o person of ordinary sensibilities would be shamed, humiliated, or have suffered mentally as a result of a vehicle entering into his or her un gated driveway and photographing the view from there.”¹²²

The requirement that the publicized matter not be of “legitimate public concern” has traditionally excluded matters regarded as “news” in accordance with social norms of publishers and the community, as well as excluding other information and facts “for purposes of education, amusement, or enlightenment, when the public may reasonably may be expected to have a legitimate interest in what is published.”¹²³

As with intrusion upon seclusion, it remains to be seen how these elements of public disclosure of private facts would apply in the UAS context—for example, to a drone operator who captures photographs or videos, sound recordings, or other potentially “private” facts about a person and posts that information on social media or publishes it in traditional news outlets. Some of the

¹¹⁸ Restatement (Second) of Torts § 652D.

¹¹⁹ Restatement (Second) of Torts § 652D cmt. a.

¹²⁰ Restatement (Second) of Torts § 652D cmt. b.

¹²¹ Restatement (Second) of Torts § 652D cmt. c.

¹²² *Boring v. Google, Inc.*, 362 Fed. Appx. 273 (3d Cir. 2010). The court also denied the homeowners’ claims for intrusion upon seclusion, negligence, and unjust enrichment, but granted their claim for trespass.

¹²³ Restatement (Second) of Torts § 652D cmt. g, j.

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same challenges to recovery may arise as with the intrusion tort, such as whether the drone-surveilled person had already made some of their “private facts” (e.g., their appearance) public by being in a public setting or a setting viewable from a public vantage point.

As several legal commentators have noted, publicizing drone-collected information recorded in public is “unlikely to result in successful claims. . . [T]he paramount question becomes whether the plaintiff was in a place where one should reasonably expect to have privacy.”¹²⁴ Publicizing the contents of drone-recorded conversations, by contrast, might be actionable.¹²⁵ And while the court in the Google Street View case noted above held that online posting of photos of the homeowners’ house and pool would not be highly offensive to a reasonable person, some legal commentators have pointed out that drones’ enhanced video capabilities may capture far more intrusive and “private” images which, if publicized, could be actionable.¹²⁶

Finally, as with intrusion upon seclusion, First and Fourth Amendment protections might come into play. As noted, according to legal commentators, Fourth Amendment aerial surveillance case law suggests it might become more difficult to bring a public disclosure of private facts claim as the number of drones operating in the national airspace increases—a court might find it has become less “reasonable” to expect privacy in certain settings. Also as noted, however, at least one legal commentator has stated that *greater* legal privacy protections are needed when drones are involved because of their greater technological capabilities.

First Amendment protections also might make it difficult to bring a public disclosure suit involving UAS-collected private facts. Challenges could arise if the facts are of legitimate public concern and their publication is protected by First Amendment’s rights of freedom of speech and/or freedom of the press. As a law firm stakeholder we spoke to explained in comments filed on behalf of the News Media Coalition:

“[R]obust, extensive and well-established state privacy laws [including intrusion upon seclusion and public disclosure of private facts] already protect privacy. These laws will apply to UAS photography as they do other forms of conduct, while, at the same time, they will safeguard the public’s right to receive information and journalists’ First Amendment rights to report the news. . . . State laws . . . safeguard the First Amendment rights of journalists to gather the news, and the public’s right to receive the news, by firmly protecting visual journalism in public places. Federal and state courts applying these state laws have thus developed a robust body of case law balancing the right to privacy against the constitutional protections for the free press.”¹²⁷

¹²⁴ See, e.g., Mathews, *supra* note 88, at 587-90.

¹²⁵ Bennett, *supra* note 81, at 5 (“Simply filming a private conversation from a drone probably won’t tee up a publication of private facts claim, absent some effort on the snooper’s part to disseminate the conversation’s contents; a quick fly-by, even when paired with video filming, probably won’t rise to the level of an intrusion upon seclusion, either. A more sustained look might be a different story.”).

¹²⁶ Farber, *supra* note 83, at 405 (capabilities of drones are “potentially more intrusive and nefarious” than Google Street View technology); Villasenor, *supra* note 88, at 504 (“Images acquired by UAS could easily convey facts not previously known to the public, and, upon publication, could be an actionable invasion of privacy in many states.”).

¹²⁷ Comments submitted on behalf of the News Media Coalition by Holland & Knight LLP to NTIA, April 20, 2015, at 3-4, 6. These comments were submitted in connection with the NTIA-convened UAS best practices multi-stakeholder process discussed in Part E. below,

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One legal commentator, however, has suggested that because of drones' enhanced capabilities to capture "private" facts, private individuals who become involuntarily caught up in newsworthy events might nonetheless be able to sue for invasion of privacy if images of those persons are publicized. "While news organizations are well aware of the tension between the privacy rights of their subjects and their organizations' First Amendment rights to gather news, they will almost certainly need to reexamine existing policies in light of the unique imaging and other information gathering capabilities (such as monitoring of wireless signals) of UAS," the commentator stated. "In addition, given the ease with which anyone—not only news organizations—can now publish content, all users of UAS who contemplate publishing aerial images or other information from UAS would be well advised to give careful consideration to the common law and statutory invasion of privacy frameworks that apply in their jurisdictions."¹²⁸

c. State Statutory Personal Privacy Laws (California Anti-Paparazzi Law)

A third type of general privacy law relevant to UAS-related invasions of privacy is illustrated by California's so-called anti-paparazzi statute, Cal. Civ. Code § 1708.8, cited to us by UAS industry and state and local government stakeholders. This law protects both physical privacy and personal data privacy. The law creates a private cause of action, broader in some respects than the common law privacy torts discussed above, where there is either a "physical" or "constructive" invasion of privacy for the purpose of photographing or otherwise recording a person engaging in "private, personal, or familial activity."

Although the law does not explicitly include the use of drones, it has been amended specifically to ensure it applies to invasion of privacy by drones. The legislative history of a 2015 amendment to the statute explains that while the law's "constructive invasion" provision likely already covered the use of drones,¹²⁹ the California legislature wanted to ensure the "physical invasion" tort also applied to drones. Citing the U.S. Supreme Court's *United States v. Causby* decision, discussed in Appendices I and II, for the principle that landowners have property rights in the airspace above their property, the drafters included a reference to trespass "into the airspace above the land of another person"¹³⁰ (aerial trespass) in addition to the law's existing reference to traditional trespass "onto [another person's] land."¹³¹

¹²⁸ Villasenor, *supra* note 88, at 504-05.

¹²⁹ "Constructive invasion of privacy" is committed by those who attempt to capture, "in a manner that is offensive to a reasonable person, any type of visual image, sound recording, or other physical impression of the [person] engaging in a private, personal, or familial activity, *through the use of any device*, regardless of whether there is a physical trespass" Cal. Civ. Code § 1708.8(b) (emphasis added),

¹³⁰ See Bill Analysis re: Invasion of Privacy, A.B. 856, Calif. Senate Judiciary Committee, 2015-2016 Regular Session, at pp. E-F ("This extension of the paparazzi law is consistent with existing . . . property law. . . '[I]f the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere.' *US v. Causby*, 328 US 256 (1946). . . . This bill would expand the conditions under which a person commits a physical invasion of privacy to include instances where the tortfeasor enters into the airspace above the land . . . in order to capture images, recordings, or other physical impressions of a person . . . This expansion would include using unmanned aerial vehicles or drones above the property of another to capture this information data, which, because of their inherent maneuverability, can glide effortlessly above fences and walls meant to exclude others.").

¹³¹ "Physical invasion of privacy" now covers those who "knowingly enter[] onto the land *or into the airspace above the land* of another person without permission or otherwise commits a trespass in order to capture any type of visual image, sound recording, or other physical impression of the [person] engaging in a private, personal, or familial activity and the invasion occurs in a manner that is offensive to a reasonable person." Cal. Civ. Code § 1708.8(a) (emphasis added).

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d. State Statutory Personal Information Privacy Laws (California Consumer Privacy Act)

A final type of general state law potentially relevant to UAS privacy—the California Consumer Privacy Act (CCPA)¹³²—protects an individual’s personal data privacy. Some legal commentators have called the CCPA, enacted in 2018, arguably the most expansive consumer privacy legislation in U.S. history.¹³³ Some stakeholders we spoke with believe the law is drafted sufficiently broadly that it may protect UAS-collected personal information.¹³⁴ The law protects California residents’ “personal information,” defined broadly as “information that identifies, relates to, describes, is capable of being associated with, or could reasonably be linked, directly or indirectly, with a particular resident or household” and includes biometric information (such as faces) and “[a]udio, electronic, visual, [and] thermal . . . or similar information.”¹³⁵

The law took effect on January 1, 2020 and became enforceable by the California Attorney General on July 1, 2020. It imposes a number of obligations on entities doing significant business in California that “collect” residents’ personal information, including by purchase, rental, receipt, access, or other means. Covered businesses must disclose to residents what categories and specific pieces of personal information it is collecting about them and whether that information is being sold or disclosed and to whom; stop selling personal information if requested; allow residents to delete personal information that businesses have collected about them; and provide non-discriminatory service and prices to residents even if they exercise these rights under the law.¹³⁶ Commentators have suggested covered businesses may decide to extend these protections to consumers beyond California for customer relations or other reasons.¹³⁷ Whether the CCPA will protect the privacy of UAS-collected personal information, and whether it will be preempted in the event Congress enacts federal consumer data privacy legislation, remains to be seen.

2. State and Local UAS-Specific Privacy Laws

a. Enacted State and Local UAS-Specific Privacy Laws

As detailed in Appendix IV, at least 46 states had enacted or issued some type of UAS-specific law, resolution, or executive order as of the end of 2019. Based on our analysis, it appears the

¹³² Stats. 2018, ch. 55 (A.B. 375), § 3, codified at Cal. Civ. Code §§ 1798.100 *et seq.*

¹³³ See, e.g., Purvi G. Patel, Nathan D. Taylor, Alexandra E. Laks, *Expert Q&A: The California Consumer Privacy Act of 2018*, 2018 WL 3341493 (Oct. 2, 2018).

¹³⁴ See generally Cynthia Larose, Laura Stefani, Jonathan Markman, and Elana R. Safner, *A New California Privacy Law Could Change Everything for Drone Operators in the U.S.* (Jan. 2, 2020), available at <https://dronelife.com/2020/01/02/a-new-california-privacy-law-could-change-everything-for-drone-operators-in-the-u-s/> (last visited Sept. 1, 2020).

¹³⁵ Cal. Civ. Code § 1798.140(o)(1)(h).

¹³⁶ Stats. 2018, ch. 55 (A.B. 375), § 2.

¹³⁷ Patel *et al.*, *supra* note 133.

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laws in at least 26 of these states addressed privacy matters.¹³⁸ Florida, for example, has authorized private suits to prohibit the use of drones equipped with an imaging device, by any person, state agency, or political subdivision, to record an image of private property or the owner or others legally on the property in violation of the surveilled person’s “reasonable expectation of privacy.” The law then broadly defines that term as where the person cannot be observed by others at ground level in a place where they have a legal right to be, *regardless* of whether they could be seen from the air by a drone, which provides more protection than Fourth Amendment case law.¹³⁹

Arkansas’s statute provides another example. It criminalizes the use of drones (and other devices) to commit voyeurism and video voyeurism in certain locations or under certain circumstances where persons have a reasonable expectation of privacy.¹⁴⁰ Louisiana has amended its existing privacy laws (voyeurism, video voyeurism, and a Peeping Tom law) to add drones as another method by which these crimes may be committed.¹⁴¹

In addition to states, some localities have enacted UAS-specific privacy laws as well. As noted in Appendix I, for example, Stone Harbor, New Jersey passed a series of UAS ordinances in 2019 which, among other things, prohibit taking photographs, video, or audio with a UAS where persons have “a reasonable expectation of privacy.”¹⁴²

No stakeholders we spoke with were aware of instances in which state or local UAS-specific privacy laws had yet been enforced in a particular case.

b. Uniform Law Commission Draft Model Drone Privacy Act

As discussed in Appendix II, in anticipation of increased drone operations as UAS integration into the national airspace system progresses, the Uniform Law Commission’s Uniform Tort Law Relating to Drones Act Drafting Committee began work in late 2017 to draft a model act that would create liability rules specific to UAS operations that states nationwide could enact. While the Drafting Committee’s efforts have focused on drafting a model drone aerial trespass act, as discussed in Appendix II, the Committee also has worked to draft a model drone privacy act.

The Committee initially considered proposing a UAS-specific version of the intrusion upon seclusion privacy tort discussed above. The Committee then drafted a privacy law similar to California’s anti-paparazzi statute. As discussed above, that law authorizes private suits for “physical” and “constructive” invasions of privacy—including aerial trespass—if the invasion of privacy was for the purpose of photographing or otherwise recording a person engaging in

¹³⁸ Based on our analysis of data compiled by the National Conference of State Legislatures, as of 2019, the 26 states whose UAS-specific laws addressed privacy matters were Alaska, Arkansas, California, Colorado, Delaware, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Mississippi, Montana, North Carolina, Oregon, New Jersey, South Dakota, Tennessee, Texas, Utah, Virginia, and Wisconsin.

¹³⁹ Fla. Stat. §§ 934.50(3)(b), (5)(b). As noted above, *see supra* note 4, the Supreme Court has ruled there is no Fourth Amendment reasonable expectation of privacy from the government either in a persons’ backyard or on other private property where someone flying in a plane or helicopter can see activity on the ground.

¹⁴⁰ Ark. Code §§ 5-16-101(b), 5-16-102(b).

¹⁴¹ La. Stat. Ann. §§ 14:283, 14:283.1, 14:284.

¹⁴² Stone Harbor, N.J., Code § 405-15.

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“private, personal, or familial activity.” The Committee’s draft law also incorporated the Florida drone privacy act’s broad definition of where a person has a “reasonable expectation of privacy”; as noted above, Florida has defined this to include where the person cannot be observed by others at ground level in a place where they have a legal right to be, regardless of whether they could be seen by drone from the air.

Subsequent Committee drafts and discussions addressed the First and Fourth Amendment issues discussed above; created a “safe harbor” defense where protected personal data is deleted; considered whether to protect privacy when drones use cameras to view persons in real time or only when they both view and record photos or other information about a person; and adopted alternative approaches for states with and without existing privacy laws.

Ultimately, because of major differences nationwide in the privacy interests that states currently protect and how they protect them, the Committee determined it was inappropriate to propose enactment of a substantive uniform UAS privacy act at this time. Instead, it decided to propose a law simply affirming that a state’s existing privacy laws, if any and whatever their content, apply to actions taken by drones.¹⁴³ The Committee believed this approach would avoid the possibility of introducing duplicative or conflicting provisions in those states with existing privacy laws potentially applicable to drones. It also would be technology-neutral: if it would be a violation of privacy rights under a state’s law to observe a person through their bedroom window using a camera with a telephoto lens, for example, the Committee explained, observing that person using an UAS hovering outside the window would likewise be a violation of privacy rights.

As discussed in Appendix II, however, the Committee’s final draft drone tort law, including both these privacy provisions and the aerial trespass provisions, was withdrawn from consideration at the Commission’s July 2019 annual meeting and the Commission has suspended the Committee’s work as of January 2020.

E. “Voluntary Best Practices” Protecting UAS-Collected Personal Information (NTIA-Convened Multi-Stakeholder Process)

As noted above, in February 2015, the President issued a Presidential Memorandum announcing the federal government was taking steps to ensure that UAS integration into the national airspace system accounts for UAS-related privacy concerns, among other things. One of those steps was the President’s direction to the National Telecommunications and Information Administration (NTIA) to convene a multi-stakeholder engagement process “to develop and communicate best practices for privacy, accountability, and transparency issues” for non-government UAS operations.¹⁴⁴

In commencing this process in March 2015, NTIA noted that UAS “can enable aerial data collection that is more sustained, pervasive, and invasive than manned flight; at the same time, UAS flights can reduce costs, provide novel services, and promote economic growth. These attributes create opportunities for innovation, but also pose privacy challenges regarding

¹⁴³ See National Conference of Commissioners on Uniform State Laws, Annual Meeting Draft, Uniform Tort Law Relating to Drones Act, June 2019, Sec. 8 (“Unmanned Aircraft and Violations of Privacy. “An unmanned aircraft is an instrumentality by which a tort in violation of privacy rights may be committed under federal or state law.”).

¹⁴⁴ 2015 UAS Privacy Presidential Memorandum, *supra* note 11.

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collection, use, retention, and dissemination of data collected by UAS.”¹⁴⁵ NTIA therefore requested public comment on, among other things, whether commercial UAS operations create unique or heightened privacy issues compared to non-UAS platforms performing the same services and how UAS privacy risks can be mitigated. Comments were submitted by about 50 organizations and individuals,¹⁴⁶ after which NTIA convened a series of meetings in 2015 and 2016 to provide a forum for discussion and consensus-building. In addition to industry and organizational stakeholders, officials from FAA and FTC participated as observers.

The process concluded in May 2016, producing a set of voluntary best practices entitled, *Voluntary Best Practices for UAS Privacy, Transparency, and Accountability: Consensus, Stakeholder-Drafted Best Practices Created in the NTIA-Convened Multistakeholder Process* (UAS Voluntary Best Practices).¹⁴⁷ Twenty-one UAS industry, news media, and other organizations then indicated their support of these UAS Voluntary Best Practices in concept.¹⁴⁸ The UAS Voluntary Best Practices state that they are intended to set forth actions that “UAS operators could take to advance UAS privacy, transparency, and accountability for the private and commercial use of UAS.” They are self-regulatory, not legally binding, and “[i]n some cases, . . . are meant to go beyond existing law” The UAS Voluntary Best Practices “do not—and are not meant to—create a legal standard of care by which the activities of any particular UAS operator should be judged.” In addition, they are “not intended to serve as a template for future statutory or regulatory obligations, in part because doing so would make these standards mandatory . . . and could therefore raise First Amendment concerns.”

The UAS Voluntary Best Practices apply to “covered data” collected by commercial and recreational UAS operators, defined as “information collected by a UAS that identifies a particular person. If data collected by UAS likely will not be linked to an individual’s name or other personally identifiable information, or if the data is altered so that a specific person is not recognizable, it is not covered data.”¹⁴⁹

In general, the UAS Voluntary Best Practices state that UAS operators should:

¹⁴⁵ 80 Fed. Reg. 11978, 11979 (March 5, 2015).

¹⁴⁶ Comments were submitted by, among others, recreational and commercial UAS users, a large UAS manufacturer, individual UAS operator/users including Amazon, a UAS technology company, news organizations, academics and academic institutions, civil rights, civil liberties, privacy and civil liberties groups including the Future of Privacy Forum and the Center for Democracy and Technology, the real estate, insurance, and utility industries, air mapping and airspace management companies, an amusement park association, agricultural associations, geographic information system companies, and the motion picture industry. The comments are available at <https://www.ntia.doc.gov/federal-register-notice/2015/comments-privacy-transparency-and-accountability-regarding-commercial-a> (last visited Sept. 1, 2020).

¹⁴⁷ *Voluntary Best Practices for UAS Privacy, Transparency, and Accountability: Consensus, Stakeholder-Drafted Best Practices Created in the NTIA-Convened Multistakeholder Process* (2016) (UAS Voluntary Best Practices), available at https://www.ntia.gov/files/ntia/publications/uas_privacy_best_practices_6-21-16.pdf (last visited Sept. 1, 2020). See generally NTIA, *Finding Common Ground on UAS* (May 19, 2016), available at <https://www.ntia.doc.gov/blog/2016/finding-common-ground-uas> (last visited Sept. 1, 2020).

¹⁴⁸ The 21 entities included individual UAS operators, users, and manufacturers (e.g., Amazon, X (formerly Google X), and PrecisionHawk), news organizations, the U.S. Chamber of Commerce, software and technology groups and companies, small-UAS users, a privacy group (Future of Privacy Forum) and an Internet-focused civil liberties group (Center for Democracy and Technology).

¹⁴⁹ UAS Voluntary Best Practices, *supra* note 147, at 2, 4.

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- avoid using UAS “for the specific purpose of intentionally collecting covered data where the operator knows [the person] has a reasonable expectation of privacy,” unless there is a “compelling need to do otherwise”;
- make a “reasonable effort to minimize” UAS operations over or within private property without landowner consent and “appropriate legal authority,” unless this would impede the purpose for which the UAS is used or conflict with FAA guidelines;
- make reasonable efforts, where practicable, to give advance notice to potentially affected individuals of the general time and place where UAS operations may “intentionally” collect covered data;
- provide a publicly available privacy policy, where covered data collection is anticipated, that includes, as practicable, the purposes of data collection, the kinds of data to be collected, any data retention and de-identification practices, examples of any entities with whom the data will be shared, how to file a complaint, and how responses will be made to law enforcement requests for collected data;
- make a “reasonable effort to avoid knowingly retaining covered data longer than reasonably necessary”; and
- limit the use and sharing of data; secure collected data; and monitor and comply with evolving federal, state, and local UAS laws.¹⁵⁰

The UAS Voluntary Best Practices do not apply to news organizations and other newsgatherers because their activities “are strongly protected by United States law, including the First Amendment to the Constitution.” Instead, these entities “should operate under the ethics rules and standards of their organization and according to existing federal and state laws.”¹⁵¹

The UAS Voluntary Best Practices do apply to both recreational and commercial UAS operators (other than news gathering organizations), and the Practices include a short reference guide, “Guidelines for Neighborly Drone Use,” for recreational users. Among other things, the Guidelines explain that “[p]rivacy is hard to define but it is important. There is a balance between your rights as a drone user and other people’s rights to privacy. That balance isn’t easy to find.” The Guidelines then provide a list of “do’s and don’ts,” including the admonition that “[i]f you think someone has a reasonable expectation of privacy, don’t violate that privacy by taking pictures, video, or otherwise gathering sensitive data, unless you’ve got a very good reason.”¹⁵²

Several UAS stakeholders told us that developing best practices rather than enacting binding legislation was appropriate at the time they were drafted given the nascent stage of UAS technology and their view that binding laws can stifle innovation. Once platforms and business models have matured, policymakers can legislate wisely based on actual experience, they said. On the other hand, a privacy group stakeholder we spoke to and a civil liberties group, who both participated in the NTIA multi-stakeholder process, have said they did not sign on as supporters to the final UAS Voluntary Best Practices because were not legally enforceable and industry

¹⁵⁰ UAS Voluntary Best Practices, *supra* note 147, at 5-6. Several of these types of features have been included in legislation introduced in recent Congresses. See, e.g., Drone Aircraft Privacy and Transparency Act of 2017, S. 631 and H.R. 1526, 115th Cong. (2017); Drone Aircraft Privacy and Transparency Act of 2015, H.R. 1229, 114th Cong. (2015); Drone Aircraft Privacy and Transparency Act of 2013, H.R. 1262, 113th Cong. (2013). Some of these features also are similar to restrictions now imposed on federal agencies’ use of drones by the 2015 UAS Privacy Presidential Memorandum that mandated the NTIA multi-stakeholder process.

¹⁵¹ UAS Voluntary Best Practices, *supra* note 147, at 7.

¹⁵² UAS Voluntary Best Practices, *supra* note 147, at 8.

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should be willing to commit to basic privacy principles rather than making vague and non-binding statements.

As discussed in Part C.3., however, although the UAS Voluntary Best Practices are not legally binding and do not create legal standards of care by which UAS operator actions can be judged, FTC officials told us that once a company announces it is abiding by one or more of the Voluntary Best Practices (or any code of conduct or binding or non-binding rules or practices), failure to comply could be an “unfair” or “deceptive” trade practice which FTC could enforce under section 5 of the FTC Act. The officials said FTC’s use of the Voluntary Best Practices in this way was discussed during the multi-stakeholder drafting process. The officials also indicated their understanding that companies are generally adhering to the Voluntary Best Practices today.

F. Stakeholder Issues and Positions

FAA,¹⁵³ NTIA,¹⁵⁴ and FTC¹⁵⁵ have characterized the ongoing debate about UAS privacy as involving three key issues:

- whether UAS pose novel privacy concerns or instead are simply a new technology raising the same concerns as other technologies;
- whether UAS privacy concerns are adequately addressed under existing law or instead warrant additional, possibly UAS-specific privacy laws; and
- how UAS privacy concerns should be further addressed.

We discuss below the general range of positions on these matters expressed by stakeholders we spoke to and others who have addressed these issues.

1. Stakeholder Positions on Whether UAS Operations Raise Novel Privacy Concerns

a. Federal Agency Statements

Agency officials we spoke with at FAA, NTIA, and FTC, each of which agencies have taken actions to address UAS privacy, did not express formal views on any of the above issues. The agencies have previously noted that UAS have characteristics that may raise privacy concerns:

FAA, in issuing its proposed fights-over-people rule in February 2019, “acknowledge[d that] unique characteristics and capabilities of UAS may pose uncertainties with regard to individual privacy. . . . [T]hese concerns are generally related to technology and equipment, which may be installed on an unmanned (or manned) aircraft, but are unrelated to the safe operation of the aircraft.”¹⁵⁶

NTIA, in convening the 2015-2016 Presidentially-mandated multi-stakeholder engagement

¹⁵³ 81 Fed. Reg. at 42190 (Part 107 final rule); 84 Fed. Reg. at 3893 (proposed flights-over-people rule).

¹⁵⁴ 80 Fed. Reg. 11978, 11979 (March 5, 2015) (NTIA request for comment regarding UAS privacy multi-stakeholder process).

¹⁵⁵ Agenda, FTC UAS Privacy Workshop, Oct. 13, 2016, *supra* note 80.

¹⁵⁶ 84 Fed. Reg. at 3893; *see supra* note 153.

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process that resulted in the UAS Voluntary Best Practices discussed above, stated that “UAS can enable aerial data collection that is more sustained, pervasive, and invasive than manned flight . . . These attributes . . . pose privacy challenges regarding collection, use, retention, and dissemination of data collected by UAS.”¹⁵⁷

Then-FTC Commissioner Ohlhausen, in remarks at FTC’s October 2016 UAS privacy workshop, noted that new technologies often have impacts on privacy and that part of society’s adaptation to these new technologies and their privacy impacts can be changes in law, policy, and social norms. As an example of such legal changes, the Commissioner noted that the invention of portable cameras and instantaneous photography prompted the writing of Brandeis and Warren’s 1890 *Right to Privacy* law review article. This, in turn, ultimately led to development of the common law privacy torts and criminal Peeping Tom laws that remain an important part of today’s legal framework protecting personal privacy. Commissioner Ohlhausen commented that concerns about UAS privacy are likewise not surprising, “given that drones can be used as flying platforms for sensors, including cameras.” It remains to be seen what all of the potential benefits of UAS are, what unique privacy concerns they may raise, and what the resulting consumer protection issues might be, she said.¹⁵⁸

b. Other Stakeholder Positions

A number of UAS stakeholders we spoke to, as well as news organizations, academic stakeholders, and others, have stated that UAS have characteristics that can raise privacy concerns. The characteristics cited most often are UAS’s small size and maneuverability—what an academic stakeholder has called their “locational capability”¹⁵⁹—and their capacity to carry sophisticated recording and sensing equipment—what a UAS manufacturer stakeholder has called their “robust data collection capability.”¹⁶⁰ The UAS Voluntary Best Practices, supported in concept by 21 companies and organizations, acknowledge that these traits can raise privacy concerns.¹⁶¹ A UAS manufacturer stakeholder we spoke to, several privacy groups, and several academics also have identified the typical “remoteness” of the drone operator—the fact that the operator is usually in a location remote from, and therefore is unseen by, those the drone is flying over and potentially collecting data about—as a unique privacy risk because the identity of the pilot and the purposes of the flight are unknown.

Stakeholders have expressed differing views, however, on whether UAS operations raise

¹⁵⁷ 80 Fed. Reg. at 11979; see *supra* note 154.

¹⁵⁸ Remarks of FTC Commissioner Ohlhausen, FTC Fall Technology Series: Drones, Oct. 13, 2016 (2016 FTC UAS Privacy Workshop), Segment 1, Transcript available at https://www.ftc.gov/system/files/documents/videos/ftc-fall-technology-series-drones-part-1/ftc_fall_technology_series_drones_-_transcript_segment_1.pdf (last visited Sept. 1, 2020).

¹⁵⁹ Remarks of Gregory McNeal, Professor of Law and Public Policy, Pepperdine University School of Law and Co-Founder, AirMap, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁶⁰ Remarks of Kara Calvert, Director, Drone Manufacturers Alliance, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158. See also Ravich, *supra* note 10, 42 N. Ky. L. Rev. at 162 (“Fundamentally, then, [UAS] are aerial platforms on which to deploy the latest and most sophisticated hardware and software information-gathering gadgets.”).

¹⁶¹ The Voluntary Best Practices state that “the very characteristics that make UAS so promising for commercial and non-commercial uses including their small size, maneuverability and capacity to carry various kinds of recording or sensory devices, can raise privacy concerns.” UAS Voluntary Best Practices, *supra* note 147, at 2.

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unique privacy concerns. On the one hand, stakeholders from the UAS industry and elsewhere have stated UAS privacy concerns are not unique, at least with respect to their information collection capabilities, because they are just one of many platforms equipped with cameras and sensors that have the potential to collect data and information. One UAS manufacturer stakeholder we spoke to, for example, has noted that aerial imagery such as that conducted by drones is not new: airplanes have been flying for over a century, satellites provide overhead imagery at high resolution that can be publicly accessed such as on Google Maps, and other companies such as Bing Maps provide even higher resolution aerial imagery captured by manned aircraft from a “Bird’s Eye” view. The UAS privacy debate therefore should start not with devising legal solutions or best practices to address possible problems, but with identifying what actual problems, if any, have been created by technologies and practices unique to UAS, the stakeholder said.¹⁶²

Similarly, an academic stakeholder has questioned whether there are harms uniquely attributable to UAS as opposed to other technologies, suggesting there is no difference between a GoPro camera held in one’s hand and the same camera affixed to a drone one inch above that in the air. Restricting one but not the other leads to “the slippery slope of privacy law . . . [And] the path of privacy law protections eventually leads to a conflict with the First Amendment, my right to freely associate; my right to freely gather information, not just for journalists and news gathering organizations, but for any person who wants to engage in that protected speech, of which photography is a protected form of speech,” the stakeholder said.¹⁶³

A privacy stakeholder we spoke to also has noted the many capabilities of equipment added as a payload on a drone—“[d]rones may be best understood as an aerial platform that will offer a wide variety of different services,” the stakeholder said—and cited some of their novel applications.¹⁶⁴ Nonetheless, the stakeholder emphasized that although “[i]ndividually, these sensor capabilities will collect a lot of information, . . . privacy concerns will only arise” based on the combination of sensors on board the drone (*e.g.*, whether the drone will be able to record images as well as live-view) and how the collected data will be allowed to be used.¹⁶⁵ On a related note, two UAS trade association stakeholders we spoke to have stated that UAS privacy discussions are often driven by hypotheticals and hyperbole and that UAS privacy issues are like those raised by other technologies such as cameras on mobile devices. “In

¹⁶² Remarks of Brendan Schulman, Vice President of Policy & Legal Affairs, DJI Technology, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁶³ Remarks of Gregory McNeal, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158. We discuss the potential impact on UAS operations of the First Amendment, freedom of speech, and rights to take photographs and gather news and other information in Part B. above. Similarly, another legal commentator has said that while drones have the capability “to obliterate traditional notions of privacy, trespass, and government searches,” the appropriate reaction is not to enact “reactionary laws that completely squelch innovation and allowable uses” but rather to determine whether “[e]xisting Fourth Amendment and privacy protections may be sufficient” Ravich, *supra* note 10, 42 N. Ky. L. Rev. at 189-90.

¹⁶⁴ Comments of Future of Privacy Forum, April 20, 2015, NTIA-Convended UAS Privacy Multi-Stakeholder Process, at 4-5. These applications included providing a simultaneous array of different audio-visual sensors, broadcasting equipment, and connective functionality by use of high-powered zoom camera lenses; advanced imaging capabilities such as night vision, infrared, ultraviolet, and thermal imaging; radar technologies; video analytics technologies; biometric recognition capabilities; and the ability to connect to personal devices on the ground.

¹⁶⁵ *Id.*

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fact,” one of these stakeholders has said, “with sensors of all kinds getting smaller and cheaper, all sorts of data will be transmitted from unlikely places.”¹⁶⁶

Finally, a UAS manufacturer stakeholder has said UAS privacy is “really about behavior”¹⁶⁷ and as an example, another UAS manufacturer stakeholder has said persistent surveillance by a drone is a “societal problem we have to deal with without regard to which technology” is involved.¹⁶⁸ An entity that “misbehave[s]” in how it uses UAS-collected personal data or in how it commits to using it but then violate[s] that commitment is not different from other technology users that misbehave in the same ways, the first UAS manufacturer stakeholder said.¹⁶⁹ And UAS operator and trade association stakeholders we spoke to and a news coalition, citing Brandeis and Warren’s 1890 *Right to Privacy* essay that formed the basis for modern privacy tort law, stated that just as Brandeis, Warren, and the public initially decried the use of the newly invented portable camera to invade personal privacy, yet the public has now embraced this technology, the same evolution will occur with drones as the public becomes accustomed to them and appreciates their many benefits.

On the other hand, privacy group stakeholders we spoke to, academics, and other legal commentators have said UAS do raise unique privacy concerns—what one privacy group has referred to in the law enforcement context as “the perfect storm for surveillance concerns”¹⁷⁰ and others have characterized as UAS-enabled “spying.”¹⁷¹ These concerns stem from drones’ unique combination of small size (and thus their unobtrusiveness and ability to maneuver in small spaces), their mobility through the airspace including being able to hover in place, and their virtually universal use of some type of digital camera, live video-streaming capability, or sensory-enhancing technology—what one legal commentator has described as a “platform for enabling surveillance.”¹⁷²

Another legal commentator has attributed drones’ “unique” privacy risks to the increasing number of drones operated by not only by the government but by private actors, due in part from their relatively low cost.¹⁷³ A civil liberties group has said “UAS are far more than flying

¹⁶⁶ Comments of Small UAV Coalition, April 20 2015, NTIA-Convened UAS Privacy Multi-Stakeholder Process, at 4.

¹⁶⁷ Remarks of Kara Calvert, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁶⁸ Remarks of Brendan Schulman, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁶⁹ Remarks of Kara Calvert, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁷⁰ Electronic Frontier Foundation, *The Civil Rights and Privacy Implications of Government Use of Drones*, Presentation at DOJ Unmanned Aircraft Systems Convening, in DOJ Office of Justice Programs, Institute of Justice, *Considerations and Recommendations for Implementing an Unmanned Aircraft System Program*, Report NCJ 250283 (Dec. 2016) at 77, 81.

¹⁷¹ Melissa Barbee, *Uncharted Territory: The FAA and the Regulation of Privacy Via Rulemaking for Domestic Drones*, 66 Admin. L. Rev. 463, 475, 478 (Spring 2014). See also Katy McLaughlin, *The Spies From Above*, Wall Street Journal, June 21, 2019.

¹⁷² Farber, *supra* note 83, at 370.

¹⁷³ Bennett, *supra* note 81, at 6 (“Two core assumptions inform modern drone policy: drones will allow for more aerial surveillance than other airborne platforms have to date, and more drones will soon find their way into more private hands. If these postulates prove even partially true, then drones are unique.”).

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cameras,” emphasizing their “technologically unique nature.”¹⁷⁴ “[M]any are enabled with movement, light, or temperature sensors, some are Internet-connected, and others carry and deliver supplies. . . . UAS are capable of going places manned aircraft cannot (such as between narrow buildings) and operating in environments that humans cannot (such as during high-g tactical maneuvers, high altitudes, and long times aloft). UAS, like manned aircraft, have unique vantage points allowing for levels of surveillance that ground-based individuals may not expect,” the group has said.¹⁷⁵ As a result, rules or guidance should be developed identifying the types of locations where individuals have a reasonable expectation of privacy—within their homes and potentially other locations on their private property—so appropriate steps can be taken to protect their privacy, according to this group.

According to a privacy group stakeholder we spoke to and a group of academic stakeholders, the types of unique privacy problems UAS can pose are more likely to arise with commercial rather than recreational UAS operations. Commercial UAS are typically equipped with cameras and other sensors capable of collecting personal information and may collect more information than consumers might imagine, they said. As the privacy group stakeholder said, “if you know anything about tech companies, they like to . . . collect information. So it’s not out of the realm of possibility that the technology used to navigate the airspace . . . will also be used to collect information about the environment and the public below.”¹⁷⁶

For example, the academic stakeholders group noted, in the case of a delivery drone equipped with a recording camera, a consumer can reasonably foresee the UAS would acquire and store their address. However, they explained, “[i]t is one thing for a delivery UAS to know where you live, and another entirely for the delivery UAS to record and store data on what bathrobe you were wearing each time you open your door to collect a package. . . . And while layering on facial recognition technology could theoretically be valuable to the delivery service—recognizing the intended recipient before completing delivery could cut down on stolen or missing packages, for example—that, too, adds a level of privacy concern that is unforeseeable when considering delivery UAS in the abstract.”¹⁷⁷

Another novel aspect of UAS operations raising personal data privacy concerns, one of these academic stakeholders has noted—at least as distinguished from personal data an individual provides with nominal consent to online businesses—is that UAS-collected personal data are typically collected without consent and often even without the individual’s knowledge that data are being collected.¹⁷⁸

¹⁷⁴ Comments of Center for Democracy & Technology, April 20 2015, NTIA-Convened UAS Privacy Multi-Stakeholder Process, at 1.

¹⁷⁵ Comments of Center for Democracy & Technology, *supra* note 174, at 2.

¹⁷⁶ Remarks of Jeramie D. Scott, Director, Electronic Privacy Information Center (EPIC) Domestic Surveillance Project, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁷⁷ Comments of Assistant Professor Margot E. Kaminski, Amie Stepanovich, and Nabiha Syed, undated, NTIA-Convened UAS Privacy Multi-Stakeholder Process, at 5.

¹⁷⁸ Remarks of Margot E. Kaminski, Assistant Professor of Law, Moritz College of Law, The Ohio State University, at 2016 FTC UAS Privacy Workshop, Segment 2, Transcript available at https://www.ftc.gov/system/files/documents/videos/ftc-fall-technology-series-drones-part-2/ftc_fall_technology_series_drones_-_transcript_segment_2.pdf (last visited Sept. 1, 2020).

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In addition, a technology public policy stakeholder has questioned the view that images captured by drones are no different than images captured by Google and other commercial entities using cars, planes, and satellites. The stakeholder explained, “[o]f course, drones are different: they are *not* simply better [Google] Street View cameras. They *do* raise new concerns: unlike Street View cameras, which merely automate, systemize and preserve what anyone could already see from public streets, drones can observe us from completely new angles—and, potentially, from much closer distance, depending on how low they are allowed to fly. Certainly, drones can observe us in a level of detail that is far more granular than what satellites could do—and probably also more than what manned aerial systems could do. How private actors use such UAS creates legitimate grounds for concern—above and beyond what government might do with them”¹⁷⁹

Finally, a privacy stakeholder we spoke to has questioned the position that the public will become accustomed to drones and embrace this new technology as it did with portable cameras a century ago, after Brandeis and Warren declared their use an invasion of privacy. The stakeholder said the public has not, in fact, grown accustomed to cameras as a technology *per se*; it has grown accustomed to the use of cameras in settings where there is no reasonable expectation of privacy. This distinction is illustrated by a Supreme Court decision that use of a different technology, GPS, can violate the Fourth Amendment.¹⁸⁰ The Court ruled that even though use of GPS is embraced in many settings, its use violated a defendant’s reasonable expectation of privacy in a different setting. Brandeis and Warren’s fundamental point—that technology can be used in ways that unacceptably invade personal privacy—therefore remains valid today, the stakeholder said.¹⁸¹

2. Stakeholder Positions on Whether UAS Privacy Issues Are Adequately Addressed Under Existing Law

On the one hand, stakeholders that have indicated UAS generally do not raise novel privacy concerns also have generally indicated that any UAS privacy concerns are adequately addressed by existing privacy laws. They do not believe there is a gap that needs to be filled to protect UAS privacy because there are strong frameworks of robust, extensive, and well-established state laws that protect personal privacy. These frameworks, the stakeholders state, have developed over decades of lawmaking and reasoned judicial decision-making to encompass and address each new form of technology. In particular, these stakeholders have said the current state-law legal framework is sufficient by citing the common law torts of intrusion upon seclusion and public disclosure of private facts, Peeping Tom laws, and laws against trespass (including California’s anti-paparazzi law), nuisance, electronic eavesdropping and wiretaps, stalking, and harassment.¹⁸²

For example, one UAS stakeholder cited the *People v. Beesmer* case, discussed in Part D.1.a. above, as illustrating how existing technology-neutral Peeping Tom laws have been

¹⁷⁹ Comments of Tech Freedom, April 20 2015, NTIA-Convened UAS Privacy Multi-Stakeholder Process, at 3 (emphasis in original).

¹⁸⁰ The referenced Supreme Court decision is *United States v. Jones*, *supra* note 4.

¹⁸¹ Remarks of Jeramie D. Scott, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁸² We discuss intrusion upon seclusion, public disclosure of private facts, Peeping Tom laws, and the California anti-paparazzi law in Part D. above. We discuss trespass and aerial trespass laws in Appendix II.

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successfully applied to address UAS privacy concerns. He noted the UAS operator in that case was acquitted of attempted unlawful surveillance (requiring intent to surveil) because the medical exam room windows he was accused of trying to peer into had been treated to prevent outsiders from looking in. Thus existing state privacy laws will apply to UAS photography and other UAS-based activities just as they do other forms of conduct, the stakeholders have said, protecting people where they have a “reasonable expectation of privacy” while safeguarding, among other things, the public’s right to receive information and journalists’ First Amendment rights to gather and report the news.

On the other hand, stakeholders that have indicated UAS do raise novel privacy concerns also have generally concluded that these concerns are not adequately addressed under existing law.¹⁸³ For example, in response to the view that existing common law privacy torts, Peeping Tom laws, and other privacy laws will provide recourse for any UAS-related privacy concerns, an academic stakeholder has stated there are “legal vacuums” in those laws.¹⁸⁴ Peeping Tom laws, for example, often have a trespass requirement and it is not always clear whether aerial trespass by a drone would meet that requirement, the stakeholder said. Those laws also often require the voyeur himself to look into windows, and it is not clear whether a drone looking into a window using a telephoto camera lens, for instance, would meet that requirement.

In addition, as discussed in Part D. above, legal commentators have noted additional reasons why Peeping Tom laws and the common law privacy torts may not address at least some UAS privacy concerns. The “intent to surveil” requirement in virtually all criminal Peeping Tom laws may not be met where the drone operator could not see what images were being filmed until the drone lands, for example. The “intent to intrude” and “reasonable expectation of seclusion/privacy” requirements in the intrusion upon seclusion tort also may be difficult to meet when individuals are on their own property but visible from a public vantage point, as well as when they are in a more public setting, legal commentators have said.

Legal commentators also have suggested, as discussed in Part D., that it may become more difficult to prove one has a reasonable expectation of privacy as the number of drones in the airspace increases. Similar challenges could occur in proving the “privacy” of personal facts exposed in a public or publicly viewable setting in a suit for public disclosure of private facts, according to legal commentators, even though drone cameras can often capture far more invasive and “private” images than the naked eye or a hand-held camera.

Finally, the position that drones pose no greater privacy risk than cellphones or other existing technologies and that those technologies’ privacy risks are adequately addressed under existing law also should be “debunk[ed],” an academic stakeholder has said.¹⁸⁵ Current law does not effectively address those other technologies’ privacy risks either, and a “significantly lower ceiling” is needed both for UAS and those technologies. “[Y]ou are having zero

¹⁸³ One legal commentator who has identified shortcomings in current privacy law as applied to UAS nevertheless acknowledges “[i]t is prudent to ask whether existing laws already prohibit the targeted conduct. . . . If taking a photograph of someone without consent can constitute an invasion of privacy, depending on whether an expectation of privacy exists, then why pass a new law that states it is illegal to do that same thing with a drone?” Farber, *supra* note 83, at 379.

¹⁸⁴ Remarks of Margot E. Kaminski, 2016 FTC UAS Privacy Workshop Segment 2, *supra* note 178.

¹⁸⁵ Remarks of Margot E. Kaminski, 2016 FTC UAS Privacy Workshop Segment 2, *supra* note 178.

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regulation in most of these places, as opposed to effective regulation of anyone,” the stakeholder said.¹⁸⁶ Nor can these UAS privacy concerns be adequately addressed by voluntary best practices, this stakeholder and a privacy group stakeholder have stated, at least not the UAS Voluntary Best Practices (discussed in Part E. above). “[N]early every single one of these suggested practices has some sort of exception, including when you’re using drones for a compelling purpose, or when you are using drones for the purpose for which they are being used, or in compliance with FAA guidelines,” the academic stakeholder said.¹⁸⁷

3. Stakeholder Positions on Potential Additional Measures to Protect UAS Privacy

a. Federal and State Legal Authority to Protect UAS Privacy

A threshold question in considering what, if any, additional legal measures should be taken to mitigate UAS privacy concerns is determining which level of government—the federal government or the state and local governments (or both)—has authority to act. As with determining federal versus state and local jurisdiction over UAS operations in low-altitude airspace and property rights in that airspace, as discussed in Appendices I and II, the answer is based in the Constitution. The federal government may protect UAS privacy to the extent it is within its power under the Constitution’s Commerce Clause or another enumerated constitutional power. Otherwise, unless Congress has clearly manifested its intent to preempt state action on matters within its constitutionally assigned powers, states may protect privacy as part of their traditional police powers to protect public health, safety, and welfare. As the Supreme Court has observed, “the protection of a person’s general right to privacy—his right to be let alone by other people—is, like the protection of his property and of his very life, left largely to the law of the individual States.”¹⁸⁸

With respect to Congress’s Commerce Clause authority to regulate UAS-based “pure” invasions of physical privacy—that is, involving no collection of data—as discussed in Appendix I, the courts have broadly interpreted the Commerce Clause and upheld its use to regulate aviation and airspace management. Nevertheless, also as discussed in Appendix I, the courts have found the Commerce Clause cannot be used to regulate purely personal, localized conduct with no material impact on interstate commerce.¹⁸⁹ As the district court observed in *Huerta v. Haughwout* in questioning Congress’s power to regulate low-altitude UAS operations over private property, “[n]o clause in the Constitution vests the federal government with a general police power over all of the air or all objects that leave the ground.”¹⁹⁰

¹⁸⁶ *Id.* This stakeholder also noted that FTC’s ability to protect the privacy of drone-collected personal information might be limited in some cases. Protecting consumer data privacy in the context of the manufacturer and purchaser of a product typically means looking at what privacy commitments the manufacturer provides to the purchaser, such as online commitments, and whether the manufacturer abided by those commitments. Where that product is a drone, however, the privacy concerns are those of a third party—the surveilled person on the ground—not those of the drone purchaser/drone operator, meaning the drone manufacturer’s privacy commitments will not carry over. This has been referred to as the “Internet of Other People’s Things problem,” the stakeholder said.

¹⁸⁷ *Id.*

¹⁸⁸ *Katz v. United States*, *supra* note 27, 389 U.S. at 350 (citing Warren and Brandeis, *The Right to Privacy*, *supra* note 15; other citations omitted).

¹⁸⁹ See Appendix I, Part D.1.a., discussing *United States v. Morrison*, 529 U.S. 598 (2000), and *United States v. Lopez*, 514 U.S. 549 (1995).

¹⁹⁰ *Huerta v. Haughwout*, 2016 WL 3919799 at *4 (D. Conn. 2016), discussed in Appendix I, Part D.1.a.

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Some law firm and privacy group stakeholders we spoke to questioned whether Congress can use its Commerce Clause power to regulate pure UAS physical privacy concerns involving no recording or use of data. A law firm stakeholder suggested Congress might lack a Commerce Clause “hook” to regulate a UAS Peeping Tom, for example, at least where the operator does not record images or other data that might then be distributed in interstate commerce. Similarly, then-FTC Commissioner Ohlhausen said the Commission’s FTC Act section 5 authority likely does not cover UAS Peeping Toms unless there is a connection to commercial activity.¹⁹¹

By contrast, Congress’s Commerce Clause power to regulate UAS data privacy—that is, drones’ collection of personal data and how that data is subsequently used, retained, and disseminated—appears to be undisputed because of the potential for that data to become part of interstate commerce. Indeed, Congress’s authority to regulate UAS data privacy and to preempt state lawmaking in this area appears to have been a working assumption in many UAS privacy discussions, such as the NTIA-convened multi-stakeholder process that focused solely on UAS personal data privacy. Moreover, Congress’s authority to protect personal data privacy in specific sectors or industries is well established; as we have reported, federal laws protect the privacy of personal data used to make credit, insurance, and employment decisions; personal data provided to financial institutions; personal health data; and personal information from children that is collected online, for example.¹⁹²

The Congressional Research Service and an attorney stakeholder we spoke to have suggested Congress could use its Commerce Clause power to address UAS privacy to the same extent this power supports FAA’s regulation of UAS operations generally. They said Congress could, for example, enact a UAS-specific Peeping Tom or video voyeurism law, a UAS-based intrusion upon seclusion law, or a UAS-specific version of California’s anti-paparazzi law.¹⁹³ In

¹⁹¹ At FTC’s 2016 UAS privacy workshop (discussed above), Commissioner Ohlhausen said the Commission’s jurisdiction is “limited to acts or practices in or affecting commerce, [so] probably excludes most cases of individual Peeping Toms” Remarks of FTC Commissioner Ohlhausen, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158. By contrast, as discussed in Part C.3. above, FTC officials told us the Commission would be able to use its section 5 “unfairness or “deception” authority against a business that, for example, transmits photographs or other personal data using a UAS or represents it will protect the privacy of personal data collected by UAS but violates that representation.

¹⁹² See [GAO-19-52](#), *supra* note 47, at 6, 12-13.

¹⁹³ See 2013 CRS Drones Report, *supra* note 4, at 20-22; Schaffer, *supra* note 60, at 55-56 (including possible preemptive effect). We discuss the non-UAS specific versions of these laws in Part D.1. above.

CRS also suggested Congress could use its Commerce Clause power to extend the current federal criminal “video voyeurism”/Peeping Tom statute (discussed in Part 1. above) to include UAS privacy violations occurring in “federal airspace.” See 2013 CRS Drones Report, *supra* note 4, at 20 n. 168 and 21 n. 171 (referencing cases upholding federal aviation legislation under the Commerce Clause). However, we note that this statute, 18 U.S.C. § 1801, which applies only within “the special maritime and territorial jurisdiction of the United States,” appears to have been enacted under the Constitution’s Federal Enclave Clause, not the Commerce Clause.

The Enclave Clause provides that Congress shall have power “[t]o exercise exclusive Legislation in all Cases whatsoever . . . over all Places purchased by the Consent of the Legislature of the State in which the Same shall be” U.S. Const., Art. I, sec. 8, cl. 17. See Video Voyeurism Prevention Act of 2003, H. Rep. No. 108-504, 108th Cong., 2d Sess. (2004); see generally DOJ, *Criminal Resource Manual*, Sec. 664 (Territorial Jurisdiction) and cases cited therein, available at <https://www.justice.gov/jm/criminal-resource-manual-664-territorial-jurisdiction> (last visited Sept. 1, 2020); Emily S. Miller, *The Strongest Defense You’ve Never Heard of: The Constitution’s Federal Enclave Doctrine and its Effect on Litigants, States, and Congress*, 29 Hofstra Labor & Employment L. J. 73 (2011). Federal enclaves include certain military bases, for example, as well as national parks, post offices, and other areas.

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CRS’s view, the Commerce Clause also would support enactment of UAS privacy standards for law enforcement search warrants or regulations regarding the use, retention, or dissemination of UAS-collected data.¹⁹⁴ Other stakeholders told us Congress also might be able to regulate UAS privacy under the Commerce Clause by imposing privacy standards on UAS manufacturers; these standards would then apply indirectly to recreational and commercial UAS operators, they said.

Assuming Congress may regulate UAS personal data privacy, the fact that UAS physical privacy and personal data privacy often go hand-in-hand as noted (because most drones can both live-view and record personal information) may create challenges in developing a comprehensive UAS privacy legal framework involving both the federal government and states and localities. If, for example, UAS physical privacy is regulated by states and localities and UAS personal data privacy is regulated by the federal government—the traditional division of authority noted by most stakeholders we spoke to, as discussed below—which level of government would regulate the initial collection of data, a step that involves both “physical” and “personal data” privacy? If Congress passes legislation addressing both UAS physical privacy (assuming that is within its constitutional powers) and UAS personal data privacy, would that preempt state Peeping Tom laws and common law intrusion upon seclusion and public disclosure of private facts lawsuits? Or state altitude-based or other privacy-based restrictions on drone operations?

Some of these questions were briefly addressed by an academic stakeholder and UAS industry stakeholders at FTC’s 2016 UAS privacy workshop. Responding to a UAS manufacturer stakeholder’s comment that state or local privacy-based UAS laws such as minimum altitude restrictions could “get into a patchwork of laws and regulations that actually could . . . truly hurt the safety implications that the FAA is working so hard to ensure as drones are integrated into the airspace,”¹⁹⁵ an academic stakeholder acknowledged the need to protect safety but suggested states and localities should be not be preempted from enacting privacy-based restrictions at least at very low altitudes.¹⁹⁶ Another UAS industry stakeholder later raised

Congress also may exercise limited police power (e.g., to address trespass) over property it holds in its proprietary capacity using its powers under the Constitution’s Property Clause and Necessary and Proper Clause, U.S. Const. Art. IV, Sec. 3, cl. 2; Art. I, Sec. 8, cl. 18. See DOJ *Criminal Resource Manual*, Sec. 668 (Limited Criminal Jurisdiction Over Property Held Proprietorially) and cases cited therein, available at <https://www.justice.gov/jm/criminal-resource-manual-668-limited-criminal-jurisdiction-over-property-held-proprietorially> (last visited Sept. 1, 2020).

It seems highly uncertain, however, that a court would interpret the Enclave Clause or the Property Clause to mean that all “federal airspace” or “navigable airspace” is a “Place” or “Property.” Among other things, that would appear to give the federal government plenary police power over all activity in all airspace in the United States without regard to whether that activity constitutes interstate commerce or any other activity subject to Congress’s Article I, section 8 enumerated powers. As the district court stated in *Haughwout*, “[n]o clause in the Constitution vests the federal government with a general police power over all of the air” 2016 WL 391799 at *4.

¹⁹⁴ 2015 CRS Drones Privacy Report, *supra* note 4, at 2 (citation omitted).

¹⁹⁵ Remarks of Kara Calvert, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

¹⁹⁶ Remarks of Gregory McNeal, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158 (“[T]hen we start to get into all these questions about airspace which are still somewhat undefined for us. It’s easy at 500 feet to say that local authorities shouldn’t say anything about that. I think it’s actually very hard to say what local authorities can say about two feet above a sidewalk or two feet adjacent to your third-floor window, even if [the drone is] not camera-equipped.”). Professor McNeal later became the Reporter for the Uniform Law Commission’s Tort Law Relating to Drones Act Drafting Committee, which, as discussed in Appendix II, Part A., worked to draft a model drone aerial trespass act until its efforts were suspended in January 2020.

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these issues but questioned state and local jurisdiction over airspace in light of FAA’s possibly exclusive jurisdiction. This stakeholder also said that airspace is to be maintained for the public and that “you don’t have a private right in certain areas within your own private property with airspace.”¹⁹⁷ These questions remain unresolved.

b. Federal versus State Regulatory Roles

Assuming both the federal government and states and localities have authority to regulate both UAS physical and personal data privacy, the next question stakeholders have debated is which level of government is better positioned to do so. As discussed above, states and localities have traditionally regulated physical privacy while the federal government has, to some extent, regulated data privacy. We describe below the positions expressed on these matters by stakeholders we spoke to and legal commentators.

Stakeholders from the UAS industry, state and local governments, and academia viewed UAS physical privacy issues as a matter to be addressed at the state and local level. They noted states’ longstanding primacy and experience in addressing privacy interests, along with property interests, under their traditional police powers (as discussed in Part D. above). In addition to states’ considerable experience in developing these privacy protections, stakeholders told us the inherently “local” nature of personal privacy invasions also makes them more appropriately enforced by states and localities than by the federal government, which would lack the resources to take timely enforcement action.¹⁹⁸

By contrast, those same stakeholders viewed UAS personal data privacy as most appropriately addressed by the federal government, with one state stakeholder expressing reservations about legislating UAS data privacy. Although stakeholders acknowledged there currently is no comprehensive or UAS-specific federal data privacy legislation, they noted the federal

¹⁹⁷ Remarks of Michael Drobac, representing the Small UAV Coalition, 2016 FTC UAS Privacy Workshop Segment 2, *supra* note 178 (“[W]e then get into a question of the state and local regulation, where it becomes really a viable question as to . . . who has jurisdiction here? . . . [W]hat jurisdiction does the FAA have, and is it exclusive? . . . who’s got jurisdiction over the airspace? . . . [T]hat discussion, in many people’s minds, has already been established. . . . Then there’s another question, . . . how far up is this vehicle? Supreme Court jurisdiction is beginning to demonstrate that, in fact, the airspace is maintained for the public, and that you don’t have a private right in certain areas within your own private property with airspace.”).

¹⁹⁸ As discussed in Appendix I regarding enforcement of other types of state and local laws to address UAS concerns, some state and local stakeholders told us it is difficult to enforce their privacy laws against drones because the identity of the operator is usually unknown due to the current lack of a Remote ID requirement. Also as discussed in Appendix I, however, FAA has proposed a Remote ID rule. The proposal was issued in December 2019 and DOT officials told us FAA plans to complete its analysis of public comments on the proposal by December 2020.

In addition, a few state, local, and tribal stakeholders we spoke to were uncertain whether they had authority to enforce their traditional privacy laws to address UAS concerns. They explained that because drones are aircraft regulated under FAA’s UAS regulations, which FAA has emphasized have a broad preemptive effect, they believed they may be preempted from enforcing their privacy laws against drones as well, such as in a Peeping Tom situation. This is particularly the case, they said, if the drone appears to be operating in compliance with FAA requirements and in a location where, as they understood the law, persons have no reasonable expectation of privacy such as outside in their backyards. A municipality organization believed its local members would need to call FAA if there were a UAS privacy problem and ask FAA to address the matter, which they found “unsettling.” Another local stakeholder described being “at a loss” to know what local law enforcement is authorized to do if there is a UAS privacy concern, such as whether they may order the drone operator to land. Finally, those local stakeholders who were aware that FAA has declined to regulate privacy because it believes it lacks authority believed they, too, may lack authority to address UAS privacy violations.

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government has experience protecting data privacy on a sector-specific basis as well as under FTC’s “unfair or deceptive trade practices” authority.¹⁹⁹ In addition, UAS stakeholders believed it would be most effective to enact a single federal law that included protections for UAS personal data privacy. They expressed concern that allowing states to enact individual data privacy laws—such as the California Consumer Privacy Act (CCPA)—will create a “regulatory patchwork quilt” that will stifle innovation, create uncertainty for the industry, and pose risks to safety, particularly if the laws are UAS-specific.²⁰⁰ This concern also has been raised by NTIA in requesting public comment about the current Administration’s consumer data privacy approach more generally.²⁰¹

Finally, with respect to whether federal data privacy legislation should be comprehensive or UAS-specific, most stakeholders we spoke to believed the law should be drafted broadly enough to include UAS privacy and could then serve as the basis for creating more specific standards for UAS, while a few stated UAS-specific legislation would be more effective.

However, several legal commentators²⁰² and a news organization stakeholder²⁰³ have disagreed that UAS data privacy should be legislated at the federal level, believing this should be left to the states, at least initially. In addition to noting states’ long history and experience protecting privacy, the legal commentators said states are best positioned to develop a range of diverse approaches to UAS data privacy and federal policymakers will benefit by seeing the results of such “state experimentation.” Seeing states’ differing approaches is particularly important with respect to identifying the most appropriate balance of privacy rights of individuals on the ground with First Amendment rights of UAS operators gathering information, an issue with which states already have considerable experience, the stakeholders said.

One of the legal commentators believed state regulation of drones’ initial collection of personal information was particularly important, noting regulation of UAS-acquired information after it is collected—addressing how it is allowed to be aggregated, processed, and stored—could be part of broader data privacy regulation enacted at the federal level. The other legal commentator stated it was pragmatic to leave UAS data privacy to states initially because there is no consensus about what privacy should mean in the UAS context, which would be a

¹⁹⁹ We discuss FTC’s authority to address data privacy issues in Part C.3. above.

²⁰⁰ We discuss the CCPA in Part D.1.d. above.

²⁰¹ As discussed in Part C.1. above, NTIA requested comment on a potential high-level Administration goal of harmonizing the U.S. regulatory landscape to avoid “patchwork of competing and contradictory baseline [privacy] laws.” See *supra* note 51. One of the privacy group stakeholders we spoke who submitted comments in that proceeding said that goal is “contrary to U.S. privacy law and principles of federalism. NTIA should promote federal baseline legislation . . . [to] ensure[] minimal protections while still preserving state and local innovation” The stakeholder also stated that “[p]rivacy is a fundamental human right in the 21st century, it may become one of the most critical human rights of all.” Comments of the Electronic Privacy Information Center, Nov. 9, 2018, NTIA Request for Comment, *Developing the Administration’s Approach to Consumer Privacy*, at 4, 8. Another public interest advocacy group commented in that proceeding that “the use of the tired, pejorative term ‘patchwork’ to mischaracterize state leadership on privacy suggests either a misunderstanding of the ways that the states have led efforts to protect consumer privacy or, worse, suggests a pre-determined bias toward preemption.” See Comments of U.S. Public Interest Research Group, Nov. 9, 2018, at 1.

²⁰² See Kaminski, *supra* note 32; Bennett, *supra* note 81.

²⁰³ Comments of the Newspaper Association of America, April 20, 2015, NTIA-Convened UAS Privacy Multi-Stakeholder Process, at 6.

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necessary starting point in enacting comprehensive federal legislation.

The news organization stakeholder also strongly favored leaving UAS data privacy to the states to ensure appropriate protection of First Amendment rights. State privacy torts are already calculated to capture variances in how states balance privacy rights and newsgathering-related rights, it said, while a nationwide UAS data privacy law would not capture those nuances developed over more than a century of reasoned lawmaking. In addition, state courts are already experienced in interpreting these privacy torts in light of the constitutional protections for newsgathering, broadcast, and publication and there is no reason to start over in developing a new set of federal rules for drones, this stakeholder said.

Finally, of those stakeholders we spoke to who believed the federal government should regulate UAS personal data privacy, the majority who expressed a position believed FAA should not be assigned this responsibility, while most but not all believed FTC could manage this responsibility. With respect to FAA (which as discussed in Part C.2. above, believes it currently lacks authority to regulate UAS privacy), stakeholders representing various UAS industry interests, states and state organizations, and a think tank stated FAA currently lacks the subject matter expertise and the resources to take on this responsibility, given its focus on its responsibilities to ensure aviation safety and efficient management of the airspace.

Two privacy group stakeholders we spoke to believed FAA does currently have authority to regulate UAS privacy, however, as discussed in Part C.2. above, and should do so as part of its overall regulation of UAS operations. To regulate UAS operations comprehensively but omit a key aspect of those operations—the risks they pose to privacy—is, at the least, confusing, one stakeholder said. Without a federal baseline, this stakeholder felt states would create a patchwork of laws like California’s CCPA which would be difficult for UAS operators and citizens to navigate. And although FAA may lack significant experience in regulating privacy matters, the other privacy stakeholder said, FAA and all agencies have some experience in protecting individual privacy based on their responsibilities in administering the Privacy Act.²⁰⁴ One attorney stakeholder told us that while *FAA* should continue with its focus on regulating the safety of UAS operations, *DOT* should regulate “social issues” relating to UAS such as privacy.

With respect to FTC, a number of UAS stakeholders and a local government association stakeholder told us they believe FTC has the legal authority and the expertise to protect UAS privacy, particularly with respect to commercial entities. A law firm stakeholder said FTC would need traditional Administrative Procedure Act rulemaking authority to take on UAS privacy, as Congress gave it in the Children’s Online Privacy Protection Act, because otherwise, FTC is limited to bringing individual enforcement actions that do not establish binding precedent.²⁰⁵ A privacy group stakeholder we spoke to, however, has strongly criticized FTC’s enforcement record using the authority it currently has.²⁰⁶ This privacy stakeholder and a number of others

²⁰⁴ We note Privacy Act protections in Part C.1 above.

²⁰⁵ We note differences between traditional APA notice-and-comment rulemaking and FTC’s current rulemaking authority under the FTC Act in Part C. above.

²⁰⁶ Comments of the Electronic Privacy Information Center to NTIA, Nov. 9, 2018, *supra* note 201.

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have called for creation of a new federal data privacy agency that would replace FTC in that role under a new non-preemptive, federal baseline privacy law.²⁰⁷

c. Considerations in Enacting Additional Measures

A comprehensive survey of the possible measures stakeholder and legal commentators have identified to mitigate UAS privacy concerns is beyond the scope of this report. We describe below examples of the types of measures stakeholders have identified and their positions on when such measures should be enacted.

(i) Timing

At the start of the NTIA multi-stakeholder process in 2015, a technology think tank stakeholder cautioned against enacting legally binding UAS privacy laws before actual privacy risks are known:

“[W]e urge caution in attempting to prescribe how . . . [UAS] technologies are regulated . . . rules written in advance will tend to inflate hypothetical threats and under-estimate both the unseen benefits of new technologies and our collective ability to adapt our expectations and social norms. America never had a federal camera law, nor a Federal Camera Commission. Nor did the Federal government of the early 20th century convene a ‘multistakeholder’ process to set industry standards, which the Federal government would then enforce. Instead, concerns about the camera were addressed in the first instance through private ordering (social norms about when it is appropriate to photograph people) and only secondarily through law.”²⁰⁸

Subsequently, at the time of FTC’s October 2016 UAS privacy workshop, a UAS organization stakeholder stated that privacy laws need to be revised to address modern technologies, stating, “we . . . have a lot of privacy laws on the books that are outdated . . . they’re still looking at things that are completely anachronistic to how we live.”²⁰⁹ Most recently, in the course of our review for this report, a UAS industry stakeholder told us the time may now be right to enact UAS privacy measures because UAS technology and business practices have evolved since the NTIA multi-stakeholder process. The stakeholder said the industry may now have reached an “inflection point” warranting action by Congress or FAA because FAA is getting closer to authorizing routine UAS operations beyond the operator’s visual line of sight (currently allowed only by FAA waiver). Beyond-visual-line-of-sight operations, in turn, could increase the number of “remote” operators, a factor stakeholders have identified as increasing privacy risks, as noted above.

(ii) Technology-Neutral versus UAS-Specific Measures

Stakeholders have expressed varying positions on whether any additional legal measures

²⁰⁷ Center for Digital Democracy *et al.*, *The Time Is Now: A Framework for Comprehensive Privacy Protection and Digital Rights In the United States*, Jan. 17, 2019, available at <https://www.democraticmedia.org/sites/default/files/field/public-files/2019/privacy-and-digital-rights-for-all-framework.pdf> (last visited Sept. 1, 2020).

²⁰⁸ Comments of Tech Freedom, *supra* note 179, at 3.

²⁰⁹ Remarks of Michael Drobac, 2016 FTC UAS Privacy Workshop Segment 2, *supra* note 178.

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protecting UAS privacy should be technology-neutral or UAS-specific.²¹⁰ On the federal level, if Congress were to enact data privacy legislation, as noted most stakeholders we spoke to believed it should be drafted broadly enough to include UAS privacy, and could serve as the basis for enacting UAS-specific standards at a later time. A few stakeholders told us UAS-specific legislation would be more effective.

On the state level, a number of UAS industry stakeholders told us privacy laws should be “agnostic” and technology-neutral. UAS-specific legislation unfairly targets UAS as a technology that is somehow uniquely invasive of privacy, the stakeholders said, even though other technologies may raise similar privacy concerns. The laws should address the actual bad behavior rather than the technology being used to carry out that bad behavior, the stakeholders stated, although most told us it would not be problematic to amend existing privacy laws to add drones to a list of other methods by which prohibited conduct may be carried out.

Moreover, the UAS stakeholders said UAS-specific legislation is largely redundant because general privacy statutes already address bad behavior by UAS operators. If a privacy statute prevents an individual from using a camera on a pole to look over a neighbor’s fence, the same statute should prevent a UAS operator with a camera from engaging in the same conduct, they said. Several legal commentators and a technology think tank stakeholder have expressed the same position. As one academic stakeholder we spoke to has said, “[a]s with any new technological development . . . there is a tendency . . . to focus too strongly on the technology and miss the way the technology fits into the existing regulatory scheme. . . . Where necessary, drone specific regulations make sense, but generally following the path of integrating such regulations into existing frameworks is the better path to take.”²¹¹

On the other hand, some state and local stakeholders told us UAS-specific laws are needed because they create certainty that the protections in fact apply to drones, as well as specifying precisely what legal elements must be proven to constitute an invasion of privacy by a drone. Such specificity, in turn, can eliminate the need to file litigation where a general privacy law may be ambiguous and its application to drones unclear. The current legal elements also might need to be altered for the UAS context. For example, a privacy group stakeholder told us the requirement in some states to prove that an invasion of privacy has caused monetary harm may not be appropriate because even though peering into someone’s window by drone may not cause monetary harm, it is clearly an invasion of privacy.

A local-government organization stakeholder told us its constituents are concerned that current privacy laws contain “loopholes” or gaps in coverage because they were developed to address conduct on the ground rather than in the air. State and local stakeholders also told us UAS-specific statutes can be beneficial because they ease constituents’ concerns about privacy and evolving technologies, which in turn can help facilitate public acceptance of UAS. Finally, state and local stakeholders and a UAS technology stakeholder told us general privacy laws may not address the diverse and unique fact situations of their jurisdictions, such as California’s need to create a law to address paparazzi using drones to photograph individuals engaging in private

²¹⁰ FAA officials told us they do not have a position on which is preferable. They said when states and localities ask whether they can enforce their general privacy laws to address UAS privacy risks, FAA simply advises them that their general laws may be used as long as they are drafted broadly enough.

²¹¹ Robert A. Heverly, *The State of Drones: State Authority to Regulate Drones*, 8 Albany Gov’t L. Rev. 29, 61-62 (2015).

activities and California's resulting amendment of its anti-paparazzi statute to apply to drones.²¹²

(iii) Stakeholder-Based Examples of Potential UAS Privacy, Transparency, and
Accountability Measures

As noted, discussions regarding possible UAS personal data privacy measures have often been framed in terms of privacy, transparency, and accountability. According to NTIA, "privacy" refers to restrictions on the initial UAS-collection of personal information and/or on the subsequent use, retention, or dissemination of that UAS-collected information; "transparency" refers to informing those affected that their information is being collected and why and how the data will be used, retained, and/or disseminated; and "accountability" refers to internal measures taken by entities to ensure these privacy protections and transparency policies are enforced within the organization.²¹³

Some stakeholders we spoke to and other entities and legal commentators have described various types of measures that might be appropriate to enhance UAS data privacy. We describe some of these possible privacy measures below; this non-exhaustive list represents just some of the many types of possible UAS privacy measures that might be established.

Emphasizing that these were developed with the express caveat that they were not intended to serve as a template for future statutory or regulatory obligations, one set of UAS privacy measures that might be considered in developing future requirements are the UAS Voluntary Best Practices. As discussed in Part E. above, the UAS Voluntary Best Practices, with numerous qualifications and exceptions, suggest restricting the intentional collection of personal data where the UAS operator knows the potentially affected person "has a reasonable expectation of privacy"; minimizing UAS operations above or on private property without the landowner's consent or in violation of law; and limiting the use, retention, and sharing of collected personal data.

The UAS Voluntary Best Practices also suggest transparency and accountability measures: providing advance notice to potentially affected individuals when and where UAS operations may intentionally collect their personally identifiable data; developing a publicly available privacy policy that addresses the purposes of data collection, the kinds of data to be collected, any data retention and de-identification practices, examples of any entities with whom the data will be shared, how to file a complaint, and how responses will be made to law enforcement requests for collected data; and monitoring and complying with federal, state, and local UAS laws as they evolve. A number of these measures are similar to those already imposed on federal agencies' use of drones by the 2015 UAS Privacy Presidential Memorandum (see Part C.1.above).

One of the legal commentators noted above who has recommended leaving UAS data privacy to the states also has suggested several types of limits that states might impose on UAS initial data collection: enacting reasonable time, place, and manner restrictions (e.g., banning data collection in certain locations or at certain times with possible exceptions for First Amendment activities); addressing "socially unacceptable behavior" by banning surreptitious use of drones to

²¹² As discussed in Part D.1.c. above, while California's anti-paparazzi law does not explicitly mention drones, the legislative history amendments to this law explicitly states the amendments were made to ensure the statute applies to drones.

²¹³ 80 Fed. Reg. at 11979-80 (March 5, 2015) (NTIA request for comment regarding UAS privacy multi-stakeholder process).

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record information or requiring consent to record; banning the use of “superhuman” enhanced technology to record information about a person in a traditionally private space; and banning the recording of acts that are subject to a reasonable expectation of privacy, including private acts occurring in public places.²¹⁴

A civil liberties group has suggested UAS privacy measures along some of the same lines, recommending development of rules to identify the types of locations where individuals have a reasonable expectation of privacy; enactment of limits on UAS collection of data and subsequent analysis and retention of that data; development of standardized methods to disclose data collection practices by commercial UAS operators and of technical capabilities to identify those operators; and creation of methods to honor requests to opt-out from UAS data collection in certain locations.²¹⁵

A privacy group stakeholder we spoke to has called for enactment of baseline transparency measures to ensure that potentially affected individuals will be provided with notice of (and perhaps consent to) what data drones are collecting and how that data will be used, retained, and shared. Such measures will help facilitate integration of UAS into the airspace because it will make people more comfortable with their use, according to this stakeholder. Notice is needed, they explained, even though some existing privacy laws cover some of the types of invasive behavior drones can be used for, because it will be impossible in many cases to enforce those laws given the anonymity of the drone operator. The stakeholder also believed some restrictions on the use of UAS-collected data could be appropriate, but did not favor restrictions on drones’ initial data collection because that may be necessary for navigational purposes.

Other stakeholders have questioned some of these measures, however. A UAS manufacturer stakeholder we spoke to has cautioned that requiring advance notice to and consent from potentially affected landowners could be impractical and burdensome to the point of making operations almost impossible in the case of an apartment building with multiple tenants. One of the FTC attorneys moderating the 2016 FTC UAS Privacy Workshop (discussed in Parts F.1. and 2. above) also raised the question how the Commission’s usual privacy guidance to industry—to provide consumers with notice and choice—would apply where a drone is delivering a package, for example. How would notice be provided to the neighbor or other third parties, the attorney asked. The FTC attorney also raised the question whether the potential impracticality of providing notice in such cases means restrictions should instead be placed on the collection or use of personal data. Requiring a drone operator to provide notice of their data collection to potentially affected parties also might raise First Amendment concerns, according to a legal commentator, because the notice might then be deemed to be compelled speech.²¹⁶

Finally, an academic stakeholder has cautioned against lawmakers inadvertently creating new problems by imposing overly restrictive measures to address UAS privacy concerns. Prohibiting a drone from collecting certain visual or sensor information in order to protect privacy, for example, might make the drone less capable of navigating safely in the airspace, the stakeholder said. Because there may be customized technology solutions to the privacy problems, this stakeholder said, Congress should define privacy harms and allow industry to

²¹⁴ Kaminski, *supra* note 32, at 69-71.

²¹⁵ Comments of Center for Democracy & Technology, *supra* note 174.

²¹⁶ Remarks of Margot E. Kaminski, 2016 FTC UAS Privacy Workshop Segment 2, *supra* note 178.

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develop solutions rather than enacting prescriptive privacy protections that may have unintended consequences.²¹⁷

²¹⁷ Remarks of Gregory McNeal, 2016 FTC UAS Privacy Workshop Segment 1, *supra* note 158.

APPENDIX IV: STATE UAS-SPECIFIC LAWS, RESOLUTIONS, AND EXECUTIVE ORDERS

This table reflects GAO’s analysis of information compiled annually by the National Conference of State Legislatures (NCSL) for the years 2013 through 2019, as made available at <https://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx> (last visited Sept. 1, 2020). As detailed in this table, 46 states had passed some type of unmanned aircraft system (UAS)-specific law, resolution, or executive order as of 2019. While NCSL’s annual updates have included all state laws, resolutions, and orders related to UAS, this table includes only those that explicitly state they apply to UAS or drones, with one exception. That exception is the California statute commonly referred to as the anti-paparazzi law. Although that law does not explicitly refer to UAS or drones, its legislative history states it was expressly amended to apply to drones.

STATE	SUMMARY	AS CODIFIED	YEAR ENACTED
Alabama	Adopts a resolution, HR 381, to recognize the benefits of a thriving UAS industry in the state and to encourage a partnership between the state of Alabama and FAA to select Huntsville, AL as a UAS test site.	Resolution (not codified)	2013
	Appropriations Act provision in HB 2001 provides \$1.2 million to higher education institutions for a Juneau Readiness Center and Unmanned Aerial System Joint Facility.	Appropriations law (HB 2001)	2019
Alaska	Adopts a resolution, HCR 6, to create a legislative task force on UAS, charged with reviewing Federal Aviation Administration (FAA) regulations and guidance regarding UAS and drafting written recommendations and legislation that allow UAS to be used in a way that protects privacy. The task force shall include, in addition to members of the legislature, representatives from state agencies, aviation organizations, and academia. The task force must provide an initial report of its findings by Jan. 15, 2014, and a final report by July 1, 2014.	Appropriations law (HB 2001)	2013
	Enacts HB 255, which creates procedures and standards for law enforcement use of UAS, as well as regulations for the retention of information collected with UAS (codified at Alaska Stat. §§ 18.65.900 to 18.65.909). Requires law enforcement agencies to adopt procedures that ensure appropriate FAA flight authorization is obtained (Alaska Stat. § 18.65.901(1)); UAS operators are trained and certified (Alaska Stat. § 18.65.901(2)); a record of all flights is maintained (Alaska Stat. § 18.65.901(5)); and there is an opportunity for community involvement in the development of the agencies’ procedures (Alaska Stat. § 18.65.901(8)). Under the law, police may use UAS pursuant to a search warrant, a judicially recognized exception to the warrant requirement, and in situations not involving a criminal investigation (Alaska Stat. § 18.65.902). Images captured with UAS may be retained by police for training purposes or if it is required as part of an investigation or prosecution (Alaska Stat. § 18.65.903). The law also authorizes the University of Alaska to develop a training program for operating UAS (Alaska Stat. § 14.40.082).	Alaska Stat. §§ 14.40.082, 18.65.900, 18.65.901, 18.65.902, 18.65.903, 18.65.909, 29.10.200, 29.35.146	2014
	Adopts a resolution, HCR 15, to extend the operating time (until June 30, 2017) and expand the number and type of participants as well as the duties of the state UAS task force.	Resolution (not codified)	
	Adopts a resolution, HRJ 5, to recognize the Academy of Model Aeronautics and to urge the state to work with federal agencies to promote best practices and communications that result in meaningful guidelines and regulations for the recreational use of UAS in a manner that protects personal privacy and safety.	Resolution (not codified)	2015
	Appropriations Act provision in HB 256 requests the Department of Fish and Game to evaluate the use of UAS for aerial survey work and report findings related to safety and cost-savings compared to manned aircraft.	Appropriations law (HB 256)	2016
	Adopts a resolution, HCR 17 (TRA), to support the economic growth of the UAS industry in the state and encourage the establishment of safe and responsible UAS business in the state. The resolution urges the governor to make state-owned land available for use by designers, owners, developers, and operators of commercial UAS for use in the in the research, manufacturing, testing, training, management and operation of those systems.	Resolution (not codified)	

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	Adopts a resolution, SCR 4, that continues the task force on UAS until June 30, 2018, and specifies additional membership and duties, e.g., review FAA regulations and guidance, provide written recommendations and suggested legislation, evaluate complaints and concerns it has received, identify privacy and public safety concerns associated with UAS and whether legislation is needed to resolve them, conduct studies, conduct hearings on privacy concerns.	Resolution (not codified)	2017
	Enacts SB 194, which amends the crime of disorderly conduct to include a person who knowingly causes an unmanned aircraft system to loiter over a private place of another without consent (Alaska Stat. § 11.61.110). It also amended the crime of indecent viewing or photography to include a person on private property without the knowledge or consent of the person viewed or shown in the picture using an unmanned aircraft system in the airspace above the private property (Alaska Stat. § 11.61.123). It also provides the definition to be used for the term “unmanned aircraft system” (Alaska Stat. § 11.81.900).	Alaska Stat. §§ 11.61.110, 11.61.123, 11.81.900	2018
Arizona	Prohibits certain operation of UAS, including operation in violation of FAA regulations and operation that interferes with first responders (Ariz. Rev. Stat. § 13-3729). The law prohibits operating near, or using UAS to take images of, a critical facility (Ariz. Rev. Stat. § 13-3729). The law also preempts any locality from regulating UAS with exceptions (Ariz. Rev. Stat. § 13-3729). The law defines several terms and adds UAS to an existing provision regarding the careless or reckless operation of an aircraft (Ariz. Rev. Stat. § 28-8280). Amends powers and duties related to UAS of the Aeronautics Division of the Arizona Department of Transportation (Ariz. Rev. Stat. § 28-8242).	Ariz. Rev. Stat. §§ 13-3729, 28-8242, 28-8280a	2016
	Makes the state liable for willful misconduct, gross negligence, or bad faith of an emergency worker engaging in emergency management activities or performing emergency functions including operating a UAS or public UAS while engaged in or supporting emergency management activities or performing emergency functions.	Ariz. Rev. Stat. § 26-314	2018
Arkansas	Arkansas Act 293 prohibits video voyeurism by knowingly using a UAS (and other devices) that is concealed, flown in a manner to escape detection, or disguised, to secretly or surreptitiously videotape, film, photograph, record, or view by electronic means another person without consent to view any part of the person’s body in which they have a reasonable expectation of privacy and under circumstances in which they have a reasonable expectation of privacy (Ark. Code Ann. § 5-16-101(b)). Prohibits voyeurism by knowingly using a UAS (or other unmanned device or in person) for the purpose of sexual arousal or gratification, to look into a private place that is part of a public accommodation where persons likely are at least partially unclothed or looks into a person’s dwelling unit in order to intrude on the person’s privacy and the person has a reasonable expectation of privacy in that part of the dwelling (Ark. Code Ann. § 5-16-102(b)).	Ark. Code Ann. §§ 5-16-101(b), 5-16-102(b), 5-60-103, 16-118-111	2015
	Arkansas Act 1019 amends Arkansas Code Title 5, Chapter 60 to include a definition of “unmanned aircraft system” and prohibits the use of UAS to collect information about or photographically or electronically record information about critical infrastructure without consent (Ark. Code Ann. § 5-60-103). It also provides for civil action against operators of UAS (Ark. Code Ann. § 16-118-111).		
	Amends the term “critical infrastructure” to add “railroad operating facility” and “communication tower and facility” to the areas where UAS may not operate. Amends the term “unmanned aircraft system” to eliminate references to the Arkansas Department of Emergency Management.	Ark. Code Ann. § 5-60-103(a)	2019
California	Adopts a resolution to recognize the benefits of a thriving UAS industry in the state and to encourage FAA to consider California as a test site for UAS and integration of those systems into a next generation air transportation system.	Resolution (not codified)	2013
	NOTE: This act does not explicitly refer to UAS or drones. However, the legislative history of the 2015 amendment states it was expressly enacted to apply to drones entering into airspace above private property in accordance with the U.S. Supreme Court’s decision in <i>United States v. Causby</i> .] Expanded the “physical invasion of privacy” cause of action in the state’s so-called “anti-paparazzi” statute so that it not only prohibits a person from	Cal. Civ. Code § 1708.8 (a)	2015

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	entering onto another person’s land, but also from entering into the airspace above another person’s land, in order to capture an image or recording of that person engaging in a private, personal, or familial activity without permission.		
	Defines unmanned aircraft and unmanned aircraft system (Cal. Gov. Code § 853). Provides immunity for first responders who damage a UAS that was interfering with the first responder while that person was providing emergency services (Cal. Civ. Code § 43.101; Cal. Gov. Code § 853). Limits liability for public entities and employees that damage a UAS while providing emergency services if the UAS interferes with the operation, support, or enabling of emergency services (Cal. Civ. Code § 43.101; Cal. Gov. Code § 853). Under the law, interfering with the activities of first responders, including through use or operation of an unmanned aerial vehicle, remote piloted aircraft, or drone during an emergency is a misdemeanor.	Cal. Civ. Code § 43.101, Cal. Gov. Code § 853, Cal. Penal Code § 402	2016
	Makes a person who knowingly and intentionally operates a UAS on or above the grounds of a state prison, a jail, or a juvenile hall, camp, or ranch guilty of an infraction punishable by a specified fine (Cal. Penal Code § 4577). Exempts persons employed by these facilities acting within the scope of that employment, or a person who receives certain authority to operate a UAS around these facilities (Cal. Penal Code § 4577).	Cal. Penal Code § 4577	2018
	Makes it unlawful for a person to operate a UAS to carry out pest control unless the pilot holds a valid manned or unmanned pest control aircraft pilot’s certificate issued by the director and is certified by FAA to conduct pest control (Cal. Food and Agric. Code § 11901). Requires a pilot to be certified by the State Department of Public Health as a vector control technician to be eligible for an unmanned pest control aircraft pilot’s certificate under the status of vector control technician (Cal. Food and Agric. Code § 11910).	Cal. Food and Agric. Code §§ 11901, 11902.5, 11910	
	Makes it a misdemeanor offense to operate UAS for the purpose of invading the privacy of a person inside their home or any other interior area where there is a reasonable expectation of privacy.	Cal. Penal Code § 647	2019
Colorado	Requires the center of excellence within the department of public safety to perform a study. The study must identify ways to integrate UAS within local and state government functions relating to firefighting, search and rescue, accident reconstruction, crime scene documentation, emergency management, and emergencies involving significant property loss, injury, or death. The study also must consider privacy concerns, costs, and timeliness of deployment for each of these uses. The legislation also creates a pilot program requiring the deployment of at least one team of UAS operators to a region of the state that has been designated as a fire hazard where they will be trained on the use of UAS for the above specifies functions.	Colo. Rev. Stat. § 24-33.5-1228	2017
	Prohibits the use of UAS to obstruct public safety operations, provides exceptions to the offense of using or threatening to use a UAS as an obstacle under specified conditions.	Colo. Rev. Stat. § 18-8-104	2018
Connecticut	Provides a definition of “commercial unmanned aircraft” and prohibits municipalities from regulating UAS. It allows a municipality that is also a water company to enact ordinances that regulate or prohibit the use or operation of UAS over the municipality’s public water supply and land as long as they do not conflict with federal law or policies and procedures adopted by the Connecticut Airport Authority.	Conn. Gen. Stat. § 7-149b	2017
Delaware	Creates the misdemeanor crime of unlawful use of a UAS and prohibits operation over any event with more than 1,500 attendees, over critical infrastructure, and over an incident where first responders are actively engaged in response or transport. The law provides exemptions, such as use of the UAS for law enforcement purposes, operation pursuant to authorization granted by the FAA, or operation pursuant to written permission granted by the property owner. The law specifies that only the state may enact a law or regulation, preempting the authority of counties and municipalities.	Del. Code tit. 11, § 1334	2016
	Adopts a resolution to express support for developing the many facets of UAS and increasing economic and training opportunities available within the FAA regulatory framework and to affirm that the protection of privacy rights (as guaranteed by the Fourth Amendment) is recognized in connection with the development of UAS and related technologies.	Resolution (not codified)	

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	Amends the misdemeanor offense of unlawful use of a UAS to make it a crime to fly a UAS in a manner that invades the privacy of or subjects to harassment another person who is on private property in a manner that violates Delaware's invasion of privacy statute in Del. Code tit. 11.	Del. Code tit. 11, § 1334(b)(5)	2018
	Makes it a felony offense to operate UAS over a correctional facility to deliver prison contraband.	Del. Code tit. 11, § 1256(b)(2)	2019
Florida	Defines a drone and limits its use by law enforcement to gather evidence or other information, but provides that law enforcement may use a drone if it obtains a search warrant, there is a terrorist threat, or "swift action" is needed to prevent loss of life or to search for a missing person. The law also authorizes someone harmed by an inappropriate use of drones to pursue civil remedies and prevents evidence gathered in violation of the law from being admitted in any Florida court.	Fla. Stat. § 934.50	2013
	Creates a private cause of action to enforce a statutory prohibition against the non-consensual use of a drone to capture an image of privately owned property or the owner or others legally on the property if a "reasonable expectation of privacy" exists. Defines that term to mean where the person cannot be observed by others at ground level in a place where they have a legal right to be, regardless of whether they could be seen from the air with the use of a drone.	Fla. Stat. § 934.50	2015
	Defines critical infrastructure to include a number of energy installations and wireless communications facilities (Fla. Stat. § 330.41). The law preempts local regulation of UAS, but allows localities to enact ordinances relating to nuisances, voyeurism (invasion of privacy law), harassment, reckless endangerment, property damage or other illegal acts (Fla. Stat. § 330.41). It also prohibits operation of UAS over or near critical infrastructure, making it a misdemeanor (Fla. Stat. § 330.41). The law also prohibits the possession or operation of a weaponized UAS (Fla. Stat. § 330.411). The law exempts communication service providers using drones for certain operation and maintenance tasks (Fla. Stat. § 934.50).	Fla. Stat. §§ 330.41, 330.411, 934.50	2017
Georgia	Adopts a resolution to recognize the benefits of a thriving UAS industry in the state and to support efforts to strengthen the aerospace industry.	Resolution (not codified) HR 80, HR 81, SR 172	2013
	Adopts a resolution to establish a House committee to study the conditions, needs, issues, and problems related to drones and recommend any action or legislation the committee deems necessary or appropriate.	Resolution (not codified)	2015
	Creates, by executive order, the Commission on Unmanned Aircraft Technology in order to adopt state-level rules and offer recommendations to the governor consistent with current FAA regulations as well as the state's business and public safety interests.	Executive order (not codified)	2016
	Defines unmanned aircraft systems and preempts local regulation of UAS after April 1, 2017. The law allows for regulation of the launch or landing of UAS on public property by the state or local government.	Ga. Code Ann. § 6-1-4	2017
	Prohibits UAS from delivering or attempting to deliver contraband to a correctional facility and from photographing any place of incarceration without prior permission.	Ga. Code Ann. § 42-5-18	2019
Hawaii	Appropriates \$100,000 for two staff positions, contracted through the University of Hawaii, to plan for the creation of, among other programs, a professional UAS pilot program administered through Hawaii Community College.	Appropriations law (not codified)	2013
	Creates a chief operating officer position for the Hawaii UAS test site (Haw. Rev. Stat. § 201-72.7; 201-73). It also establishes a UAS test site advisory board to plan and oversee test site development and appropriates funds to establish the test site (Haw. Rev. Stat. § 201-72.6).	Haw. Rev. Stat. §§ 201-72.6, 201-72.7, 201-73	2015
	Authorizes the Department of Land and Natural Resources to mitigate the hazards posed by vessels, thrill craft, drones, and other means used by spectators to observe or record regattas, marine parades, surfing contests, and other events in the waters of the state.	Haw. Rev. Stat. § 200-40.5	2018

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	Provides that probable cause for arrest for violation of the state's Fireworks Control Law or a county's fireworks ordinance may be established by, among other things, recordings made using a UAS showing the commission of the offense and exempting such UAS-collected recordings from the general requirement of authentication by one or more witnesses.	Haw. Rev. Stat. § 132D-20	2019
Idaho	Defines "unmanned aircraft system," requires search warrants for their use by law enforcement, establishes guidelines for their use by private citizens and provides civil penalties for damages caused by improper use.	Idaho Code § 21-213	2013
	Adopts a resolution to recognize the benefits of a thriving UAS industry in the state.	Resolution (not codified)	
	Prohibits the use of UAS for hunting, molesting or locating game animals, game birds and furbearing animals.	Idaho Code § 36-1101	2016
Illinois	Defines "drone" as any aerial vehicle that does not carry a human operator (720 Ill. Comp. Stat. § 5/48-3). The law prohibits anyone from using a drone to interfere with hunters or fisherman (720 Ill. Comp. Stat. § 5/48-3). Allows drones to be used by law enforcement with a search warrant, to counter a terrorist attack, to prevent harm to life or to prevent the imminent escape of a suspect among other situations (725 Ill. Comp. Stat. § 167/15). If a law enforcement agency uses a drone, the agency must destroy all information gathered by the drone within 30 days, except that a supervisor at the law enforcement agency may retain particular information if there is reasonable suspicion it contains evidence of criminal activity (725 Ill. Comp. Stat. § 167/20).	720 Ill. Comp. Stat. Ann. § 5/48-3, 725 Ill. Comp. Stat. Ann. § 167/1 to 167/40	2013
	Creates regulations for how law enforcement can obtain and use information gathered from a private party's use of UAS. The law requires police to follow search warrant protocols to compel third parties to share information, and if the information is voluntarily given to police, authorities are required to follow the state's law governing UAS data retention and disclosure (725 Ill. Stat. Ann. § 167/40). The law also loosens regulations regarding law enforcement's use of UAS during a disaster or public health emergency (725 Ill Comp. Stat. Ann. § 167/15).	725 Ill. Comp. Stat. Ann. §§ 167/15, 167/40	2014
	Creates a UAS Oversight Task Force, which is charged with considering commercial and private use of UAS, landowner and privacy rights, and general rules and regulations for the safe operation of UAS. The task force will prepare recommendations for the use of UAS in the state.	20 Ill. Comp. Stat. § 5065/1 - 99 (Repealed 2017)	2015
	Expands the membership of the UAS Oversight Task Force and extends the deadline for the task force to issue a report from July 1, 2016 to July 1, 2017.	20 Ill. Comp. Stat. § 5065/15, 20 (Repealed 2017)	2016
	Amends the Aeronautics Act to establish definitions related to UAS and regulations for UAS. Provides that to the extent it does not conflict with federal laws, rules or regulations, regulation of UAS is an exclusive power of the State.	620 Ill. Comp. Stat. Ann. § 5/42.1	2018
Indiana	Adopts a resolution to urge the legislative council to study UAS issues.	Resolution (not codified)	2013
	Excludes electronic monitoring with an UAS from the definition of "lawful detention." Creates search warrant requirements and exceptions for police use of UAS and real-time geo-location tracking devices. It also prohibits law enforcement from compelling individuals to reveal passwords for electronic devices without a warrant. If law enforcement obtains information from an electronic service provider pursuant to a warrant, the provider is immune from criminal or civil liability (Ind. Code § 35-33-5-13). The law provides that if police seek a warrant to compel information from media entities and personnel, then those individuals must be notified and given the opportunity to be heard by the court concerning issuance of the warrant (Ind. Code § 35-33-5-14). The law also creates the privacy-related crime of "Unlawful Photography and Surveillance on Private Property," making it a misdemeanor. This crime is committed by a person who knowingly and intentionally electronically surveys the private property of another without permission.	Ind. Code §§ 35-31.5-2-343.7, 35-31.5-2-337.5, 35-33-5-0.5, 35-33-5-9, 35-33-5-10	2014

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	Allows the use of UAS to photograph or take aerial photographs or video of a traffic crash site on a public street or highway. Prohibits the use of UAS to scout game during hunting season, but permits use of UAS to monitor areas of agriculture production or to monitor nuisance wild animals as well as to provide veterinary treatment to a wild animal.	Ind. Code §§ 14-22-6-16, 35-33-5-9	2016
	Defines unmanned aerial vehicle, creates a number of new criminal offenses. These offenses include the “sex offender unmanned aerial vehicle offense”, “public safety remote aerial interference”, and “remote aerial harassment.” All of these offenses are misdemeanors unless the person has a prior conviction, in which case it is a felony. It is also a misdemeanor to commit “remote aerial voyeurism” (invasion of privacy). It becomes a felony if the person publishes the images, makes them available on the Internet, or shares them with another person.	Ind. Code §§ 14-22-6-16, 35-31.5-2-342.3, 35-31.5-2-343.7, 35-31.5-2-343.8, 35-33-5-0.5, 35-42-4-12.5, 35-44.1-4-10, 35-45-4-5, 35-45-10-6, 35-46-1-15.1	2017
	Amends § 35-33-5-9 to require a search warrant to use a UAS over private property or to conduct surveillance, obtain a photograph, or obtain video of private property or of individuals, items, or structures on private property without the property owner’s consent, except that a warrant is not required to use a UAS if a warrant would not be required for the same search without a UAS.	Ind. Code § 35-33-5-9	2019
Iowa	Defines Unmanned Aerial Vehicles. Under law, it illegal for a state agency to use a UAS to enforce traffic laws (Iowa Code § 321.492B). The law requires a search warrant, or other lawful means, to use information obtained with UAS in a civil or criminal court proceeding (Iowa Code § 808.15). It also requires the department of public safety to develop guidelines for the use of UAS and to determine whether changes to the criminal code are necessary; the department’s findings must be reported to the general assembly by Dec. 31, 2014 (some provisions not codified).	Iowa Code §§ 321.492B 808.15	2014
Kansas	Expands the definition of harassment in the Protection from Stalking Act to include certain uses of UAS. The law appropriates funds that can be used to focus on research and development efforts related to UAS by state educational institutions. The law specifies a number of focuses for the research, including the use UAS for inspection and surveillance by the Department of Transportation, Highway Patrol, and State Bureau of Investigation. It requires that the director of UAS make recommendations regarding state laws and rules that balance privacy concerns and the need for “robust UAS economic development” in the state. (Some provisions are not codified)	Kan. Stat. Ann. § 60-31-a02 2016 Omnibus Appropriations Act	2016
	Adopts resolution urging FAA to accept Kansas’s 2019 application to be a participant in FAA’s UAS Integrated Pilot Program.	Resolution (not codified)	2018
Kentucky	Allows commercial airports to prepare UAS facility maps to display the airport’s airspace overlaid with gridlines or other indicators of where it is unsafe to operate a UAS without airport authorization, unless FAA has created such a facility map. Prohibits UAS from entering into areas prohibited by the airport’s facility map for UAS takeoff, landing, or operation. Prohibits operation of UAS in a reckless manner that creates a risk of serious physical injury or damage to property. Anyone who violates § 183.086 is guilty of a misdemeanor, or a felony if the violation causes a significant change of course or a serious disruption to the safe travel of an aircraft that threatens the physical safety of the passengers and crew. The law does not apply to commercial UAS operators in compliance with FAA regulations.	Ky. Rev. Stat. Ann §§ 183.011 183.085 183.086 183.990	2017
	Creates Citizens’ Freedom from Unwarranted Surveillance Act. Defines unmanned aircraft system, prescribes permitted and prohibited uses of UAS, provides exceptions, prohibits the use of evidence obtained by a UAS in violation of stated prohibitions, clarifies criminal liability for offenses committed using a UAS, creates the offense of obstructing an emergency responder. The law also establishes the offense of trespass upon key infrastructure assets, defines key infrastructure assets to include various utility facilities, hazardous material facilities, rail facilities, military defense facilities, and telecommunication facilities, and provides that a violation is a misdemeanor and also provides exceptions.	Ky. Rev. Stat. Ann. §§ 500.130 511.100	2018
	Prohibits UAS over a correctional facility, as a newly-added key critical infrastructure asset, or to deliver contraband.	Ky. Rev. Stat. Ann. §§ 511.100 520.010	2019

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Louisiana	Defines the unlawful use of a UAS as the intentional use of a UAS to conduct surveillance of a targeted facility (e.g., oil and alumina refineries, nuclear facilities, chemical and rubber manufacturing facilities) without the owner's prior written consent. The crime is punishable by a fine of up to \$500 and imprisonment for six months. A second offense may be punishable by a fine up to \$1,000 and one year imprisonment.	La. Stat. Ann § 14:337	2014
	Adds a new chapter of the Louisiana Revised statutes to regulate the use of UAS in agricultural commercial operations, provide definitions, authorize the commissioner to adopt rules, provide for license and registration requirements, discuss operation of UAS, and cover violations and related penalties.	La. Stat. Ann §§ 3:41 through 3:47	2015
	Adds the intentional crossing of a police cordon using a drone to the crime of obstructing an officer. Authorizes law enforcement and fire department personnel to disable [counter] UAS if it endangers the public or an officer's safety. Prohibits using a drone to conduct surveillance of, gather evidence or collect information about, or take photo or video of a school, school premises, or correctional facilities. The law establishes a penalty of a fine and up to six months in jail. The law authorizes the establishment of registration and licensing fees for UAS. The law adds the use of UAS to the existing invasion of privacy crimes of voyeurism, video voyeurism, and Peeping Tom. The law specifies that surveillance by a UAS constitutes criminal trespass under certain circumstances.	La. Stat. Ann §§ 3:43, 3:48, 14:108, 14:337, 14:283, 14:283.1, 14:284	2016
	Specifies that only the state may regulate UAS. The law also defines "unmanned aerial system" and "unmanned aircraft system." It specifies that the definition of UAS does not apply to a UAS used by a local, state, federal government, or other specified entities.	La. Stat. Ann. § 2:2	2017
	Specifies that surveillance equipment may not be attached to UAS for video voyeurism. Adds that identifiable person has a reasonable expectation of privacy. Provides and exception for bone fide news or public interest media.	La. Stat. Ann § 14:283	2018
Maine	Requires law enforcement agencies to obtain approval before acquiring UAS. Specifies that the use of UAS by law enforcement must comply with all FAA requirements and guidelines. The law requires a search warrant to use UAS for criminal investigations except in certain circumstances and sets out standards for the operation of UAS by law enforcement. The Commissioner of Public Safety shall submit to the legislature a report containing the number of instances in which a UAS has been deployed by any law enforcement agency.	Me. Stat. tit. 25, § 4501	2015
Maryland	Appropriates \$500,000 for the state's unmanned aerial system test site.	Appropriations law (not codified)	2013
	Adds a new section to the Article for Economic Development that defines "unmanned aircraft" and "unmanned aircraft system." Specifies that only the state can enact laws to prohibit, restrict, or regulate the testing or operation of unmanned aircraft systems. This preempts county and municipal authority.	Md. Code, Econ. Dev. § 14-301	2015
	Enacts the Unmanned Aircraft Systems Research, Development, Regulation, and Privacy Act of 2015. This requires a study on the concerns and specified benefits of UAS, encourages local governments to work with Federal Aviation Law Enforcement to determine how to enforce FAA regulations and general applicability laws that apply to UAS, and requires the review of UAS recreational use and make recommendations for regulatory changes to support governance or enforcement efforts related to UAS.	2015 Maryland Laws Ch. 164 (S.B. 370)	
Michigan	Adopts a resolution to recognize the benefits of a thriving UAS industry in the state.	Resolution (not codified)	2013
	Prohibits using UAS to interfere with or harass an individual who is hunting. The law prohibits using UAS to take game.	Mich. Comp. Laws § 324.40111c	2015
	Enacted the Unmanned Aircraft Systems Act that provides for the operation and regulation of UAS. Prohibits localities from regulating UAS unless authorized by statute. Permits commercial operation in the state if the operator is authorized by the FAA to operate commercially and permits hobby operation so long as the operator complies with federal law. The law prohibits using a drone in a way that interferes with emergency personnel and it prohibits the use of a drone to harass an individual, to violate a restraining order, or to capture images in a way that invades an individual's reasonable expectation of privacy. The law also prohibits sex offenders from using a drone to follow, contact, or photograph a person that they are prohibited from contacting. Anyone who uses a drone in a prohibited way is guilty of a misdemeanor. The	Mich. Comp. Laws § 259.301 to 331	2016

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	law also creates the unmanned aircraft systems task force to “develop statewide policy recommendations on the operation, use, and regulation” of UAS in the state. It specifies the members of the task force, the length of appointment and other specifics related to the task force.		
	Provides a budget for the department of state police to draft a report that evaluates law enforcement issues related to the use of drones; the efficacy of federal, state, and local regulation; and recommendations for laws/regulations and policy related to the use of drones.	Appropriations law (not codified)	2018
	Allows a political subdivision that prohibits the operation of nonemergency motor vehicles to enact and enforce an ordinance, regulation or resolution, under certain circumstances, to prohibit the knowing and intentional operation of UAS in a manner that interferes with the safe use of a horse in certain commercial activities.	Mich. Comp. Laws § 259.305	2019
Minnesota	Appropriates money from environment and natural resources trust fund to the University of Minnesota to assess the use of unmanned aerial vehicles to monitor moose populations and changes in the ecosystem.	Appropriations law (not codified)	2017
Mississippi	Specifies that using a drone to commit the invasion of privacy offense of “Peeping Tom” activities is a felony.	Miss. Code Ann § 97-29-61	2015
Montana	Limits when information gained from the use of UAS may be admitted as evidence in any prosecution or proceeding within the state. The information can be used when it was obtained pursuant to a search warrant or through a judicially recognized warrant exception. The law defines “unmanned aerial vehicle” as “an aircraft that is operated without direct human intervention from on or within the aircraft,” not including satellites.	Mont. Code Ann. § 46-5-109	2013
	Defines “unmanned aircraft” and “unmanned aircraft system.” Prohibits using UAS to interfere with wildfire suppression efforts. Anyone who violates this prohibition is liable for the amount equivalent to the costs of the interference. The law also prohibits local governments from enacting an ordinance addressing the private use of UAS in relation to a wildfire.	Mont. Code Ann. §§ 76-13-214, 7-1-111	2017
	Specifies that information obtained from UAS is admissible as evidence during the investigation of a motor vehicle crash scene on a public roadway.	Mont. Code Ann. § 46-5-109	2019
Nevada	Appropriates \$4 million to the interim Finance Committee for allocation to the Governor’s Office of Economic Development for the Unmanned Aerial Vehicle program. The funds can only be appropriated if Nevada is selected as an FAA test site. The legislature adopted a resolution to recognize the benefits of a thriving UAS industry in the state.	Appropriations law & Resolution (not codified)	2013
	Includes UAS in the definition of aircraft and regulates the operators of UAS. Prohibits the use of weaponized UAS and prohibits the use of UAS within a certain distance of critical facilities and airports without permission. The bill specifies certain restrictions on the use of UAS by law enforcement and public agencies and requires the creation of a registry of all UAS operated by public agencies in the state. Provides certain criminal and civil penalties for the unlawful operation or use of a UAS.	Nev. Rev. Stat. §§ 493.020, 493.103 to 493.118, 493.120	2015
	Adds certain transmission lines to the definition of “critical facility” for the purpose of limiting where a UAS can be operated.	Nev. Rev. Stat. § 493.020	2017
	Directs the Office of Economic Development to establish a UAS program, including UAS registration. Authorizes the program to provide training, conduct testing and develop safety guidelines.	Nev. Rev. Stat. § 231.1525	2019
New Hampshire	Prohibits the use of UAS for hunting, fishing or trapping.	N.H. Rev. Stat. Ann. § 207:57	2015
New Jersey	Provides that UAS operation must comply with federal law. Specifies that owners or operators of critical infrastructure may apply to FAA to prohibit or restrict operation of UAS near critical infrastructure. Operating a UAS in a manner that endangers the life or property of another is an offense. It is a crime if a person endangers the safety or security of a correctional facility by operating a UAS on the premises of or in close proximity to that facility. Using a UAS to conduct surveillance of a correction facility is also a crime. It is a criminal offense to operate a UAS in a way that interferes with a first responder. A person may not use a UAS to capture wildlife. The law prohibits operation of a UAS under the influence of drugs or alcohol. Restrictions on	N.J. Stat. Ann. §§ 2C:40-27 to 2C:40- 302C:43-6.4	2017

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	UAS operation may be included in restraining orders; however, a conviction for violating a UAS law is separate from other convictions such as harassment, stalking, and invasion of privacy. The law allows for prohibition or restricted use of UAS by sex offenders. The law preempts localities from regulating UAS in any way that is inconsistent with state law.		
	Resolution urges the U.S. Congress and the President to fund the FAA's Drone Test Site Program.	Resolution (not codified)	2018
	Appropriates \$500,000 to the Department of Transportation for its UAS program.	Appropriations law (not codified)	2019
	Prohibits UAS from transferring or delivering medical cannabis.	N.J. Stat. Ann. § 24:6I-20	
New Mexico	House and Senate adopt memorials to express its desire that state entities with wildlife responsibilities stay aware of changing technologies, including drones that may affect wildlife. Also calls for the state parks division to recommend methods for to protect wildlife from drones.	Memorials (not codified)	2015
North Carolina	Prohibits the use of UAS by state and local personnel unless the use is approved by the Chief Information Officer (CIO) for the Department of Transportation. The CIO may determine there is a need to develop a UAS program within the State of North Carolina. This effort must include the CIO and the Department of Transportation Aviation Division Director.	Appropriations law (not codified)	2013
	Prohibits the purchase and use of UAS by state and local personnel, until December 31, 2015, unless the use is approved by the Chief Information Officer (CIO) for the Department of Transportation (not codified). Defines "unmanned aircraft" and "unmanned aircraft system." Prohibits any entity from conducting UAS surveillance of a person or private property and prohibits taking a photo of a person without their consent for the purpose of distributing it (N.C. Gen. Stat. § 15A-300.1). The law creates a civil cause of action for those whose privacy is violated (N.C. Gen. Stat. § 15A-300.1). Any crime committed with UAS in NC is subject to NC law (N.C. Gen. Stat. § 14-7.45). Restricts the use of infrared and thermal imaging technology by commercial and private UAS (repealed in 2017) (N.C. Gen. Stat. § 15A-300.1(d). See also N.C. Gen. Stat. § 14-401.25. All agents of the state who operate UAS must pass a knowledge and skills test (N.C. Gen. Stat. § 63-95). The law enables law enforcement to use UAS pursuant to a search warrant (N.C. Gen. Stat. § 15A-300.1). Creates several new crimes e.g., using UAS to interfere with manned aircraft (N.C. Gen. Stat. § 14-280.3), possessing an unmanned aircraft with an attached weapon (N.C. Gen. Stat. § 14-401.24), the unlawful fishing or hunting with UAS (N.C. Gen. Stat. § 14-401.24), harassing hunters or fisherman with a UAS (N.C. Gen. Stat. § 113-295), unlawful distribution of images obtained with a UAS (N.C. Gen. Stat. § 14-401.25), and operating a UAS commercially without a license (N.C. Gen. Stat. § 63-96). The law prohibits the launch or recovery of a UAS from any State or private property without consent.	N.C. Gen. Stat. §§ 15A-300.1, 15A-300.2, 14-7.45, 14-280.3, 14-401.24, 14-401.25, 63-95, 63-96, 113-295	2014
	Expands the authority of the state's Chief Information Officer to approve the purchase and operation of UAS by the state and modifies the state regulation of UAS to conform to FAA guidelines. (Some provisions not codified.)	N.C. Gen. Stat. § 63-96	2015
	Prohibits the operation of UAS within a certain distance of a correctional facility. (N.C. Gen. Stat. § 15A-300.3) The exemption that specified that certain model aircraft were not unmanned aircraft was removed (N.C. Gen. Stat. § 15A-300.1). Allows the use of UAS for emergency management activities, including incident command, area reconnaissance, search and rescue, preliminary damage assessment, hazard risk management, and floodplain mapping. The bill makes other changes to align the state law with federal law. It also exempts model aircraft from training and permitting requirements for UAS. Repealed § 300.1(d) to remove the restriction on the use of special imaging technology. (Some provisions not codified.)	N.C. Gen. Stat. §§ 15A-300.1, 15A-300.3, 63-94, 63-96	2017
	Appropriates \$4 million to the Department of Transportation for the purchase of UAS equipment, including aircraft systems, mobile command systems and technology.	Appropriations law (not codified)	2019
North Dakota	Grants \$1 million from the state general fund to a UAS test site officially designated by FAA. If selected, the law would grant an additional \$4 million to operate the site. The law created a special treasury fund to defray the expenses of the operations of the UAS test site facility.	N.D. Cent. Code § 54-60-29	2013

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	The legislature adopted a resolution to recognize the benefits of a thriving UAS industry in the state.	Resolution (not codified)	
	With exceptions, limits the use of UAS for surveillance. Prohibits domestic UAS use in private surveillance without the express, informed consent of either the surveilled person or the landowner of property on which the surveilled person is present. Person authorized to conduct surveillance must document use; any images or other UAS-collected data lawfully obtained must be deleted after 90 days unless there is a reasonable and articulable suspicion the images or data contain evidence of a crime or are relevant to an ongoing investigation or trial. The law prohibits arming a UAS with a lethal weapon including by law enforcement.	N.D. Cent. Code § 29-29.4-01 to -06	2015
	Executive order establishes the Northern Plains Unmanned Systems Authority to oversee operation of the UAS test site in the state	Executive order (not codified)	2016
	Adopts a resolution to support development of the UAS industry in the state, congratulates FAA on the first Beyond Visual Line of Sight Certificate of Authorization in the United States, and encourages further cooperation with FAA to integrate UAS into the national airspace.	Resolution (not codified)	2017
Ohio	Creates the aerospace and aviation technology committee, the duties of which include research and development of aviation technology including UAS.	Ohio Rev. Code § 122.98	2014
	Appropriates \$125,000 annually to support the expansion of an unmanned aviation STEM program for high school students.	Appropriations law (not codified)	2019
Oklahoma	Prohibits the operation of UAS over a critical infrastructure facility if the unmanned aircraft is less than 400 feet above ground; defines several terms related to UAS and critical infrastructure.	Okla. Stat. tit. 3, § 322	2016
Oregon	Defines a drone as an unmanned flying machine, not including model aircraft. The law allows law enforcement agencies to use UAS if they obtain a search warrant, with exceptions including for training purposes. Requires that a drone operated by a public body be registered with the Oregon Department of Aviation (DOA), which shall keep a registry of drones operated by public bodies. The law grants the DOA rulemaking authority to implement these provisions. It also creates new crimes and civil penalties for mounting weapons on drones and interfering with or gaining unauthorized access to public drones. Creates a cause of action for landowners to exclude UAS flights below 400 feet above their property, and obtain treble damages, if the UAS operator previously flew over the property at least once and the landowner told the operator not to do so. The law also requires the DOA to report to legislative committees on the status of federal regulations and whether UAS operated by private parties should be registered in a manner similar to the requirement for other aircraft. Law prohibits local regulation of drones.	Or. Rev. Stat. §§ 837.300 to 837.390	2013
	Requires the development of rules prohibiting the use of UAS for angling, hunting, trapping, or interfering with a person who is lawfully angling, trapping, or hunting. Changes the term "drone" to "unmanned aircraft system" in statute.	Or. Rev. Stat. §§ 498.128, 837.300 to 837.390, 837.995	2015
	Modifies definitions related UAS and makes it a misdemeanor to operate a weaponized UAS. It also creates the offense of reckless interference with an aircraft through certain uses of UAS. The law regulates the use of drones by public bodies, including requiring policies and procedures for the retention of data. It also prohibits the use of UAS near critical infrastructure, including correctional facilities. The law specifies the fees for registration of public UAS.	Or. Rev. Stat. §§ 163.700, 164.885, 837.300, 837.360 837.362, 837.365, 837.372, 837.374, 837.380	2016
	Modifies the law prohibiting the weaponization of a UAS, making it a felony. It is a felony if serious physical injury is caused to another person. The law also creates an exception if the UAS is used to release a nonlethal projectile other than to injure or kill people or animals, if the UAS is used in compliance with specific authorization from the FAA. UAS may be used by law enforcement to reconstruct an accident scene. Prohibits UAS operators from flying over private property to intentionally, knowingly, or recklessly harass or annoy the owner or occupant of the property. This law does not apply to law enforcement.	Or. Rev. Stat. §§ 837.340, 837.365, 837.370	2017
	Modifies the law prohibiting the weaponization of UAS. Prohibits UAS from being designed or modified to cause, and is presently capable of causing, serious physical injury.	Or. Rev. Stat. § 837.365	2018

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	Makes it a misdemeanor offense to operate UAS to direct a laser at an aircraft, crash into aircraft, or prevent takeoff or landing of an aircraft. Directs the Department of Aviation to adopt rules maintaining records of an educational institution's use of UAS, including registration, and states that the Department shall not charge UAS registration fees to educational institutions.	Or. Rev. Stat. §§ 837.374, 837.360	2019
Penn.	Adopts a resolution that directs the Joint State Government Commission to conduct a study on the use of UAS by state and local agencies.	Resolution (not codified)	2015
	Amends statutes relating to burglary and other criminal intrusion, defines the offense of unlawful use of a UAS and provides exceptions. The law prohibits local regulation of UAS and preempts any UAS ordinance, resolution, rule or other enactment of a municipality.	18 Pa. Cons. Stat. § 3505 53 Pa. Cons. Stat. § 305	2018
Rhode Island	Gives exclusive regulatory authority over UAS to the state of Rhode Island and the Rhode Island Airport Corporation, subject to federal law.	1 R.I. Gen Laws § 1-8-1	2016
South Carolina	Provides that it is unlawful to operate a UAS within a certain distance of a Department of Corrections facility and any local detention facility without written consent. Provides penalties for this violation and requires recordkeeping of confiscated UAS.	S.C. Code Ann. §§ 24-1-300, 24-5-175	2018
South Dakota	Exempts UAS that weigh less than 55 pounds from aircraft registration requirements. (The provision exempting certain unmanned aircraft from registration was repealed in 2019). The law defines "drone" as a powered aerial vehicle without a human operator that can fly autonomously or be piloted remotely (repealed 2018). The law requires that UAS operation comply with all applicable FAA requirements. Military drones are exempt from Act to regulate Drones. The law prohibits operation of drones over the grounds of correctional and military facilities unless authorized Operation over these facilities is a misdemeanor. If a drone is used to deliver contraband or drugs to a correctional facility, the operator is guilty of a felony. The law also prohibits the intentional use of a drone to observe, photograph or record someone in a private place with a reasonable expectation of privacy and landing a drone on the property of an individual without that person's consent. Unlawful surveillance is a misdemeanor. The unlawful surveillance provisions do not apply to individuals operating a drone for commercial or agricultural purposes or to emergency management workers using a drone in their duties.	S.D. Codified Laws §§ 22-21-1, 50-11-9.1, 50-15-1 (repealed 2018), 50-15-2 to 50-15-4	2017
	Defines that aircraft include drones. Drones are further defined as a small UAS which is "any unmanned aircraft and its associated elements that is operated without the possibility of direct human intervention from within or on the aircraft, and that weighs not more than fifty-five pounds, including anything that is onboard or otherwise attached to the aircraft."	S.D. Codified Laws §§ 50-1-1, 50-11-8 (repealed 2019)	2018
Tennessee	Addresses the use of drones by law enforcement. The law authorizes law enforcement to use drones in compliance with a search warrant, to counter a high-risk terrorist attack and if swift action is needed to prevent imminent danger to life. Evidence obtained in violation of this law is inadmissible in state criminal prosecutions. Those wronged by such evidence also can seek a civil remedy.	Tenn. Code Ann. § 39-13-609	2013
	Makes it a misdemeanor for any private entity to use a drone to conduct video surveillance of a person who is hunting or fishing without their consent. It also makes it a misdemeanor for a person to use UAS to interfere with privacy—to intentionally conduct surveillance of an individual or their property. It makes it a crime to possess those images or distribute and otherwise use them. The law also identifies 18 lawful uses of UAS, including the commercial use of UAS under FAA regulations, professional or scholarly research and for use in oil pipeline and well safety.	Tenn. Code Ann. §§ 70-4-301, 70-4-302	2014
	Prohibits using a drone to capture an image over certain open-air events and fireworks displays. It also prohibits the use of UAS over the grounds of a correctional facility.	Tenn. Code Ann. § 39-13-903	2015
	Creates the crime of using a drone to fly within 250 feet of a critical infrastructure facility for the purpose of conducting surveillance or gathering information about the facility. The law clarifies that it is permissible for a	Tenn. Code Ann. §§ 39-13-902, 39-13-903	2016

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	<p>person to use a UAS on behalf of either a public or private institution of higher education, rather than just public institutions.</p> <p>Defines drone, law enforcement must obtain a search warrant to use drone to search for and collect evidence or obtain information or data. Provides an exception for use of drone without a warrant. Provides that evidence and information obtained by use of drone shall be deleted within 3 business days unless it is part of an ongoing investigation. Provides civil remedy for violation of the law.</p> <p>Prohibits UAS operations over a correctional facility. Makes it a felony offense, rather than a misdemeanor, to operate UAS over a “critical infrastructure facility,” which includes electrical systems, petroleum refineries, certain manufacturing facilities, chemical storage facilities, water treatment facilities, utilities transmission infrastructure and railroads.</p>	<p>Tenn. Code Ann. § 39-13-609</p> <p>Tenn. Code Ann. § 39-13-903</p>	<p>2018</p> <p>2019</p>
Texas	<p>The newly enacted Texas Privacy Act creates two invasion of privacy misdemeanor crimes: (1) to “use[] an unmanned aircraft to capture an image of an individual or privately owned property . . . with the intent to conduct surveillance on the individual or property captured in the image” and (2) to capture such an image and possess, disclose, display, distribute, or otherwise use it. “Image” is broadly defined. Violators also are subject civil actions by an affected landowner or tenant. Destruction of an image violating the law is a defense. The law specifies 19 exceptions (now 21 exceptions) of circumstances in which it is lawful for a UAS to capture images, e.g., use to capture images of “public real property or a person on that property”; use to capture images with the subject’s consent; use in airspace designated as an FAA test site; use in connection with a valid search or arrest warrant; and use in oil pipeline safety and rig protection. The Department of Public Safety is directed to adopt rules for use of UAS by law enforcement and law enforcement agencies in communities of over 150,000 people are required to submit annual reports on their use.</p> <p>Two resolutions were adopted addressing the legislative procedure needed to enact the new Texas Privacy Act.</p>	<p>Tex. Gov. Code §§ 423.001 to 423.008</p> <p>Resolutions (not codified): HR 3035 SR 1084</p>	<p>2013</p>
	<p>Bans UAS operations below 400 feet over a “critical infrastructure facility”; violation is a Class B misdemeanor. Authorizes state officials to adopt rules restricting or banning UAS operations above the State Capitol Complex, making violation of the rules a misdemeanor. Authorizes those in specified professions or engaging in certain activities to capture images using UAS in the course of those professions or activities under certain conditions.</p>	<p>Tex. Gov. Code §§ 423.002, 423.0045, 411.062</p>	<p>2015</p>
	<p>Expands the ban of UAS operations below 400 feet to UAS operations over correctional facilities and sports venues. Expands the definition of “critical infrastructure” to include structures used as part of telecommunications services, animal feeding operations, and a number of facilities related to oil and gas. Prohibits political subdivisions from regulating UAS use except use during “special events” and when the UAS is used by the political subdivision. Expands the exceptions permitting use of UAS to capture images. Specifies that only law enforcement may use UAS to captures images of real property that is within 25 miles of the U.S. border for border security purposes.</p>	<p>Tex. Gov. Code §§ 423.002, 423.0045, 423.0046, 423.009</p>	<p>2017</p>
Utah	<p>Regulates the use of UAS by state government entities. A search warrant is required for a law enforcement agency to “obtain, receive or use data” derived from the use of UAS. The law also establishes standards for when it is acceptable for an individual or other non-governmental entity to submit data to law enforcement. The law provides standards for law enforcement’s collection, use, storage, deletion and maintenance of data. If a law enforcement agency uses UAS, that agency must submit an annual report on their use to the Department of Public Safety and to publish the report on its website. The new law notes that it is not intended to “prohibit or impede the public and private research, development, or manufacture of unmanned aerial vehicles” (not codified).</p>	<p>Utah Code Ann. §§ 72-14-101, 72-14-102, 72-14-203, 72-14-204 (originally codified at 63G-18-101 to 63G-18-105) (63G-18-105 repealed in 2017)</p>	<p>2014</p>

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	Allows a law enforcement agency to use an unmanned aircraft system to collect data at a testing site and to locate a lost or missing person in an area in which a person has no reasonable expectation of privacy. It also institutes testing requirements for a law enforcement agency's use of an unmanned aircraft system.	Utah Code Ann. §§ 72-14-101, 72-14-102, 72-14-203, 72-14-204 (originally codified at 63G-18-101 to 63G-18-105) (63G-18-105 repealed in 2017)	2015
	Makes it a misdemeanor to operate a UAS within a certain distance of a wildfire. It is a misdemeanor if the UAS causes an aircraft fighting the wildfire to drop a payload in the wrong location or to land without dropping the payload. It is a felony if the UAS crashes into a manned aircraft or if it causes the manned aircraft to crash. The law increases the penalties for offenses related to operating within a certain distance of a wildfire and permits certain law enforcement officers to disable a drone that is flying in a prohibited area near a wildland fire.	Utah Code Ann. § 65A-3-2.5	2016
	Prohibits a person from intentionally, knowingly, or recklessly chasing, actively disturbing, or harming livestock through the use of UAS. Anyone who violates this law is guilty of a misdemeanor. Preempts local regulation of UAS and exempts UAS from aircraft registration in the state. Addresses UAS use by law enforcement, allowing use for purposes unrelated to a criminal investigation. Requires law enforcement to create an official record when using UAS that provides information regarding the use of the drone and any data acquired. The law makes it a misdemeanor to fly a UAS that carries a weapon or has a weapon attached. Exceptions include if a person has authorization from the FAA, the state or federal government. The law also defines safe operation of unmanned aircraft, specifying operational requirements for recreational operators. The operator must maintain visual line of sight, cannot operate within certain airspace, cannot operate in a way that interferes with operations at an airport, heliport or seaplane base, cannot operate from specified locations, and must operate below 400 feet unless it is within 400 feet of a structure. Any operator who violates these requirements is liable for any damages and law enforcement shall issue a written warning for the first violation. A second violation is an infraction and any subsequent violations are misdemeanors. The offense of criminal trespass is modified to include drones entering and remaining unlawfully over property with specified intent. The law also specifies that a person is not guilty of what would otherwise be a privacy violation if the person is operating a UAS for legitimate commercial or education purposes consistent with FAA regulations. It also modifies the offense of voyeurism, a misdemeanor, to include the use of any type of technology, including UAS, to secretly record video of a person in certain instances.	Utah Code Ann. §§ 72-10-109, 72-14-103, 72-14-104, 72-14-201, 72-14-202, 72-14-205, 72-14-206, 72-14-301, 72-14-302, 72-14-303, 72-14-401, 72-14-402, 72-14-403, 76-9-308, 76-9-402, 76-9-702.7	2017
	The legislature adopted a resolution to support the building of a NASA drone testing facility and Command Control Center and requested the Governor's support to expand Utah's UAS infrastructure.	Resolution (not codified)	
	Defines correctional facility, prohibits the operation of UAS to deliver any item to or inside the property of a correctional facility or in a manner that interferes with the operations or security of the facility. Exempts UAS operating in the course and scope of an operation of a mosquito abatement district.	Utah Code §§ 72-10-109, 72-14-304	2018
Virginia	Prohibits drone use by any state agencies "having jurisdiction over criminal law enforcement or regulatory violations" or units of local law enforcement until July 1, 2015. Numerous exceptions to the ban are provided, including enabling officials to deploy drones for Amber Alerts, Senior, Alerts, Blue Alerts, use by the National Guard, by higher education institutions and search and rescue operations. Requires the Virginia Department of Criminal Justice Services and other state agencies to research and develop model protocols for drone use by law enforcement in the state.	Temporary moratorium (not codified)	2013
	Defines unmanned aircraft and unmanned aircraft system. Requires law enforcement agencies to obtain a search warrant before using a drone for any purpose, except in limited circumstances, such as when certain alerts have been activated or when the use of UAS is necessary to alleviate immediate danger to an individual.	Va. Code Ann. § 19.2-60.1	2015

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	An executive order established a commission on UAS to study drones and their potential uses and concerns.	Executive order (not codified)	
	Prohibits the regulation of UAS by localities and prohibits individuals from entering land solely on the basis of UAS possession if otherwise not permitted to enter. The legislature appropriated \$1,000,000 to support the advancement of unmanned systems companies and development of the unmanned systems industry. In addition, it appropriated \$850,000 for the establishment of an Unmanned Aerial Systems Commercial Center of Excellence and business accelerator. Also appropriated \$1,636,493 to Virginia Tech for UAS research and development.	Va. Code Ann. § 15.2-926.3 Appropriations law (not codified)	2016
	Makes it a misdemeanor to use UAS to trespass to secretly or furtively peep, spy, or attempt to peep or spy into a dwelling or occupied building (invasion of privacy). Specifies that the fire chief or other officer in charge of a fire department has authority to maintain order at an emergency incident including the immediate airspace. Individuals who do not obey the orders of the officer in charge are guilty of a misdemeanor.	Va. Code Ann. §§ 18.2-130.1, 27-15.1, 27-15.1:1	2017
	Provides that any person who knowingly and intentionally causes any electronic device to enter the area of a dwelling house of another person with the intent to coerce, intimidate, or harass any other person, after being given notice to desist, is guilty of a misdemeanor. Also provides that a UAS may be deployed without a search warrant by a law enforcement officer, following an accident where a report is required, to survey the scene of such accident for the purpose of crash reconstruction and to record the scene by photographic or video images. Defines unmanned aircraft and unmanned aircraft system. Prohibits a political subdivision from regulating the use of a privately owned UAS; prohibits a person from entering upon public land solely on the basis of possession of a UAS unless otherwise permitted to do so; makes it a crime to commit trespass with a UAS; provides penalties.	Va. Code Ann. §§ 5.1-1, 15.2-926.3, 18.2-121.3, 18.2-324.2, 19.2-60.1	2018
	Makes it a misdemeanor offense to take off or land in violation of current Federal Aviation Administration Special Security Instructions or UAS Security Sensitive Airspace Restrictions (e.g., military and defense facilities). Allows UAS to be operated by law enforcement to survey the residence of a person subject to an arrest warrant, or to locate a person that has fled law enforcement and the officer is in active pursuit.	Va. Code Ann. §§ 18.2-121.3, 19.2-60.1	2019
Vermont	Regulates the use of drones by law enforcement, requires compliance with FAA requirements and guidelines, and requires law enforcement to annually report on the use of drones by the department. Prohibits weaponized drones. Requires the Transportation Agency on or before December 15, 2016, to make recommendations or proposals it determines necessary for the regulation of drones pursuant to Vt. Stat. Ann. tit. 20, § 4623 (not codified).	Vt. Stat. Ann. tit. 20 §§ 4621, 4622, 4623, 4624 Vt. Stat. Ann. tit. 13, § 4018	2016
	Revises provisions prohibiting the use of drones over a correctional facility or surrounding property that is easily recognizable or identifiable to a reasonable person as being a correctional facility property; establishes civil penalties; provides exceptions.	Vt. Stat. Ann. tit. 20 §§ 4621, 4625	2018
Washington	Appropriates \$300,000 to develop a UAS program at a local college.	Appropriations law (not codified)	2019
Wisconsin	Revises provisions relating to the operation and local regulation of UAS; makes technical corrections.	Wis. Stat. §§ 114.04, 114.105, 175.55	2018
	Requires law enforcement to obtain a search warrant before using drones in a place where an individual has a reasonable expectation of privacy. The law also creates two new crimes: "possession of a weaponized drone" and "use of a drone." Use of a drone is a misdemeanor prohibiting a person who, with intent, observes another person in a place where that person has a reasonable expectation of privacy. Possession of a weaponized drone is a felony.	Wis. Stat. §§ 114.04, 175.55, 941.292, 942.10, 972.113	2014

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	Prohibits using a drone to interfere with hunting, fishing, or trapping. Prohibits the operation of UAS over correctional facilities.	Wis. Stat. §§ 29.083, 29.971, 114.04, 114.045	2016
West Virginia	Prohibits hunting with a UAS.	W. Va. Code § 20-2-5	2015
	Establishes regulation for UAS, establishes misdemeanor criminal offenses for certain conduct using a UAS, provides for penalties, establishes felony criminal offenses for operating a UAS equipped with a lethal weapon, establishes felony criminal offenses for operating a UAS with the intent to cause damage or to disrupt in any way the flight of a manned aircraft. Authorizes the use of recreational drones within state parks, requires persons who intend to operate drones to register and specify where the activity will take place, provides that a superintendent may only prohibit the use of drones within a state park in certain circumstances and areas, requires the superintendent to provide a list and map of any prohibited areas, provides that participants in drone activity assume full responsibility and liability for any risk or injury thereto. Prohibits the use of a drone or unmanned aircraft to wound, harass, or transport wildlife.	W. Va. Code §§ 20-2-5, 20-5-2, 20-7-9, 61-16-1, 61-16-2	2018
Wyoming	Defines the term “operator” and defines “unmanned aircraft” to exclude small UAS weighing under 55 pounds. Requires the Wyoming Aeronautics Commission to develop rules regulating where UAS can take off and land. The commission is also permitted to develop reasonable rules regulating the operation of UAS through coordination with the UAS and local governments. The law specifies that the commission does not have the power to regulate UAS operations in navigable airspace. It also makes it unlawful to land a UAS on the property of another person, but operators can pilot a UAS over their own property.	Wyo. Stat. Ann. §§ 10-1-101, 10-3-201, 10-3-301, 10-4-303	2017

Source: GAO analysis of 2013-2019 information compiled by the National Conference of State Legislatures.

APPENDIX V: EVOLUTION OF PROPERTY RIGHTS IN AIRSPACE

To understand what property rights in airspace the law may recognize today—which, in turn, may affect the Federal Aviation Administration’s (FAA) and Congress’s authority to regulate activity within the “navigable airspace,” the “national airspace system,” and “airspace of the United States,” as discussed in Appendix I¹—it is necessary to understand the evolution of these rights. As discussed below, while property rights are traditionally governed by state law, some argue Congress or FAA have eliminated or at least preempted state law-based property rights in airspace, while others argue such rights remain in full force and have a significant impact on key UAS jurisdiction issues being debated today.

While the advent of unmanned aircraft has raised concerns about flights into the airspace above private property, similar concerns arose about manned aircraft a century ago. In both cases, new technology raised questions about the balance between individual private property rights, on the one hand, and the benefits of aviation to society, on the other hand. As the California Supreme Court described these competing interests in 1964, in the context of landowners seeking to stop commercial jet overflights but in terms similar to those used to describe UAS-related concerns today:

“The use of large and powerful aircraft has created certain annoyances: noise, vibrations, and in some cases apprehension to many people. The question as to whether an individual should have redress for such annoyances and, if so, under what theory and against whom, are very troublesome. These problems have become aggravated by the advent of jets, which are noisier . . . and which require longer and shallower glide paths. . . . On the other hand, the great public benefit, in terms of commerce, transportation, and defense, which is derived from the use of jet aircraft, is obvious.”²

As some have framed the issue: who owns the sky? Does the federal government own the airspace above the states and territories based on Congress’s declaration that the government has “exclusive sovereignty of airspace of the United States”³ or some other basis?⁴ Or do

¹ As discussed in Appendix I, Congress has provided that every “citizen of the United States has a public right of transit through the navigable airspace” and has authorized FAA to regulate “the use of the navigable airspace” in 49 U.S.C. § 40103(a)(2) and (b)(1); has directed FAA to set requirements for civil (non-government) UAS operations in the “national airspace system” in 49 U.S.C. §§ 44802 and 44807; and has declared that the U.S. Government has “exclusive sovereignty of airspace of the United States” in 49 U.S.C. § 40103(a)(1).

² *Loma Portal Civic Club v. American Airlines, Inc.*, 394 P.2d 548, 550 (Cal. 1964). In *Loma Portal*, although the court declined to stop the airlines from flying through landowners’ overlying airspace based on a traditional balance-of-equities analysis, it rejected the airlines’ threshold argument that FAA’s comprehensive regulatory scheme preempted the state court from even considering these issues. The court suggested the landowners would have been successful if they had sued the airlines for monetary damages for nuisance or trespass instead of seeking to prevent the planes from flying through their overlying airspace, or had sued the county airport owner/operator for an unconstitutional taking of their property rights in the overlying airspace in accordance with the Supreme Court’s decision in *Griggs v. Allegheny County*, 369 U.S. 84 (1962) (discussed below).

³ 49 U.S.C. § 40103(a)(1).

⁴ The courts have not resolved this issue. At least seven U.S. Supreme Court Justices have stated, in various decisions, that the federal government does not own the airspace. See *Braniff Airways v. Nebr. Bd. of Equalization and Assessment*, 347 U.S. 590, 596 (1954) (5-Justice majority rejected Congress’s assertion of U.S. airspace “sovereignty” in 49 U.S.C. § 40103(a)(1) as establishing federal ownership of the airspace; “[t]hese Federal Acts regulating air commerce are bottomed on the commerce power of Congress, not on national ownership of the airspace, as distinguished from sovereignty.”); *Massachusetts v. United States*, 435 U.S. 444, 473 (1978) (2

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landowners own at least some of the overlying airspace that runs with their parcel of land, and thus have the traditional property “bundle of rights” to control that airspace and exclude others?⁵

Questions about ownership and control of the airspace are not new. As one academic legal expert we spoke with has explained, disputes involving objects in the airspace over private property date back centuries, at least to the late 1500s and possibly back to the days of the Romans.⁶ For most of that time, such concerns were addressed by reference to the legal doctrine of *cujus est solum, ejus est usque ad coelum et ad inferos*—he who owns the soil, owns upwards unto the heavens and down to the depths.⁷ These “three-dimensional” property interests gave landowners the right to build structures on their land, for example, and to compel their neighbors to remove “trespassing” structures or tree branches overhanging onto their property—rights that remain in place today.⁸

Courts continued to apply the *ad coelum* legal doctrine as technology advanced. In 1906, for example, in the often-cited case of *Butler v. Frontier Telephone Co.*,⁹ the court ruled that installation of a telephone wire across private property, 20 feet above the land, was a permanent ouster of the landowner’s possession of his property justifying the wire’s “ejection” (removal). “Was the space occupied by the wire part of the land in the eye of the law?” the

additional Justices, dissenting, stated “[t]he United States does not ‘own’ the airspace above its territorial boundaries, although it undoubtedly has considerable authority to regulate the use of that airspace.” (citations omitted).

Department of Transportation (DOT) officials told us it is not the Department’s position that Congress’s declaration of U.S. government sovereignty of airspace of the United States in 49 U.S.C. § 40103(a)(1) gives the United States “ownership” of the navigable airspace, citing *Braniff Airways*. Rather, the provision merely excludes the exercise of sovereignty by foreign nations (but not states or localities), they said. At least one legal commentator has come to a different conclusion. See Robert A. Heverly, *The State of Drones: State Authority to Regulate Drones*, 8 Albany Gov’t L. Rev. 29, 37 (2015) (“The question of who owns the skies is oft repeated in the drone discussion. The short answer is: The United States of America owns the skies above the United States,” citing 49 U.S.C. § 40103(a)(1)).

⁵ Courts have long recognized that property is comprised of a legal “bundle of rights,” including the right to possess, exclude, use, control, and dispose. See, e.g., *United States v. General Motors Corp.*, 323 U.S. 373 (1945); *United States v. Lutz*, 295 F.2d 736 (5th Cir. 1961). The right to exclude has been recognized as “one of the most essential sticks in the bundle of rights that are commonly characterized as property.” *Dolan v. City of Tigard*, 512 U.S. 374, 384 (1994) (citation omitted). See, e.g., *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 435-36 (1982) (“The power to exclude has traditionally been one of the most treasured strands in an owner’s bundle of property rights.”); *Kaiser Aetna v. United States*, 444 U.S. 164, 179-80 (1979) (citations omitted) (the right to exclude is “so universally held to be a fundamental element of the property right”). See generally GAO, *Department of Commerce—Property Implications of Proposed Transition of U.S. Government Oversight of Key Internet Technical Functions*, B-327398 (Sept. 12, 2016), at 8-10.

⁶ See Stuart Banner, *Who Owns the Sky? The Struggle to Control Airspace from the Wright Brothers On* (Harvard Univ. Press 2008). See generally Colin Calhoun, *Low Altitude Airspace: A Property Rights No-Man’s Land*, 56 J. Air. L. & Com. 157, 161-67 (Fall 1990); Stuart Ball, *The Vertical Extent of Ownership in Land*, 76 U. Pa. L. Rev. 631 (1928); Troy A. Rule, *Airspace in an Age of Drones*, 95 B. U. L. Rev. 155, 166-69 (2015).

⁷ See, e.g., Banner, *supra* note 6, at 4-41, 69-101; *United States v. Causby*, 328 U.S. 256, 260-61, n. 5, 264, n. 9 (1946), citing 1 Coke, *Institutes of the Laws of England* (19th ed. 1832) ch. 1, § 1 (4a); 2 Blackstone, *Commentaries on the Laws of England* (Lewis ed. 1902) at 18; 3 Kent, *Commentaries on American Law* (Gould ed. 1896) at 621; *Baten’s Case*, 77 Eng. Rep. 810 (1610).

⁸ See Appendix II, discussing Restatement (Second) of Torts (1965) §§ 158, 159(a).

⁹ *Butler v. Frontier Telephone Co.*, 79 N.E. 716 (N.Y. 1906).

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court asked, and found that it was, relying on the *ad coelum* doctrine. The landowner “owned the space occupied by the wire, and had the right of the exclusive possession of that space, which was not personal property but a part of his land. . . . [S]pace above land is real estate the same as the land itself,” the court declared.¹⁰

The advent of manned flight, first by hot-air balloons and dirigibles in the 1800s, then by traditional aircraft in the early 1900s following the Wright Brothers’ famous first flight, began to change how society and the law viewed activities in the airspace. Now competing with core property rights of individuals in the airspace above their land was the desire to use the same airspace for manned flight to achieve economic progress for society as a whole. Some aviation proponents suggested enacting federal or state legislation declaring a public right of flight at a minimum altitude without liability to underlying landowners for interference with their property rights.

Some government lawyers, however, raised objections that such legislation would amount to an unconstitutional “taking” of private property without “just compensation,” in violation of the Fifth Amendment to the U.S. Constitution or its state equivalents.¹¹ To address these concerns, the lawyers suggested either following the constitutional process—by having Congress use its eminent domain power to condemn the airspace above all privately owned land in the United States and pay just compensation¹²—or amending the Constitution so landowners give up their property rights in airspace to some extent and allow an easement of passage through the airspace (thought to be a less expensive although more time consuming option than condemning airspace across the country).¹³ Neither suggestion was implemented.

In the absence of such global solutions, state courts began limiting landowners’ airspace property rights as a matter of common law, as did a number of state legislatures. In the often-cited 1923 decision in *Johnson v. Curtiss Northwest Airplane Co.*,¹⁴ for example, the first apparent civil trespass-by-airplane decision in the U.S., the court relied on the *ad coelum* doctrine but ruled that it must yield to some extent to the modern age of flight. The court declined to prohibit all plane flights over the plaintiff’s land at any altitude on the basis that they were “trespassers,” instead prohibiting only those flights below an altitude-based line in the sky of 2,000 feet above ground level, based on the state’s minimum altitude for flights in the

¹⁰ *Butler*, 79 N.E. at 718 (emphasis added).

¹¹ The Fifth Amendment authorizes the federal government to “take” private property for a public use using its eminent domain power, provided the government pays “just compensation.” U.S. Const. Amend. V. This limitation has long been recognized as applying to the states through the Fourteenth Amendment. See, e.g., *Palazzolo v. Rhode Island*, 533 U.S. 606, 617 (2001), citing *Chicago B. & Q.R. Co. v. Chicago*, 166 U.S. 226 (1897).

¹² See William R. MacCracken, *Air Law*, 57 Am. L. Rev. 98, 99 (1923), citing proposal by William Lamb, Solicitor of the Department of Commerce. MacCracken was later appointed as the first U.S. Assistant Secretary of Commerce for Aeronautics.

¹³ Eliza C. Johnson, *Legal Questions Affecting Federal Control of the Air*, U.S. Army Air Service (Washington, DC: Government Printing Office, 1921) at 13-14. Johnson was a U.S. Army Major and lawyer in the Judge Advocate General’s office advising the U.S. Army Air Service, predecessor to the U.S. Air Force.

¹⁴ *Johnson v. Curtiss Northwest Airplane Co.* (Minn. Dist. Ct. 1923), reprinted in *Current Topics and Notes*, 57 Am. L. Rev. 905, 908-911 (1923).

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plaintiff's location.¹⁵

At around the same time, the National Conference of Commissioners on Uniform State Laws, now known as the Uniform Law Commission (ULC),¹⁶ approved a model state aviation law in 1922 known as the Uniform Aeronautics Act. Instead of a line-in-the-sky approach adopted by the court in *Curtiss Northwest*, the model law took an interference-based approach. The model law explicitly recognized that a landowner “owns” the airspace above his land, but also recognized a flight easement in that airspace as long as the flights were high enough not to “interfere with the then existing use to which the land . . . or the space over the land . . . is put by the owner” and did not create imminent danger to persons or property lawfully on the ground.¹⁷

The model law seemingly declared that such an easement already existed rather than being newly created, thus avoiding the constitutional requirement for the government to pay just compensation for a Fifth Amendment taking. Although a number of Commissioners opposed the model law because they believed it changed existing law and thus was a taking of landowners’ airspace property rights, ultimately 23 states enacted it.¹⁸ According to one legal commentator, as of 2017, the model law’s declaration of landowner airspace ownership remained in force in 22 states.¹⁹

Congress addressed some of these issues to some extent when it enacted the Air Commerce Act of 1926, the first federal statute regulating air commerce, aviation, and airspace

¹⁵ The court explained, “This [*ad coelum*] rule . . . is a generality [and] . . . was adopted . . . at a time when any practical use of the upper air was not considered or thought possible The air, so far as it has any direct relation to the comfort and enjoyment of the land, is appurtenant to the land, and no less the subject of protection than the land itself, but when, as here, the air is to be considered at an altitude of two thousand feet or more, to contend that it is a part of the realty . . . is only a legal fiction, devoid of substantial merit.” *Id.*

¹⁶ The American Bar Association established the National Conference of Commissioners on Uniform State Laws in 1878. The purpose of this organization, comprised of state-appointed lawyers, judges, law professors, and other experts serving as Commissioners, was and remains to draft proposed uniform state laws, which the Commissioners then seek to have enacted by their home state legislatures.

¹⁷ The relevant provisions of the 1922 model Uniform State Law of Aeronautics stated:

“Section 3. Ownership of Space—The ownership of the space above the lands and waters of this State is declared to be vested in the several owners of the surface beneath, subject to the right of flight described in Section 4.

“Section 4. Lawfulness of Flight—Flight in aircraft over the lands and waters of this State is lawful, *unless at such a low altitude as to interfere with the then existing use to which the land or water, or the space over the land or water, is put by the owner, or unless so conducted as to be imminently dangerous to persons or property lawfully on the land or water beneath*”

See *Braniff Airways*, *supra* note 4, 347 U.S. at n. 11 (1954) (emphasis added).

¹⁸ *Braniff Airways*, *supra* note 4, 347 U.S. at 595; Banner, *supra* note 6, at 127-130.

¹⁹ Stephen J. Migala, *UAS: Understanding the Airspace of States*, 82 J. Air. & Com. 3, 60-61 (Winter 2017). The Uniform Law Commission withdrew its recommendation for enactment of the 1922 model act and other aviation model laws it had approved in 1943, because it was believed their usefulness as uniform acts had waned. See *Braniff Airways*, *supra* note 4, 347 U.S. at 596; Herzel H.E. Plaine, *State Aviation Legislation*, 14 J. Air L. & Com. 333, 335 (1947).

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management.²⁰ Enactment followed debate about which of Congress’s constitutional powers authorized such legislation; Congress determined to rely on its power under the Commerce Clause.²¹ Although the explicit language of the Commerce Clause only authorizes federal regulation of *interstate*, not *intrastate*, commerce (Congress may regulate commerce “among the Several States”), the Supreme Court by that time had interpreted the clause broadly to include intrastate acts that affect interstate commerce.²² Congress thus authorized flight within the zone where it believed interstate commerce or activities affecting interstate commerce occurred—“navigable airspace”—which it defined as “airspace above the minimum safe altitudes of flight prescribed by the Secretary of Commerce”²³

The 1926 Air Commerce Act also declared a “public right of freedom of . . . air navigation” through this navigable airspace, although initially this right was limited to *interstate* flights.²⁴ Some believed this public navigation easement was a “taking” of landowners’ property rights in airspace, the same concern expressed several years earlier when legislation was first discussed, as noted above. This public navigation easement also left unclear what landowners and state and local governments could do regarding flights *below* navigable airspace.²⁵

Litigation continued in the state courts, with landowners obtaining varying results in suits for aerial trespass and/or nuisance based on their overlying airspace property rights.²⁶ In 1934, the American Law Institute issued its first “restatement” of the common law of aerial trespass, which was similar to the ULC’s 1922 model Uniform Aeronautics Act described above.²⁷ The Restatement declared that landowners had property rights in their overlying airspace but also that aircraft had a “privilege” to trespass through the airspace as long as the flight was

²⁰ Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568 (1926 Air Commerce Act).

²¹ Other options reportedly considered included the Admiralty and Maritime Clause, U.S. Const. Art. III, sec. 2, cl. 1; the Treaty Clause in conjunction with the Necessary and Proper Clause, U.S. Const. Art. VI, cl. 2; Art. I, sec. 8, cl. 18; and the War Powers Clause, U.S. Const. Art. I, sec. 8, cl. 11. Some believed a constitutional amendment was needed due to concerns about the inadequacy of these existing powers. See *generally* Banner, *supra* note 6, at 136-68; see also *Swetland v. Curtiss Airports Corp.*, 41 F.2d 929, 938 (N.D. Ohio 1930).

²² See, e.g., *Swift & Co. v. United States*, 196 U.S. 375, 398-99 (1905) (allowing federal regulation of intrastate acts that are part of a “current of commerce”); *Houston, East & West Texas Ry. Co. v. United States*, 234 U.S. 342, 251-52 (1914) (allowing federal regulation of intrastate acts “related” to interstate acts); *Railroad Comm’n of Wisconsin v. Chicago, Burlington & Quincy Railroad Co.*, 257 U.S. 563, 588 (allowing “incidental” regulation of intrastate acts needed for effective interstate regulation).

²³ 1926 Air Commerce Act § 10, 44 Stat. at 574.

²⁴ *Id.* (“[S]uch navigable airspace shall be subject to a public right of freedom of *interstate* and foreign air navigation in conformity with the requirements of this Act.”) (emphasis added).

²⁵ Banner, *supra* note 6, at 162-68.

²⁶ See, e.g., *Smith v. New England Aircraft Co.*, 170 N.E. 385 (Mass. 1930) (aircraft trespass occurs in lower airspace (100 feet)); *Swetland v. Curtiss Airports Corp.*, 55 F.2d 201 (6th Cir. 1932) (aircraft trespass does not occur in upper airspace (above 500 feet)).

²⁷ The American Law Institute (ALI) was established in 1923 to mitigate uncertainty and complexity in the law. Today its members are noted lawyers, law professors, judges, and other legal experts. ALI has issued a series of “restatements” of the law in key areas to clarify and synthesize the common law in various subject areas. While Restatements are relied upon as authoritative by many courts and practitioners, they are not the law and have no independent legal effect.

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conducted in a reasonable manner and at such a height as not to unreasonably interfere with the landowner's enjoyment of his land or airspace.²⁸

Congress amended the public navigation easement provision of the 1926 Air Commerce Act in the 1938 Civil Aeronautics Act, giving the public a right of transit through navigable airspace for intrastate as well as interstate flights.²⁹ Litigation continued regarding what property rights landowners had in lower-altitude airspace above their land, with courts again reaching differing conclusions. Some courts referenced the minimum flight altitudes set by the federal government in defining navigable airspace, while other courts did not.

Ultimately these airspace property rights issues reached the U.S. Supreme Court in 1946, in the landmark case of *United States v. Causby*.³⁰ In *Causby*, the Army and Navy had leased a local airport near a family-owned chicken farm and residence in North Carolina and their bombers and other military aircraft continuously took off and landed directly over the family's property. The flights were frequent, loud, and low, as low as 83 feet above the land and 18 feet above the trees. The flights caused the death of so many chickens that the property could no longer be used for the business and also adversely affected the well-being of the family. Unable to file a trespass suit against the U.S. government because Congress had not yet waived the federal government's sovereign immunity from such suits,³¹ the family instead sued under the Fifth Amendment, seeking just compensation for the government's taking of its property based on the military's flights through the airspace above their land.

The government argued it was not liable because Congress had granted all citizens a right of transit through the navigable airspace, that is, airspace above the minimum safe altitudes of flight prescribed by the Civil Aeronautics Authority, predecessor to FAA. Because the government alleged its flights occurred within that airspace and did not physically invade what the government asserted was the landowners' only private property—the land—there was no "taking," the government argued.

The Court, acknowledging "[t]his is a case of first impression,"³² ruled against the United States. It found the government had taken the Causbys' property and owed them just compensation. The Court rejected the government's assertion that its flights had occurred within statutory "navigable airspace," noting that even though the Civil Aeronautics Authority had approved the particular takeoff and landing glide path, the statutory definition was restricted to safe altitudes of *flight*, not safe altitudes of *takeoffs and landings*. If the government had defined the safe *flight* altitude as 83 feet—the lowest takeoff/landing altitude involved in *Causby*—that regulation might

²⁸ *Restatement of Torts* § 194, Travel Through Air Space (1934).

²⁹ Civil Aeronautics Act of 1938, Pub. L. No. 75-706, § 3, 52 Stat. 973, 980 (1938) ("There is hereby recognized and declared to exist in behalf of any citizen of the United States a public right of freedom of transit in air commerce through the navigable air space of the United States."). The 1938 Act also made non-substantive changes to the definition of navigable airspace, to read "airspace above the minimum safe altitudes of flight prescribed by the Civil Aeronautics Authority." *Id.*, at § 1(24).

³⁰ *United States v. Causby*, 328 U.S. 256 (1946).

³¹ Congress enacted the Federal Tort Claims Act in 1946, waiving the federal government's sovereign immunity from certain common law tort claims in certain circumstances.

³² *Causby*, *supra* note 30, 328 U.S. at 258.

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be “invalid[],” the Court said.³³ But even if Congress had defined navigable airspace to include takeoff and landing pathways (which it later did, as discussed below), and even if the flights were within that airspace in compliance with federal law, the Court said—and the government agreed—that flights so close to private land as to make it uninhabitable would still constitute a taking.

Writing for the Court, Justice Douglas agreed with previous rulings of some lower courts that the historic common law *ad coelum* doctrine “has no place in the modern world.”³⁴ Paraphrasing Congress and agreeing with the government on this point, he declared:

“The air is a public highway . . . Were that not true, every transcontinental flight would subject the operator to countless trespass suits. Common sense revolts at the idea. To recognize such private claims to the airspace would clog these highways, seriously interfere with their control and development in the public interest, and transfer into private ownership that to which only the public has a just claim.”³⁵

But while Justice Douglas rejected property rights in airspace as extending as far up as “the periphery of the universe,” he found a landowner does still “own []at least as much of the space above the ground as he can occupy or use in connection with the land.” On the specific facts of *Causby*, the Court found this meant at least up to the government’s 83-foot altitude flights, which the Court found were within the “immediate reaches” of the family’s land. As the Court explained:

“We have said that the airspace is a public highway. Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have *exclusive* control of the *immediate reaches of the enveloping atmosphere*. Otherwise buildings could not be erected [and] trees could not be planted . . . *The landowner owns at least as much of the space above the ground as he can occupy or use in connection with the land.* . . . The fact that he does not occupy it in a physical sense—by the erection of buildings and the like—is not material. . .

³³ The Court stated, “[t]he fact that the path of glide taken by the planes was that approved by the Civil Aeronautics Authority does not change the result. The navigable airspace which Congress has placed in the public domain is ‘airspace above the minimum safe altitudes of flight prescribed by the Civil Aeronautics Authority.’ . . . *If that agency prescribed 83 feet as the minimum safe altitude, then we would have presented the question of the validity of the regulation.* But . . . [t]he minimum [flight altitude] prescribed by the Authority is 500 feet during the day and 1,000 feet at night for air carriers . . . and from 300 feet to 1,000 feet for other aircraft . . . The Civil Aeronautics Authority has, of course, the power to prescribe air traffic rules. But Congress has defined navigable airspace only in terms of one of them—the minimum safe altitudes of flight.” *Causby*, 328 U.S. at 263-64 (citations omitted) (emphasis added).

Some legal commentators have suggested the *Causby* Court meant that a federal regulation setting a minimum altitude of flight within the “immediate reaches” of a landowner’s property would exceed Congress’s (and thus the agency’s) Commerce Clause power. See, e.g., Migala, *supra* note 19, at 78; Maxwell Mensinger, *Remodeling “Model Aircraft”: Why Restrictive Language That Grounded Unmanned Industry Should Cease to Govern It*, 100 Minn. L. Rev. 405, 415-16 (Nov. 2015). Another legal commentator seems to suggest the Court meant that such a regulation would be an unconstitutional taking. See Calhoon, *supra* note 6, at 171-72. It is also possible the Court simply meant a regulation specifying what was a safe *takeoff/landing* altitude as a safe *flight* altitude would exceed the agency’s *statutory* authority to set safe flight altitudes, without reference to whether that would constitute a taking.

³⁴ *Causby*, *supra* note 30, 328 U.S. at 261.

³⁵ *Id.*

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While the owner does not in any physical manner occupy that stratum of airspace or make use of it in the conventional sense, he does use it in somewhat the same sense that space left between buildings for the purpose of light and air is used. The *superadjacent airspace* at this low altitude is so close to the land that continuous invasions of it affect the use of the surface of the land itself. *We think that the landowner, as an incident to his ownership, has a claim to it and that invasions of it are in the same category as invasions of the surface. . . . [T]he damages . . . were a product of a direct invasion of [the Causbys'] domain.*³⁶

The Court concluded by holding that the government had taken an “easement of flight”³⁷ in the Causbys’ immediate reaches property, leaving open the precise boundaries of that property: “[t]he airspace, *apart from the immediate reaches above the land*, is part of the public domain. We need not determine at this time what those precise limits are.”³⁸ As for what government acts constitute a taking of that “immediate reaches” airspace requiring compensation, the Court declared that “[f]lights over private land are . . . a taking . . . [if] they are so low and so frequent as to be a direct and immediate interference with the enjoyment and use of the land.”³⁹

Justice Black, dissenting, joined by Justice Burton, disagreed with the Court’s analysis and believed there was no government taking. As Justice Black explained, “the Constitution has heretofore never been given so sweeping a meaning. . . . It is inconceivable to me that the Constitution guarantees that the airspace of this Nation needed for air navigation is owned by the particular persons who happen to own the land beneath to the same degree as they own the surface below. . . . Old concepts of private ownership of land should not be introduced into the field of air regulation.”⁴⁰

Following *Causby*, in 1958 Congress expanded the statutory definition of “navigable airspace” to include airspace necessary to ensure safe takeoffs and landings.⁴¹ But as Justice Douglas had predicted in *Causby*, the Court again ruled, in *Griggs v. Allegheny County*,⁴² that aircraft conducting low-altitude takeoffs and landings above private land that interfered with landowners use and enjoyment of their property were an unconstitutional taking. This time, Justice Douglas, again writing for the Court, held the county owner/operator of the airport liable for the taking and payment of just compensation, determining the county had appropriated a flight easement in the airspace above the neighboring landowners’ land by authorizing takeoffs and landings as low as 30 feet above their houses. Even though the flights occurred in what Congress had now

³⁶ *Causby*, *supra* note 30, 328 U.S. at 264-65 (emphasis added) (citations omitted).

³⁷ Flights easements, also known as aviation easements, are discussed immediately below regarding the *Griggs* decision.

³⁸ *Causby*, *supra* note 30, 328 U.S. at 266 (emphasis added).

³⁹ *Id.*

⁴⁰ *Causby*, *supra* note 30, 328 U.S. at 270-71, 274 (citations omitted) (Black, J., dissenting).

⁴¹ Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731 (1958), as amended and recodified, 49 U.S.C. §§ 40101 *et seq.* The Federal Aviation Act was passed following a series of fatal collisions between civil and military aircraft operating under separate flight rules, to which Congress responded by creating and enforcing one unified system of flight rules under the control of the Federal Aviation Agency, later renamed as the Federal Aviation Administration as part of the creation of the Department of Transportation.

⁴² *Griggs v. Allegheny County*, 369 U.S. 84 (1962).

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defined as “navigable airspace,” the Court, relying on *Causby*, found that low-altitude airspace was still part of the underlying landowners’ property. Affirming the reasoning of its *Causby* ruling 16 years earlier, the *Griggs* Court explained that “the use of the land presupposes the use of some of the airspace above it” and “invasion of the ‘superadjacent airspace’” often adversely affects use of the underlying land to an extent that it constitutes a taking of private property.⁴³

The *Griggs* Court rejected the county’s argument that it was the airlines—which had conducted the flights⁴⁴—or the federal government (the Civil Aeronautics Administration)—which had approved the airport’s runway plans and required the county to acquire flight easements in neighboring airspace needed for takeoff and landing—that were legally responsible. Instead, Justice Douglas found the county responsible because a federal statute placed the onus on airport sponsor-grantees such as the county to acquire “good title” to airport landing areas. “In designing [the airport, the county] had to acquire some private property. Our conclusion is that by constitutional standards it did not acquire enough,” Justice Douglas concluded.⁴⁵

Justice Black and Justice Frankfurter, dissenting, believed it was the United States, not the county, that had taken the landowners’ airspace property rights. Justice Black, who had dissented in *Causby*, now agreed that under the binding precedent of that decision, the flights in *Griggs* had caused a taking. But he reasoned the United States was responsible because it was the federal Civil Aeronautics Administrator who had approved the county’s runway locations and “Congress . . . [already] appropriated the airspace necessary for planes to fly at high altitudes . . . [and] the low altitude airspace essential for . . . approach and take off from airports.”⁴⁶ “There is no . . . duty on the local community to [again] acquire flight airspace,”

⁴³ *Griggs*, *supra* note 42, 369 U.S. at 84 (citations omitted).

⁴⁴ The landowners had originally sued the airlines as well, for trespass. See *Gardner v. County of Allegheny*, 114 A.2d 491 (Pa. 1955); *Gardner v. County of Allegheny*, 142 A.2d 187 (Pa. 1958). The landowners later dismissed the airlines from their suit, apparently for strategic reasons.

⁴⁵ *Griggs*, *supra* note 42, 369 U.S. at 90. The *Griggs* Court was interpreting former 49 U.S.C. § 1108(d), which authorized the Civil Aeronautics Administration, predecessor to FAA, to approve public airport development grants only if a public agency held or acquired “good title” to the airport “landing area.” See Pub. L. No. 79-377, sec. 9(d), 60 Stat. 170, 175 (1946), formerly codified at 49 U.S.C. § 1108(d). *Griggs* interpreted this title requirement as including title to what it called “air easements” or “navigation easements,” which *Causby* had called “flight easements” and which are today known as “avigation easements.” Avigation easements continue to be recognized today as a property interest with market value. See, e.g., Wisconsin Dept. of Transportation, *Avigation Easements* (May 2012), available at <https://wisconsindot.gov/Documents/doing-bus/aeronautics/resources/av-ease.pdf> (last visited Sept. 1, 2020); Gary David Strauss, *Valuation of Avigation Easements*, Right of Way (March/April 2012); Stephon B. Bagne, *Broad Rights of an Avigation Easement*, Right of Way (May/June 2014).

As discussed in Appendix I, the same statutory “good title” restriction applies to DOT today—it may only approve an airport development grant if the sponsor, a public agency, or the Government holds or will acquire “good title” to the airport landing, takeoff, and maneuvering areas. See 49 U.S.C. § 47106(b)(1). Seemingly consistent with *Griggs*, FAA has implemented 49 U.S.C. § 47106(b)(1) in its Airport Improvement Program (AIP), and property acquisition requirements in the Uniform Relocation Assistance and Real Property Acquisition Policies Act, 42 U.S.C. §§ 4601 *et seq.*, as including avigation easements. FAA’s AIP directives state that avigation easements are “real property interests” and “a conveyance of airspace,” and thus airport sponsors must pay “just compensation” to acquire them and may need to use formal “taking” (condemnation) proceedings under the government’s eminent domain power. DOT officials declined to indicate to us whether they agree with *Griggs* or to identify the basis for FAA’s inclusion of avigation easements in its AIP property requirements, explaining it is currently considering such issues. Appendix I, Part D.1.a.(ii) provides additional detail.

⁴⁶ *Griggs*, *supra* note 42, 369 U.S. at 92 (Black, J. dissenting).

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Justice Black explained, because “[h]aving taken the airspace over Griggs’ private property for a public use, it is the United States which owes just compensation.”⁴⁷

Relying on *Causby* and *Griggs*, courts have continued to recognize landowners’ low-altitude airspace property rights in the context of manned aviation, finding government takings of private property. In *McCarran International Airport v. Sisolak*,⁴⁸ for example, the Nevada Supreme Court held a county’s 150-foot height limit on development near a local airport was an unconstitutional taking of a landowner’s overlying airspace. And in *Brenner v. New Richmond Regional Airport Commission*,⁴⁹ the court found a landowner had a property interest in the airspace above his land, bounded by the surface dimensions of the land up to approximately the height of government-defined minimum safe altitudes of flight, and physical invasions of that superadjacent airspace by aircraft overflights may be an unconstitutional taking.

Courts relying on *Causby* also have continued to recognize low-altitude property rights in airspace in upholding state law claims for aerial trespass by aircraft. As discussed in Appendix II, under Restatement (Second) of Torts § 159(2), there is a trespass if an aircraft enters the “immediate reaches” of a landowner’s overlying airspace and this “interferes substantially with the other’s use and enjoyment of his land.” The court in *Schronk v. Gilliam*,⁵⁰ for example, relying in part on *Causby*, found that “[a]bsent legislation, the aeronaut’s rights generally terminate at, and the landowner’s exclusive dominion extends at least to the altitude of the owner’s existing and effective reasonable use of the land.” The court therefore found a crop duster flying in the “immediate reaches” over the plaintiff’s land, which inadvertently sprayed poison intended for other crops on the plaintiff’s crops, had committed a trespass.

Most recently, the Uniform Law Commission’s Uniform Tort Law Relating to Drones Act Drafting Committee worked from 2017 until January 2020, when its work was suspended, to draft a model state aerial trespass statute specific to drones. As discussed in Appendix II, the Committee’s final June 2019 draft, derived from *Causby*, recognized aerial trespass if drones flying in a landowner or land possessor’s overlying airspace cause “substantial interference with the use and enjoyment of the property” based on a multiple-factor test.

Finally, the U.S. Supreme Court has recognized airspace private property rights in non-aviation contexts as well. One of the most notable examples is the Court’s seminal decision in *Penn Central Transp. Co. v. City of New York*.⁵¹ Penn Central owned the Grand Central Terminal railroad station, a designated landmark in New York City. It proposed to build a 55-story office building above the terminal using its airspace rights—known as “transferable development rights” under New York City’s zoning laws. Then and today, those laws enable landowners who have not developed their properties to the full permitted height to transfer their unused rights to

⁴⁷ *Griggs*, *supra* note 42, 369 U.S. at 94 (Black, J., dissenting).

⁴⁸ *McCarran Intern. Airport v. Sisolak*, 137 P.3d 1110 (Nev. 2006).

⁴⁹ *Brenner v. New Richmond Regional Airport Com’n*, 816 N.W. 2d 291 (Wisc. 2012).

⁵⁰ *Schronk v. Gilliam*, 380 S.W.2d 743, 744-45 (Ct. Civ. App. Tex. 1964).

⁵¹ *Penn Central Transp. Co. v. City of New York*, 438 U.S. 104 (1978).

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another land parcel.⁵² When the New York City Landmarks Preservation Commission disapproved Penn Central’s construction plans, the company sued the city, claiming the Commission’s disapproval was a Fifth Amendment taking of its airspace property for which it was owed just compensation.

Relying in part on *Causby*, the Supreme Court did not question that Penn Central had “valuable” “air rights” constituting “property interests” in the airspace above the Terminal.⁵³ To determine whether the city had “taken” this Penn Central property, the Court looked to *Causby* and *Griggs*. In those cases, the *Penn Central* Court noted, there had been a government “acquisition” and “appropriat[ion]” of property in part because there was a “physical invasion” of the airspace by the aircraft.⁵⁴ The *Penn Central* Court also distinguished the case before it from *Portsmouth Co. v. United States*,⁵⁵ where the Court had found an unconstitutional taking based on the U.S. military’s repeated firing of gunshots over private property. The *Penn Central* Court concluded New York City had not taken the airspace over Grand Central Terminal in part because there was no physical invasion of the airspace causing an interference with property rights as in *Causby*, *Griggs*, and *Portsmouth*, and because viewing Penn Central’s property interests as a whole—airspace plus the underlying land and structures—the Court believed the company could still earn what the Court said was a reasonable return on its investment. Thus the Supreme Court reaffirmed the existence of property rights in airspace above private property but determined the government’s actions in the case before it did not rise to the level of a taking.

The Supreme Court again recognized airspace property rights, and found a government taking of those rights based on physical invasion and occupation, in *Loretto v. Teleprompter Manhattan CATV Corp.*⁵⁶ Relying on *Causby* and *Penn Central*, *Loretto* held that a New York City ordinance compelling landlords to allow placement of small cable television boxes and cable on their building rooftops and exterior walls was a so-called regulatory taking. The Court noted the equipment not only occupied part of the rooftop surface but also the “space immediately above” that surface, which it found constituted part of the landlord’s property. Quoting *Causby*, the *Loretto* Court said it was “constitutionally irrelevant” whether the landlord had previously occupied that airspace because “a ‘landowner owns at least as much of the space above the ground as he can occupy or use in connection with the land.’”⁵⁷

The *Loretto* Court also clarified that the relatively small size of the cable equipment “invading”

⁵² Sale of air rights in the U.S. occurred as early as the 1920s and 1930s in urban locations such as New York, Chicago, Philadelphia, Boston, Baltimore, and Cleveland. See Banner, *supra* note 6, at 32-33. Regarding the current recognition and use of transferable development rights in New York City, see New York City Department of Planning, *A Survey of Transferable Development Rights Mechanisms in New York City* (Feb. 26, 2015), available at <https://www1.nyc.gov/site/planning/plans/transferable-development-rights/transferable-development-rights.page> (last visited Sept. 1, 2020); Norman Marcus, *Air Rights in New York City: TDR, Zoning Lot Merger and the Well-Considered Plan*, 50 Brook. L. Rev. 867 (1984).

⁵³ *Penn Central*, *supra* note 51, 438 U.S. at 135-37.

⁵⁴ *Penn Central*, *supra* note 51, 438 U.S. at 124, 128, 135 (citations and quotations omitted).

⁵⁵ *Portsmouth Co. v. United States*, 260 U.S. 327 (1922).

⁵⁶ *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982).

⁵⁷ *Loretto*, *supra* note 56, 458 U.S. at 438, n. 16, quoting *Causby*, 328 U.S. at 264.

Appendix V – Evolution of Property Rights in Airspace

and “occupying” the landlord’s property (approximately 1-½ cubic feet) did not affect its takings analysis. “[W]hether the installation is a taking does not depend on whether the volume of space it occupies is bigger than a breadbox,” the Court explained.⁵⁸ The Court did consider relevant, however, that the invasion and occupation was by a “stranger,” which it said resulted in “a special kind of injury . . . [P]roperty law has long protected an owner’s expectation that he will be relatively undisturbed at least in the possession of his property. To require, as well, that the owner permit another to exercise complete dominion literally adds insult to injury.”⁵⁹ On a related point, the Court concluded that “the government does not have unlimited power to redefine property rights . . . [A] State, by *ipse dixit*, may not transform private property into public property without compensation.”⁶⁰

⁵⁸ *Loretto*, *supra* note 56, 458 U.S. at 438, n. 16.

⁵⁹ *Loretto*, *supra* note 56, 458 U.S. at 436.

⁶⁰ *Loretto*, *supra* note 56, 458 U.S. at 439 (citation and quotations omitted).

APPENDIX VI: LIST OF INTERVIEWEES

For this report on federalism and personal privacy issues related to the integration of unmanned aircraft systems (UAS) into the national airspace system, conducted pursuant to sections 373 and 358 the FAA Reauthorization Act of 2018, Public Law No. 115-524, we spoke with the 66 individuals, entities, and organizations listed below. We selected the federal agencies based in part agencies that were identified in these mandates (the Department of Transportation (DOT) including the Federal Aviation Administration (FAA), as well as the National Telecommunications and Information Administration), as well as agencies authorized to enforce requirements relevant to the subjects of the mandates (the Department of Justice and the Federal Trade Commission).

We also selected interviewees based on their representation of constituencies identified in the mandates (state, local, and tribal governments) and organizations and individuals recommended by those constituencies, as well as their status as Lead Participants in DOT's UAS Integrated Pilot Program. In addition, based on our prior work relating to UAS matters and consumer data privacy matters, we spoke with privacy advocate groups and with large and small UAS industry manufacturers, UAS operators, UAS traffic management system developers, and trade associations representing these and other UAS industry members, as well as with individuals recommended by those entities.

In addition, we spoke with academic legal experts, attorneys and consultants, state model-law drafting commission members and affiliated individuals, and others knowledgeable about aviation and UAS matters, property law matters, and constitutional law matters, who we identified through our prior work as well as through literature searches and recommendations.

Finally, in order to obtain a diverse range of geographic views, we sought out individuals in the above-mentioned categories located in different parts of the country, and we spoke with various individuals and organizations that actively reached out to us to speak about the matters addressed in the mandates.

Industry

AirMap
Amazon
Boeing
Digital Design & Imaging Service, Inc./
AirPhotosLIVE.com
DJI Technology
Federal Express
Google Wing
Kittyhawk
PrecisionHawk
United Parcel Service

Industry Groups

Academy of Model Aeronautics (AMA)
Aerospace Industries Association
Association for Unmanned Vehicle Systems
International (AUVSI)
Commercial Drone Alliance
Consumer Technology Association

Appendix VI – List of Interviewees

	CTIA Small UAV Coalition ¹
Public Safety Groups	National Council on Public Safety UAS
Attorneys and Consultants	Baker & McKenzie LLP ² Cozen O'Connor Crowell & Moring LLP DLA Piper LLP Reginald C. Govan ³ Hogan Lovells US LLP Holland & Knight LLP JHW Unmanned Solutions LeClairRyan David E. Schaffer Associates LLC Steptoe & Johnson LLP Wiley Rein LLP Wilkinson Barker Knauer LLP
Academics	Loretta Alkalay, Adjunct Professor, Vaughn College of Aeronautics and Technology Stuart Banner, Professor of Law, University of California, Los Angeles Troy A. Rule, Professor of Law, Sandra Day O'Connor College of Law, Arizona State University
State-Law Drafting Advisory Organizations	Robert A. Heverly, Associate Professor of Law, Albany Law School, Union University; Reporter, National Conference of Commissioners on Uniform State Laws (Uniform Law Commission), Tort Law Relating to Drones Drafting Committee D. Joe Willis, Commissioner, Conference of Commissioners on Uniform State Laws (Uniform Law Commission); Member, ULC Uniform Tort Law Relating to Drones Act Drafting Committee
Public Interest and Public Policy Groups	Cato Institute Electronic Frontier Foundation Electronic Privacy Information Center Future of Privacy Forum
Federal Government Agencies	Department of Commerce, National Telecommunication and Information Administration Department of Justice

¹ One of the individuals we interviewed speaking on behalf of the Small UAV Coalition is a former Chief Counsel of the Federal Aviation Administration.

² One of the individuals we interviewed is a former Chief Counsel of the Federal Aviation Administration.

³ Former Chief Counsel of the Federal Aviation Administration.

Appendix VI – List of Interviewees

Department of Transportation
Federal Aviation Administration
Federal Trade Commission

**State Government Agencies
and Entities**

Alabama Department of Transportation
Kansas Department of Transportation (DOT
Integrated Pilot Program Lead Participant)
National Conference of State Legislatures
National Governors Association
North Carolina Department of Transportation (DOT
Integrated Pilot Program Lead Participant)
North Dakota (Policy Advisor to the Governor)
Rhode Island House of Representatives (Senior Deputy
Majority Leader)

**Local Government Agencies
and Entities**

Burbank, California (City Attorney)
San Diego, California (DOT Integrated Pilot Program
Lead Participant)
California League of Cities
Fort Collins, Colorado (Mayor)
Pinecrest, Florida (Councilmember)
Springfield, Illinois (Mayor)
National League of Cities
Stone Harbor, New Jersey (Borough Prosecutor)
New York City Police Department (Chief of Department;
Deputy Commissioner of Intelligence and
Counterterrorism)
United States Conference of Mayors
Spokane, Washington (Council President)

Tribal Government Entities

Cherokee Nation
Choctaw Nation of Oklahoma (DOT Integrated Pilot
Program Lead Participant)
National Congress of American Indians