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Drones in the National Airspace

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DRONES IN THE NATIONAL AIRSPACE

TIMOTHY T. TAKAHASHI, Ph.D.*

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ABSTRACT

Some visionaries are planning a robotic future where drone aircraft will home deliver your take-out burrito. Unfortunately, the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012 (the Act) does not provide a durable framework to welcome the “arrival of the drones.” This review contrasts elements of the Act in context with the historical development of aviation law. The author advocates a framework that enables robotic aircraft to enter the national airspace through modification of existing government regulations, specifically repudiating the idea that drones represent a new paradigm that can only flourish in the absence of regulation. Government should continue to employ a system founded on proven engineering standards, empowered by long-standing statutes, to carefully scrutinize the inherent engineering of drone aircraft prior to issuing an “airworthiness certificate.” These inspections exist first and foremost to protect our citizens from aerially-inflicted harm to their person or property. To that end, government should continue to certify all “airmen” in-

volved in the operation of flying machines. In order to facilitate public acceptance of drones, these aircraft must safely and reliably operate in accordance with the law.

INTRODUCTION

“PLANES DO NOT WANDER about in the sky like vagrant clouds. They move only by federal permission, subject to federal inspection, in the hands of federally certified personnel and under an intricate system of federal commands.”¹

On Tuesday, February 14, 2012, President Barack Obama signed the FAA Modernization and Reform Act of 2012 into law.² This compromise bill, brokered between House Speaker John Boehner (R-Ohio) and Senate Majority Leader Harry Reid (D-Nevada), ended many years of bitter stalemate over the future of the FAA.³ Although this bill passed the House of Representatives on a largely Republican party-line vote, it had broad bipartisan support in the Senate.⁴ The Act funds the FAA through 2015.⁵ Among its many provisions, this bill commands the FAA to expedite procedures to allow robotic drone aircraft to operate within the national airspace.⁶

In March 2012, the FAA announced plans to “integrate unmanned aircraft into the national airspace by 2015.”⁷ Using a “request for comment” published in the Federal Register, the FAA solicited information to help it “select six places across the country that will be used [to test] how to safely fly drones in the same area as traditional planes.”⁸ In May 2012, the FAA set forth a streamlined process to issue “Certificates of Waiver or

¹ *Nw. Airlines v. Minnesota*, 322 U.S. 292, 303 (1944) (Jackson, J., concurring).

² Keith Laing, *Obama Signs \$63B FAA Funding Bill into Law*, HILL (Feb. 14, 2012, 4:59 PM), <http://thehill.com/blogs/transportation-report/aviation/210649-obama-signs-63b-faa-funding-bill-into-law>; see also FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

³ *Id.*

⁴ See *House Vote 33—H.R.658: On Agreeing to the Conference Report*, N.Y. TIMES (Feb. 3, 2012), <http://politics.nytimes.com/congress/votes/112/house/2/33>; see also *Senate Vote 15—H.R.658: On the Conference Report*, N.Y. TIMES (Feb. 6, 2012), <http://politics.nytimes.com/congress/votes/112/senate/2/15>.

⁵ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

⁶ Brian Bennett, *FAA Moves Toward Allowing Unmanned Drones in U.S. Airspace*, L.A. TIMES (Mar. 8, 2012), <http://articles.latimes.com/2012/Mar/08/news/la-pn-faa-drones-us-airspace-20120308> [hereinafter Bennett, *FAA Moves Toward Allowing Drones*].

⁷ *Id.*

⁸ *Id.*; see also Unmanned Aircraft System Test Sites, 77 Fed. Reg. 14,319 (2012) (to be codified at 14 C.F.R. pt. 86).

Authorization (COAs) to operate [small unmanned] public aircraft.”⁹ This ruling grants government safety agencies a direct, expedited process to obtain a COA¹⁰ to fly small, unmanned aircraft “within the line of sight of the operator, less than 400 feet above the ground, during daylight conditions, inside Class G (uncontrolled) airspace and more than five miles from any airport or other location with aviation activities.”¹¹

The FAA’s actions have led to public expressions of both delight and concern. Drone acolytes believe the future will behold robotic aircraft that deliver tacos, “sell houses, shoot movies, and assist local police in chasing suspects.”¹² For proponents of commercial drones, these rulings come none too soon. In some jurisdictions, local law enforcement groups have forced commercial operators of drones to ground their aircraft because commercial operations could create a “potential safety hazard.”¹³ Police have told commercial operators that their operation of drones without authorization could “violate federal aviation policy.”¹⁴ Meanwhile, local governments wait anxiously for the FAA to formally bless their operation of taxpayer-funded drone aircraft.¹⁵

⁹ Timothy Adelman, *Under New Leadership, FAA’s Unmanned Aircraft Systems Integration Office Meets Its Deadline*, AUVSI NEWSL. (May 14, 2012), <http://www.auvsi.org/AUVSI/News/>. The reader should note that this announcement was not printed in the Federal Register.

¹⁰ The term “wavier” means that the government voluntarily has relinquished its right to require a flying machine to have a formal FAA-certified “Airworthiness Certificate.” *Id.*

¹¹ See *FAA Makes Progress with UAS Integration*, FAA, <http://www.faa.gov/news/updates/?newsId=68004> (last visited Oct. 19, 2012).

¹² See Salvador Rodriguez, *Tacocopter the Latest in a Rich Tradition of Internet Hoaxes*, L.A. TIMES (Mar. 28, 2012), <http://articles.latimes.com/2012/mar/28/business/la-fi-tn-tacocopter-internet-hoax-20120328>; see also Nick Wingfield, *Lights, Camera, Drones!*, N.Y. TIMES (Feb. 18, 2012, 9:00 AM), <http://bits.blogs.nytimes.com/2012/02/18/lights-camera-drones!/>.

¹³ W.J. Hennigan, *New Rules for Drones Delayed: FAA Had Planned to Issue Its Proposal This Month but Now Aims to Release It in Spring*, L.A. TIMES, Jan. 31, 2012, at B2.

¹⁴ *Id.*

¹⁵ Brian Bennett, *Police Await FAA Drone Clearance: The Agency Has Just Weeks to Outline How It Will License Public Safety Agencies Eager to Use the Aircraft*, L.A. TIMES, Apr. 30, 2012, at A5. Bennett notes that police departments have acquired robotic surveillance aircraft in anticipation of receiving authority to use them. It remains unclear how many entities are using these aircraft in the absence of formal permission. See *id.*

Drone skeptics raise concerns about privacy¹⁶ and law enforcement overreach.¹⁷ *The New Yorker* recently published an article regarding drones.¹⁸ The article expressed ethical concerns regarding the development rationale and domestic use of drones.¹⁹ In June 2012, Representative Rand Paul (R-KY) introduced a bill restricting the ability of police to use drones without a search warrant.²⁰

Drones, in both their presence on the home front and their impending regulation, have made the prime time. Perhaps the most expedient problem regarding the peacetime use of drones is simpler: the FAA Modernization and Reform Act of 2012 is written in a manner that encourages the inadvertent construction and operation of unnecessarily dangerous flying machines.

Currently, the FAA officially “ban[s] the widespread use of drones because of concerns that the unmanned planes cannot see other planes and could cause a crash.”²¹ However, a careful reading of the history of aviation regulations reveals that the FAA has a duty to provide a much more comprehensive certification framework.²² The FAA is expected to qualify the design, manufacture, maintenance, and operation of drone aircraft.²³

Robotic flying machines should be proven airworthy before the government allows their operation over populated areas. Airworthiness covers both the basic engineering and assembly of

¹⁶ Jonathan Zittrain, *These Aren't Just Toy Planes*, N.Y. Times (Feb. 20, 2012), <http://www.nytimes.com/roomfordebate/2012/02/20/civilian-drones-in-the-united-states/civilian-drones-arent-just-toy-planes>; M. Ryan Calo, *A Scary, and Useful, Technology*, N.Y. Times (Feb. 21, 2012, 6:29 PM), <http://www.nytimes.com/roomfordebate/2012/02/20/civilian-drones-in-the-united-states/drones-can-be-scary-and-useful>.

¹⁷ Brian Bennett, *Spy Drones Aiding Police: The Use of Predators in Pursuing Crime at Home Troubles Privacy Advocates*, L.A. TIMES, Dec. 11, 2011, at A1 [hereinafter Bennett, *Spy Drones Aiding Police*].

¹⁸ See Nick Paumgarten, *Here's Looking at You: Should We Worry About the Rise of the Drone?*, NEW YORKER, May 14, 2012, at 46.

¹⁹ *Id.* at 54, 57.

²⁰ Somini Sengupta, *Lawmakers Want to Know: What Are Those Drones Doing Up There?*, N.Y. TIMES (Aug. 1, 2012 2:44 PM), <http://bits.blogs.nytimes.com/2012/08/01/lawmakers-want-to-know-what-are-those-drones-doing-up-there>.

²¹ Bennett, *FAA Moves Toward Allowing Drones*, *supra* note 6.

²² Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731, 744, 75-76.

²³ *Id.*; see also Ben Walsh, FAA, Unmanned Aircraft Regulatory-Based Design Considerations, Presentation at California Polytechnic State University—San Luis Obispo (Jan. 27, 2012). According to this briefing, much of the current discussion at the FAA regards the need for drone aircraft to provide visual “sense and avoid” capability rather than basic airworthiness.

the flying machine, as well as its repair and maintenance.²⁴ The *Los Angeles Times* reports that some military drones suffer unusually high accident rates—high enough for the military to refrain from using these specific drones until corrective action has been accomplished.²⁵ While the military procurement of immature technology for use in combat is necessary in order to defend our nation overseas and protect our soldiers in the battlefield, is it wise to permit the broad use of this sort of flying machine on the home front during peacetime?

Government should ensure that robotic flying machines are owned and operated by law-abiding citizens. Drones should not fall into the hands of terrorist organizations through inaction. While robotic aircraft may or may not be piloted in the conventional sense, they respond to human commands. The people controlling these devices should be vetted according to the same high moral standards as are our nation's private and commercial pilots.²⁶

This monograph reviews the history of federal aviation regulations, documents the reasoning behind the legal features deemed essential when experts promulgated aviation law in the 1920s, traces how these laws have evolved over the intervening ninety years, and discusses what features of legal and regulatory precedent apply equally to human-piloted and robotically-piloted aircraft. In addition, this monograph suggests the appropriate breadth of upcoming federal regulations for unmanned aircraft. There is a need to establish consistent, national standards to certify and operate robotic aircraft. In their absence, a patchwork quilt of inconsistent local laws could prove detrimental to the viability of this emerging industry.

When Congress requires a federal agency to deregulate an offshoot (robotic flight) of an otherwise pervasively regulated industry (manned commercial flight), our government has chosen to abrogate a role deeply rooted in our nation's traditions and history. Because manned aviation law draws its foundational legal principles from maritime and admiralty law, older forms of jurisprudence whose federal roles are explicitly stated in the

²⁴ See generally 14 C.F.R. § 23 (2011) (for light aircraft); 14 C.F.R. § 25 (2011) (for transport category aircraft).

²⁵ W.J. Hennigan, *Copter Drones Grounded After Crashes: Navy Halts Flights of Fire Scouts, Another Stain on Defense Giant Northrop Grumman*, L.A. TIMES, Apr. 11, 2012, at B1.

²⁶ See 14 C.F.R. § 61.153 (2011).

Constitution,²⁷ the FAA Modernization and Reform Act of 2012 has disturbing long-term policy implications.

I. THE EXISTING STATUTORY AUTHORITY OF THE FAA
CLEARLY PRIORITIZES SAFETY AND UPHOLDS
ESTABLISHED, TRADITIONAL NORMS FOR
ENGINEERING, MANUFACTURING,
AND OPERATION

The FAA Modernization and Reform Act of 2012 amends Title 49 of the U.S. Code.²⁸

A. UNDER THE MODERN FRAMEWORK, CONGRESS REGULATES
AVIATION THROUGH ITS ABILITY TO
PASS FEDERAL STATUTES

A federal statute, 49 U.S.C. § 40101, specifies the general policy of the Department of Transportation.²⁹ The primary purpose of the FAA (today a part of the Department of Transportation) is to maintain safety “as the highest priority in air commerce.”³⁰ More specifically, Congress intended the FAA to move cautiously, to “maintain the safety vigilance that has evolved in air transportation . . . and has come to be expected by the . . . public.”³¹

Congress permits “appropriate military authority [to] authorize aircraft of the armed forces of the United States to deviate from . . . regulations . . . because of . . . urgent military necessity.”³² In other words, U.S. military aircraft and flying munitions need not conform to the full suite of FAA regulations promulgated for civilian flight. However, U.S. military aircraft generally operate in a manner consistent with FAA air traffic control regulations when flying in public airspace.³³

In addition, Congress gives the FAA some flexibility to “grant an exemption from a regulation prescribed . . . when the Ad-

²⁷ U.S. CONST. art. III, § 2, cl. 1 (Admiralty Clause).

²⁸ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11. *See generally* 49 U.S.C. §§ 40101–40129 (2006) (aviation-related portion of Title 49).

²⁹ 49 U.S.C. § 40101 (2006).

³⁰ 49 U.S.C. § 40101(a)(1); *see also* Department of Transportation Act of 1966, Pub. L. No. 89-670, §§ 2(a), 3(e)(1), 80 Stat. 931, 931–32.

³¹ 49 U.S.C. § 40101(a)(3).

³² 49 U.S.C. § 40106(a) (2006).

³³ 49 U.S.C. § 40103(b)(1)–(2) (2006).

ministrator decides the exemption is in the public interest.”³⁴ While this does not mean that the FAA has the authority to change the Code of Federal Regulations (C.F.R.) outside of the procedures embodied in the Administrative Procedure Act,³⁵ the FAA can choose selectively to ignore individual regulations as applied to specific flying machines.³⁶

B. THE FAA IMPLEMENTS CONGRESSIONALLY-MANDATED AVIATION LAW

The federal government pervasively regulates aircraft design, manufacture, repair, and operation by publishing an elaborate set of rules in Title 14 of the C.F.R.³⁷ In addition, the FAA regularly releases clarification and policy documents in the form of agency orders, advisory circulars, and notices-to-airmen (NOTAMs).³⁸ While not legally binding in the same manner as formal regulations, these documents inform those in the aviation business of the government’s official position on specific regulations.³⁹

While only Congress can amend the U.S. Code, under the Administrative Procedure Act, the FAA may alter, remove, or add new regulations.⁴⁰ To do so, it posts a Notice of Proposed Rulemaking (NPRM) in the Federal Register.⁴¹ After a comment period, the FAA must respond to, and address the concerns of, the participants.⁴² If the FAA is satisfied that the proposed rule adequately responds to the received comments, it publishes the final rule in the Federal Register.⁴³ The rule becomes effective thirty days after publication and is published in the next edition of the C.F.R.⁴⁴

³⁴ 49 U.S.C. § 40109(b) (2006).

³⁵ 5 U.S.C. § 553(b)–(d) (2006).

³⁶ See Petition from Boeing Co., to U.S. Dep’t of Transp., Petition for Exemption from FAR §§ 25.841(a)(2) and (a)(3) with Respect to Uncontained Engine Failures, Docket No. FAA-2004-19890 (Dec. 10, 2004), *available at* <http://www.regulations.gov#!documentDetail;D=FAA-2004-19890-0001> (where Boeing successfully applied for an exemption from a cabin pressurization regulation that would otherwise prohibit the 787 “Dreamliner” from being certified for flight at high altitudes).

³⁷ See, e.g., 14 C.F.R. §§ 23, 25 (2011).

³⁸ See generally FAA, <http://www.faa.gov> (last visited Sept. 9, 2012).

³⁹ *Id.*

⁴⁰ 5 U.S.C. § 553(b)–(d).

⁴¹ *Id.* § 553(b).

⁴² *Id.* § 553(c).

⁴³ *Id.* § 553(c)–(d).

⁴⁴ *Id.* § 553(d).

Because federal aviation regulations were established in the 1920s, these laws have been part of the Code of Federal Regulations since its inception in 1938.⁴⁵ The FAA and its predecessor agencies followed contemporaneous government requirements when promulgating regulations.⁴⁶ Many regulations in today's C.F.R. trace directly to those first published in 1938.⁴⁷ Due to an administrative reorganization of Title 14 in 1966, the early legislative history of the federal regulations is obscured to the casual observer.⁴⁸

For eighty-six years, the FAA and its predecessor agencies have comprehensively certified the basic design, manufacture, repair, and operation of aircraft.⁴⁹ Since 1926, the federal government has followed procedures to ensure that operational aircraft are airworthy.⁵⁰

Following the certification process already established in the United Kingdom⁵¹ and France,⁵² the U.S. federal government certified the basic engineering of a specific aircraft design under an "Approved Type Certificate."⁵³ To obtain this certificate, the designer bore the burden of proof to convince the government that the basic design was airworthy.⁵⁴ The process required the designer to supply significant engineering details to the government.⁵⁵ Only after a review of the supplied data and the successful completion of a government-supervised flight test program

⁴⁵ See generally Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731 (repealed and recodified in scattered sections of 49 U.S.C.); Civil Aeronautics Act of 1938, Pub. L. No. 75-706, 52 Stat. 973 (codified as amended in scattered sections of 49 U.S.C.); Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568 (codified as amended in scattered sections of 49 U.S.C.).

⁴⁶ *Id.*

⁴⁷ See generally 14 C.F.R. §§ 00-99 (1938).

⁴⁸ See Department of Transportation Act of 1966, Pub. L. No. 89-670, 80 Stat. 931 (repealed and recodified in scattered sections of 49 U.S.C.); see also 29 Fed. Reg. 7169, 7170-232 (June 2, 1964) (the issue of the Federal Register where 14 C.F.R. § 4b was reorganized into 14 C.F.R. § 25).

⁴⁹ See AERONAUTICS BRANCH, DEP'T OF COMMERCE, INFO. BULL. NO. 7, AIR COMMERCE REGULATIONS (1928) [hereinafter DEP'T OF COMMERCE INFO. BULL. NO. 7]; see also Federal Aviation Act of 1958, 72 Stat. 731.

⁵⁰ DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49.

⁵¹ NAT'L ADVISORY COMM. FOR AERONAUTICS, TM-23, BRITISH CERTIFICATES OF AIRWORTHINESS (1921).

⁵² NAT'L ADVISORY COMM. FOR AERONAUTICS, TN-155, REGULATIONS GOVERNING THE ISSUANCE CERTIFICATES OF AIRWORTHINESS OF AIRCRAFT IN FRANCE (1923).

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ Federal Aviation Act of 1958, Pub. L. No. 85-726, § 603(a), 72 Stat. 731, 776-77.

would the government issue a type certificate for a specific design.⁵⁶

Once a type certificate was issued, the burden of proof would again shift to the manufacturer.⁵⁷ Only upon comprehensive inspection would the government certify the airworthiness of any specific airplane built to the “type specification” with an “Airworthiness Certificate.”⁵⁸ The federal government would certify mechanics and repair stations under a watchful eye.⁵⁹ The federal government would also “license” pilots for either “commercial” or “private” operations.⁶⁰

Today, these basic mechanisms for certification of design, manufacture, repair, and operation function smoothly. The accident rate, particularly among domestic “common carrier” commercial airlines, is remarkably low.⁶¹ In the eighty-six years since the passage of the Air Commerce Act of 1926, commercial aviation has transformed itself from an inherently dangerous activity to our nation’s safest form of transportation.⁶²

C. FEDERALISM REQUIRES THE FAA TO WORK ALONGSIDE STATE AND LOCAL LAWMAKERS TO FORMULATE AND ENFORCE AVIATION LAW

State and federal laws do not create an inherent right to fly. Rather, they operate from the point of view that “air navigation is an existing fact, and requires regulation in the interest of public welfare.”⁶³ Historically, courts ruled in a manner consistent with the idea that the regulation of aviation was “founded in the police power . . . that under our Constitution . . . is vested in the individual states.”⁶⁴ Hence, the federal government may set regulations and issue certificates for the design, manufacture, and operation of aircraft.⁶⁵ The federal government may litigate against infractions taken during the operation of an aircraft in

⁵⁶ *Id.* § 603(a), (b).

⁵⁷ *Id.* § 603(a).

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ See Alan Farnham, *7 Safest U.S. Airlines, but Who’s Counting?*, ABC NEWS (Apr. 11, 2011), <http://abcnews.go.com/Business/safest-us-airlines-airtran-airways-safest-fewest-incidents/story?id=13347280>.

⁶² *Id.*

⁶³ Warren Jefferson Davis, *The Uniform State Aeronautical Code*, 8 AIR L. REV. 280, 282 (1937–1938).

⁶⁴ *Id.*

⁶⁵ See *id.*

interstate commerce.⁶⁶ The local constabulary must enforce the law "with respect to the act of flying and with respect to the business of flying within state borders."⁶⁷ Thus, federal aviation regulations have not fully preempted state law.⁶⁸

In the earliest days of aviation, individual states passed a patchwork of inconsistent aviation laws.⁶⁹ States largely harmonized their essential aviation laws by adopting elements from the Uniform State Law for Aeronautics, a series of durable and extensible model laws developed by committee in 1923.⁷⁰ It defines "aircraft" broadly as any "vehicle used for navigation through the air."⁷¹ The model law makes no requirement for an aircraft to feature wings or a pilot.⁷²

The model law declares the ownership of space above the lands and waters of the state to be vested in the several owners of the surface beneath, subject to the minimum altitude governed for lawful flight by other statute or regulation.⁷³ The model law assigns primary liability for damages to the owner of the aircraft, creates a default state jurisdiction for any crimes or torts committed while in flight over the state, and permits criminal and civil penalties for infractions.⁷⁴

Since the 1920s, each state has tailored its aviation laws. For example, the model-law-inspired statute found in the General Laws of the State of California (dated 1924—prior to any federal regulation) declares, "no aircraft shall be flown . . . unless said aircraft is registered."⁷⁵ The state provided that "no person . . . shall direct or operate an aircraft" unless he has obtained a license contingent upon examination by the state board.⁷⁶

Today, California features a State Aeronautics Act as part of its Public Utilities Code.⁷⁷ This state law specifies that "the opera-

⁶⁶ *Id.* at 284–85.

⁶⁷ George B. Logan, *The Interstate Commerce "Burden Theory" Applied to Air Transportation*, 1 J. AIR L. 433, 442 (1930).

⁶⁸ See generally *Cleveland v. Piper Aircraft Corp.*, 985 F.2d 1438, 1442 (10th Cir. 1993).

⁶⁹ Davis, *supra* note 63, at 282–83.

⁷⁰ COMM. ON INTERSTATE & FOREIGN COMMERCE, U.S. HOUSE OF REPRESENTATIVES, LAW MEMORANDA UPON CIVIL AERONAUTICS 132 (1928).

⁷¹ *Id.* at 133.

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Id.* at 134.

⁷⁵ CAL. GEN. LAWS tit. 12, act 148, § 2 (Deering 1924).

⁷⁶ *Id.* § 5.

⁷⁷ See CAL. PUB. UTIL. CODE §§ 21001–21009 (West 2007).

tion of aircraft [above the land or waters] is a privilege subject to the laws of [that] state.”⁷⁸ It specifies that flight below federally prescribed altitudes or flight that is “imminently dangerous to persons or property” is unlawful.⁷⁹ It grants state-law remedies under tort liability for injury or death to passengers and property.⁸⁰ California may impose civil or criminal penalties for unlawful operation of aircraft within its state boundaries.⁸¹ The state will cite pilots who fly an aircraft lacking a proper airworthiness certificate or an uncertified pilot who operates a certified aircraft.⁸²

In a 1993 decision, the Tenth Circuit Court of Appeals reaffirmed that “the plain language of the Federal Aviation Act [of 1958] suggests that Congress intended that the [law] have no general preemptive effect.”⁸³ The court held that state laws regulating aviation are valid unless they are specifically preempted by federal statute or regulation.⁸⁴ Yet, in another recent case, the Ninth Circuit Court of Appeals affirmed the idea that the federal government, through the FAA, impliedly preempts the law in the many areas where it explicitly regulates aviation operations.⁸⁵

⁷⁸ CAL. PUB. UTIL. CODE § 21401 (West 2007).

⁷⁹ CAL. PUB. UTIL. CODE § 21403 (West 2007).

⁸⁰ CAL. PUB. UTIL. CODE §§ 21404–21405 (West 2007).

⁸¹ CAL. PUB. UTIL. CODE §§ 21407.6(a), 21408 (West 2007).

⁸² CAL. PUB. UTIL. CODE §§ 21410–21411 (West 2007).

⁸³ *Cleveland v. Piper Aircraft Corp.*, 985 F.2d 1438, 1442 (10th Cir. 1993). This was an unfortunate products liability case where Piper, the aircraft manufacturer, was held partially liable for the death of a pilot who crashed a user-modified aircraft. *Id.* at 1441. Piper unsuccessfully argued that their aircraft, as delivered, was compliant with federal regulations in force at the time of manufacture. *Id.* at 1445.

⁸⁴ *Id.* at 1446.

⁸⁵ *Montalvo v. Spirit Airlines*, 508 F.3d 464, 471 (9th Cir. 2007). This was a consolidated case involving plaintiffs who suffered deep vein thrombosis on long flights in cramped airliners. *Id.* at 469. The airlines successfully argued that they were not liable because their seating plan was compliant with FAA regulations. *Id.* at 470. Compliance with FAA regulations preempted state-law tort actions for “failure to warn.” *Id.* at 475. Implied preemption exists when federal law so thoroughly occupies a legislative field “as to make reasonable the inference that Congress left no room for the [s]tates to supplement it.” *Id.* at 470 (internal quotation marks omitted).

II. CONGRESS, IN PASSING THE FAA MODERNIZATION AND REFORM ACT OF 2012, COMMANDS THE FAA TO LEGALIZE THE COMMERCIAL AND LAW-ENFORCEMENT USE OF DRONES

The FAA Modernization and Reform Act of 2012 amends Title 49 of the U.S. Code to “authorize appropriations for the [FAA] for fiscal years 2011 through 2014.”⁸⁶ Among its many provisions is a section dedicated to “Unmanned Aircraft Systems.”⁸⁷ This section specifically commands the FAA, “in consultation with representatives of the aviation industry,” to develop a plan to integrate “civil unmanned aircraft systems into the national airspace system.”⁸⁸

A. CONGRESS HAS INSTRUCTED THE FAA TO ISSUE CERTIFICATES OF WAIVER OR AUTHORIZATION, INSTEAD OF FORMAL AIRWORTHINESS TYPE CERTIFICATES, TO ENABLE OPERATORS OF SERIES-PRODUCED DRONES TO FLY

Section 331(2) of the FAA Modernization and Reform Act of 2012, in conjunction with Section 333(b), details how a COA can replace a formal type certificate or airworthiness certificate. It is by this mechanism that the FAA will permit unmanned aircraft to operate in the national airspace.⁸⁹ This is troubling because it enshrines the idea that unmanned aircraft are exceptional and that they do not need to satisfy reasonable requirements for airworthiness developed over the past eighty-six years by the FAA and its predecessor agencies.⁹⁰

B. CONGRESS REQUIRES THE FAA TO PROMULGATE A LIMITED SET OF RULES TO EXPEDITE CIVIL DRONE OPERATIONS

The FAA Modernization and Reform Act of 2012 features several inconsistencies. For example, the Act requires the FAA to establish a “phased-in approach” to integrate civil unmanned systems into the national airspace and to create “a process to develop certification, flight standards, and air traffic requirements for civil unmanned aircraft systems,” but only for use at

⁸⁶ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

⁸⁷ *Id.* §§ 331–36.

⁸⁸ *Id.* § 332(a)(1).

⁸⁹ *Id.* §§ 331(2), 333(b).

⁹⁰ *See generally* 14 C.F.R. §§ 23, 25 (2011).

test ranges.⁹¹ This is incongruent with a command to “allow a government public safety agency to operate unmanned aircraft” under certain circumstances within ninety days of enactment of legislation.⁹²

Section 332(b)(1) of the Act requires the FAA to produce “a final rule on small unmanned aircraft systems that will allow for civil operation of such systems in the national airspace . . . , to the extent the systems do not meet the requirements for expedited operational authorization.”⁹³ This command seems consistent with the idea that unmanned systems need not comply with even a tailored subset of airworthiness standards. But this command is inconsistent with the well-established burden-of-proof process by which a manufacturer delivers an aircraft with a proper airworthiness certificate.⁹⁴

C. CONGRESS MANDATES THAT THE FAA SELECT AND FUND CIVIL DRONE TEST RANGES

The FAA recently published a “request for comment” regarding its plans to establish six test ranges for unmanned aircraft development.⁹⁵ While this effort is worthwhile, Section 332(c)(2)(B) of the Act seems to focus on a certification standard for flight operations at the test facility rather than a certification standard for the design or manufacture of the unmanned aircraft tested at the facility.⁹⁶ Again, the wording of the statute seems consistent with the idea that unmanned systems need not comply with even a tailored subset of airworthiness standards.

D. CONGRESS SPECIFICALLY COMMANDS THE FAA NOT TO REGULATE HOBBYIST “MODEL” AIRCRAFT, WHICH MAY BE INDISTINGUISHABLE FROM COMMERCIAL DRONES

The specificity of the terms in the Unmanned Aircraft Systems portions of the FAA Modernization and Reform Act of 2012 ties the FAA’s hands by stating that the FAA:

⁹¹ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

⁹² *Id.* §§ 334(c)(1), (c)(2)(c).

⁹³ *Id.* § 332(b)(1).

⁹⁴ *See id.*

⁹⁵ Unmanned Aircraft System Test Sites, Request for Comments, 77 Fed. Reg. 14,320 (March 9, 2012) (to be codified at 14 C.F.R. pt. 91).

⁹⁶ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if . . . the aircraft is flown strictly for hobby or recreational use . . . [and] if the aircraft is limited to not more than [fifty-five] pounds unless certified through . . . a community-based organization.⁹⁷

Practically speaking, Congress has forced the FAA to grant select users a waiver to operate otherwise uncertified aircraft in the general public airspace.⁹⁸

The Act constrains the discretion of the FAA to implement the broad range of regulatory standards carefully crafted over decades to ensure the safe and reliable operation of piloted aircraft.⁹⁹ In general, the Act defines “model aircraft” so broadly as to encompass airframes that may be otherwise indistinguishable from a commercial or military drone. In addition, “operation by exemption” does not appear to be a temporary, interim provision; the Act treats it as a permanent carve-out for technology to be functionally exempt from FAA regulation.¹⁰⁰ These rules forbid the FAA from regulating any non-commercial (hobbyist) unmanned aircraft, no matter what its size, and seem to open the door for certain unsavory elements residing within our nation to produce large, ostensibly hobbyist airframes for use as weapons.¹⁰¹

III. WHAT ARE DRONES AND WHAT COMPRISES THE NATIONAL AIRSPACE?

The media uses the word “drone” to refer to a wide variety of unmanned flying machines. This technology is not new; it was present in a primeval form at the time federal aviation law was

⁹⁷ *Id.* § 336(a). One would assume that a “community-based organization” might be the Association for Unmanned Vehicle Systems International (AUVSI). See generally AUVSI, www.auvsi.org (last visited Nov. 5, 2012); ACADEMY OF MODEL AERONAUTICS (AMA), <http://www.modelaircraft.org> (last visited Nov. 5, 2012).

⁹⁸ See FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 336(a), 126 Stat. 11, 82.

⁹⁹ See *id.* § 332.

¹⁰⁰ *Id.* §§ 334(a)(2), (c)(1).

¹⁰¹ See Jay Lindsay, *Could Model Airplanes Become a Terrorist Tool?*, VIRGINIAN-PILOT (Sept. 30, 2011), at A3 (describing a foiled plan to use large, explosive-laden, radio-controlled model airplanes to attack the Pentagon); see also FAA Modernization and Reform Act of 2012, § 336(a), 126 Stat. 11, at 77 (The fifty-five-pound weight limit delineates aircraft that require no inspection from those that satisfy an inspection performed by a “community-based” organization.).

first promulgated.¹⁰² Before building their famous Flyer, Orville and Wilbur Wright worked out their ideas by testing unmanned, albeit cable-controlled, gliders.¹⁰³ Lawrence Sperry, famous for perfecting the gyroscope, developed a mechanical aircraft autopilot in 1912.¹⁰⁴ This technology was demonstrated publicly the following year.¹⁰⁵ Beginning in 1914, the British military began experimenting with unmanned aircraft.¹⁰⁶ They reached some level of success by the late 1920s.¹⁰⁷ During the Second World War, Nazi Germany deployed large numbers of V-1 “buzz bombs.”¹⁰⁸ These early cruise missiles were bomb-laden aircraft with an autopilot pre-programmed to fly from launch to an explosion at a specific destination.¹⁰⁹

After the Second World War, hobbyists constructed many home-built, radio-controlled (R/C) airplanes. In the United States, these operators were largely unregulated and voluntarily complied with rules set up by the Academy of Model Aeronautics.¹¹⁰ The government expressly encouraged hobbyist use: the radio frequency spectrum for radio control allocated by the Federal Communications Commission,¹¹¹ while the FAA issued guidelines regarding the permissible conditions for flight of R/C aircraft.¹¹²

¹⁰² See RUSSELL FREEDMAN, *THE WRIGHT BROTHERS: HOW THEY INVENTED THE AIRPLANE* 31 (1991).

¹⁰³ *Id.*

¹⁰⁴ William Scheck, *Lawrence Sperry: Autopilot Inventor and Aviation Inventor*, AVIATION HIST. MAG., June 12, 2006, <http://www.historynet.com/lawrence-sperry-autopilot-inventor-and-aviation-innovator.htm>.

¹⁰⁵ *Id.*

¹⁰⁶ Kenneth P. Werrell, *The Cruise Missile*, AIR UNIV. REV., Jan.–Feb. 1981, <http://www.airpower.au.af.mil/airchronicles/aureview/1981/jan-feb/werrell.htm>.

¹⁰⁷ *Id.*

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ See ACADEMY OF MODEL AERONAUTICS, <http://www.modelaircraft.org> (last visited Oct. 19, 2012).

¹¹¹ See 47 C.F.R. § 95.201 (2011) (for current regulations).

¹¹² FAA, AC 91-57, ADVISORY CIRCULAR: MODEL AIRCRAFT OPERATING STANDARDS (1981).

A. ALTHOUGH HOBBYIST, RADIO-CONTROLLED, MODEL
AIRCRAFT POSSESS MOST OF THE CHARACTERISTICS OF
COMMERCIAL OR MILITARY DRONES, THEY
HAVE TRADITIONALLY BEEN EXEMPT
FROM FEDERAL REGULATION

Before the FAA Modernization and Reform Act of 2012, FAA guidelines for model aircraft were found in an advisory circular, AC 91-57.¹¹³ These guidelines were never formally part of a federal statute or promulgated into the Code of Federal Regulations.¹¹⁴ The advisory circular purports to clarify 14 C.F.R. § 91, entitled “Air Traffic and General Operating Rules” for aircraft, but does not expressly trace its reasoning to any specific subsection of Part 91.¹¹⁵

AC 91-57 makes several recommendations for voluntary compliance.¹¹⁶ It suggests that model aircraft be operated away from “populated areas.”¹¹⁷ It encourages designers not to operate model aircraft in the presence of spectators until it has been “proven airworthy.”¹¹⁸ It instructs operators not to fly model aircraft in excess of 400 feet above ground level and to avoid flight in the “proximity of full scale aircraft.”¹¹⁹ Presumably, the model airplane terms in the FAA Modernization and Reform Act of 2012 will supersede AC 91-57 and allow more permissive model aircraft operations by hobbyists.¹²⁰

Initially, the press colloquially used the word “drone” to refer to large, radio-controlled, remotely-piloted military aircraft such as the Global Hawk, Predator, and Reaper. These drones have seen considerable overseas use before, during, and after the Sec-

¹¹³ *Id.*

¹¹⁴ *Id.*; see also WILLIAM F. FUNK, SIDNEY A. SHAPIRO & RUSSELL L. WEAVER, ADMINISTRATIVE PROCEDURE AND PRACTICE 355 (4th ed. 2010). This advisory circular is a “nonlegislative rule” and is not formally binding as law when litigated in a court. The reader should note that hobbyist R/C aircraft are not instrumentalities of interstate commerce in the sense that other flying machines are. Federalism would normally restrict the FAA to regulate airspace, and aircraft with some tangible connection to interstate commerce.

¹¹⁵ FAA, AC 91-57, ADVISORY CIRCULAR: MODEL AIRCRAFT OPERATING STANDARDS (1981).

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 336(a)(1), 126 Stat. 11, 74.

ond Gulf War.¹²¹ Today, media reports use the word “drone” to refer to all types of radio-controlled, remotely-piloted, semi-autonomous or fully-autonomous aircraft, including hobbyist radio-controlled airplanes.¹²²

B. THE GOVERNMENT CLASSIFIES AND REGULATES MUCH OF
THE SKY ABOVE OUR NATION; UNREGULATED AIRSPACE
EXISTS THROUGH ITS “DORMANT
REGULATORY” POWER

The government classifies the skies above our nation into several categories. The government’s default position is to classify “navigable airspace” as the sky beyond a minimum safe altitude above the ground.¹²³ However, the government may classify airspace as “prohibited,” meaning that no flight operations may take place in the sky above certain land without the express permission of the government.¹²⁴ Additionally, the government may classify airspace as “restricted,” where the government may limit the operation of aircraft between designated times and altitudes above certain land.¹²⁵ Otherwise, the government classifies airspace among six categories: Classes A, B, C, D, E, and G.¹²⁶

Class A airspace typically comprises airspace above the United States and its coastal waters from an altitude of 18,000 feet above sea level to a pressure altitude of 60,000 feet.¹²⁷ In this region, all pilots and aircraft are expected to conform to the “rating requirements, operating rules and equipment requirements” of

¹²¹ See generally *Factsheet: RQ-4 Global Hawk*, U.S. AIR FORCE (Jan. 27, 2012), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=13225>; *Factsheet: MQ-1B Predator*, U.S. AIR FORCE (Jan. 5, 2012), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=122>; *Factsheet: MQ-9 Reaper*, U.S. AIR FORCE (Jan. 5, 2012), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=6405>.

¹²² See Jason Ukman, *Privacy Group Seeks to Lift Veil on Domestic Drones*, WASH. POST (Jan. 13, 2012), http://www.washingtonpost.com/blogs/checkpoint-washington/post/privacy-group-seeks-to-lift-veil-on-domestic-drones/2012/01/12/gI QABH6OuP_blog.html; see also Glenn Greenwald, *The Growing Menace of Domestic Drones*, SALON (Dec. 12, 2011), <http://www.salon.com/2011/12/12/the-growing-menace-of-domestic-drones>.

¹²³ See 49 U.S.C. § 40102(a) (32) (2006); see also Air Commerce Act of 1926, ch. 344, § 10, 69 Stat. 568, at 574.

¹²⁴ 14 C.F.R. §§ 73.81–73.83 (2011).

¹²⁵ *Id.* §§ 73.11–73.13.

¹²⁶ 14 C.F.R. § 71.20(1) (2011). Airspace categories conform to international law. Class F airspace is a form of uncontrolled airspace that exists elsewhere on the planet, but outside of the jurisdiction of the FAA. *Id.*

¹²⁷ See *id.* §§ 71.31–71.33.

14 C.F.R. § 91.¹²⁸ Commercial airliners at cruising altitude operate in Class A airspace.

Class B typically comprises airspace around a primary airport.¹²⁹ In this region, all aircraft operations are “subject to minimum pilot flight qualification requirements, operating rules, and aircraft equipment restrictions” of 14 C.F.R. § 91.¹³⁰ Commercial airliners on take-off, climb-out, descent, and approach to major airports operate in Class B airspace.¹³¹

Class C and Class D typically comprise airspace around secondary airports.¹³² In this region, all aircraft operations are “subject to operating rules, and aircraft equipment requirements” of 14 C.F.R. § 91.¹³³ Commercial airliners on take-off, climb-out, descent, and approach to major airports may operate in Class C airspace, but flight operations by student pilots are no longer restricted.¹³⁴

Class E typically comprises all other airspace between 14,500 and 18,000 feet above sea level with limitations so that in very mountainous terrain, it never extends closer than 1,200 feet above the Earth’s surface.¹³⁵ Aircraft during climb-out and descent may pass through Class E airspace as they transition from flight in Class A to Class B, C, or D airspace.¹³⁶

Class G comprises all other airspace less than 1,200 feet above the Earth’s surface.¹³⁷ Class G airspace is uncontrolled airspace; it is not directly regulated by any specific provision in the C.F.R.¹³⁸ Its existence is referred to elsewhere in Title 14, but its definition is not expressly articulated in Section 73, which defines Class A through E airspace.¹³⁹ Aircraft during climb-out

¹²⁸ *Id.* § 71.31.

¹²⁹ *See id.* § 71.41.

¹³⁰ *Id.*

¹³¹ *See* FAA, AERONAUTICAL INFORMATION MANUAL ch. 3, § 3-2-3 (2012).

¹³² *See* 14 C.F.R. § 71.51 (for Class C airspace); 14 C.F.R. § 73.61 (2011) (for Class D airspace).

¹³³ *See* 14 C.F.R. § 71.51; 14 C.F.R. § 73.61.

¹³⁴ *See* 14 C.F.R. § 61.94 (2011).

¹³⁵ *See* 14 C.F.R. § 71.71 (for Class E airspace). For example, Denali extends to a summit elevation of over 20,000 feet. The regulations ensure that no Class E airspace can possibly exist around the summit.

¹³⁶ *Id.*

¹³⁷ *See* 14 C.F.R. § 91.155 (2011) (for a reference to Class G airspace).

¹³⁸ *See* 14 C.F.R. § 73 (note that Class G airspace is undefined—it is unregulated airspace).

¹³⁹ *See id.*

and descent may pass through Class G airspace en route to flight in other regions of airspace.¹⁴⁰

Historically, courts have ruled flight at excessively low altitudes constituted trespass of a landowner's property.¹⁴¹ The Air Commerce Regulations of 1928 set a minimum federal altitude for navigable airspace at 500 feet above ground level.¹⁴² This distinction proved durable as it has been retained in Title 14.¹⁴³ The minimum altitude for navigable airspace played a significant role in two important Fourth Amendment warrantless-search cases, *California v. Ciraolo* and *Florida v. Riley*.¹⁴⁴ In *Ciraolo*, the Supreme Court held that warrantless, visual surveillance from a police aircraft flying in navigable airspace did not constitute an unreasonable search.¹⁴⁵ Similarly, in *Riley*, the Supreme Court held that warrantless searches made from a police helicopter flying at an altitude of 400 feet was not an "unreasonable search" because Title 14 permits helicopters to "be operated at less than the minimums prescribed . . . if the operation is conducted without hazard to persons or property on the surface."¹⁴⁶ In addition, 14 C.F.R. § 91 designates two general types of flight operation: flight under Visual Flight Rules (VFR) and flight under Instrument Flight Rules (IFR).¹⁴⁷

Under VFR, flight must be limited to operations in weather offering favorable "[v]isual [m]eteorological [c]onditions."¹⁴⁸ The FAA limits VFR operations to Class B, C, D, E, or G airspace; this restricts operations to an altitude of less than 18,000 feet above sea level.¹⁴⁹ In addition, the FAA requires the aircraft to transmit an identifying transponder signal if it flies more than

¹⁴⁰ See generally FAA, AERONAUTICAL INFORMATION MANUAL ch. 3 (2012).

¹⁴¹ See, e.g., *Neiswonger v. Goodyear Tire & Rubber Co.*, 35 F.2d 761, 763 (N.D. Ohio 1929).

¹⁴² U.S. DEP'T OF COMMERCE INFO. BULL. No. 7, *supra* note 49, § 74(G)(2).

¹⁴³ 14 C.F.R. § 91.119(a)–(c) (2011).

¹⁴⁴ 476 U.S. 207, 213–15 (1986); 488 U.S. 445, 466 (1988).

¹⁴⁵ *Ciraolo*, 476 U.S. at 213–15.

¹⁴⁶ *Riley*, 488 U.S. at 445 (O'Connor, J., concurring) (Justice O'Connor expressed concern with how the majority relied on the FAA's 400-feet-above-ground-level rule for navigable airspace to determine whether a surveillance flight constitutes an unreasonable search.) (Note that 14 C.F.R. § 91.79 (1988), as referred to in the holding, has been renumbered as 14 C.F.R. § 91.119 (2011).) See also 14 C.F.R. § 91.119(d).

¹⁴⁷ See 14 C.F.R. § 91.151 (for VFR); 14 C.F.R. § 91.167 (for IFR).

¹⁴⁸ See generally *id.* § 91.151.

¹⁴⁹ See *id.*

10,000 feet above sea level.¹⁵⁰ Although VFR operations do not directly require the pilot to contact a control tower, the FAA recommends that the pilot communicate with air traffic control personnel for “awareness and safety.”¹⁵¹

Under IFR, the aircraft may fly in favorable or unfavorable meteorological conditions, as well as at night.¹⁵² To fly under IFR, the operator must file a flight plan with the FAA before departure.¹⁵³ IFR flight requires a comprehensive set of equipment, including a transponder and VHF radio.¹⁵⁴ While pilots may use Global Positioning System (GPS) equipment in a supplemental capacity, the aircraft must follow verbal commands given by federal air traffic controllers.¹⁵⁵ Radio communications include air traffic clearances (authorization to fly at a specific altitude), specific navigational instructions (change in heading), and separation services (requests to fly at specific speeds to avoid potential collisions).¹⁵⁶

C. LARGE MILITARY DRONES ARE BASICALLY REMOTELY-PILOTED CONVENTIONAL AIRCRAFT

The General Atomics Predator, used by the U.S. Air Force overseas and the U.S. Customs and Border Protection at home (see Figure 1), represents a class of unmanned, remotely-piloted aircraft that physically and operationally resemble conventional aircraft.¹⁵⁷ They fly from conventional runways.¹⁵⁸ When operating over the United States, they cruise primarily in Class A airspace.¹⁵⁹

Nothing inherent in their mission profile, speed, altitude, endurance, or agility is extraordinary; they basically replace

¹⁵⁰ See *id.* § 91.157 (referring to the equipment list required by 14 C.F.R. § 91.205(d)).

¹⁵¹ See *id.* §§ 91.126–91.131.

¹⁵² See *id.* § 91.167.

¹⁵³ See *id.* §§ 91.169, 91.73.

¹⁵⁴ See *id.* § 91.205.

¹⁵⁵ See *id.* § 91.183.

¹⁵⁶ See *id.* §§ 91.126–91.135.

¹⁵⁷ See *Factsheet: MQ-1B Predator*, *supra* note 121; see also Bennett, *Spy Drones Aiding Police*, *supra* note 17 (describing how local law enforcement enlisted help from a Predator B drone operated by the Customs and Border Protection Agency to arrest members of the Brossart family after an altercation with the local sheriff involving a dispute over a neighbor's cattle that had wandered onto their ranch).

¹⁵⁸ See generally *Factsheet: RQ-4 Global Hawk*, *supra* note 121; *Factsheet: MQ-1B Predator*, *supra* note 121.

¹⁵⁹ See 14 C.F.R. § 71.31 (2011) (Class A airspace comprising flight beyond 18,000 feet above sea level); see also Walsh, *supra* note 23.

manned surveillance aircraft.¹⁶⁰ While automation extends their endurance and enhances their utility, these drones operate in a world dominated by the rules and customs of manned aircraft.¹⁶¹

Fig. 1: General Atomics Predator B Drone¹⁶²

D. SMALL MILITARY DRONES ARE AERIAL ROBOTS AND MAY NOT SHARE THE SAME ENGINEERING PEDIGREE OR OPERATIONAL REQUIREMENTS AS PILOTED AIRCRAFT

The second category of unmanned aircraft may be broadly considered the progeny of R/C model aircraft. They are not remotely piloted like a Global Hawk; their command and control systems do not mimic a conventional cockpit. These aircraft

¹⁶⁰ See generally *Factsheet: RQ-4 Global Hawk*, *supra* note 121; *Factsheet: MQ-1B Predator*, *supra* note 121.

¹⁶¹ See FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 335, 126 Stat. 1176–77 (instructing the FAA to “carry out all safety studies necessary to support the integration of unmanned aircraft systems into the national airspace system”).

¹⁶² See *Factsheet: MQ-1B Predator*, *supra* note 121.

include production drones such as the U.S. Air Force's RQ-11B Raven (see Figure 2).¹⁶³ They are much smaller than manned aircraft, and they do not operate from conventional runways.¹⁶⁴ These unmanned flying robots perform missions to unexpected locations. Their existence and utility depends entirely upon the capabilities of miniaturized electronics.¹⁶⁵ They are not typically flown by joystick, but rather fly missions where the operator interacts with a computer that directs the control of the aircraft.¹⁶⁶ Other drones feature more exotic configurations, such as quad-rotor configurations (see Figure 3).

Fig. 2: Aerovironment RQ-11B Raven Drone¹⁶⁷

¹⁶³ See *Factsheet: RQ-11B Raven*, U.S. AIR FORCE (Sept. 14, 2011), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=10446>; see *Factsheet: WASP III*, U.S. AIR FORCE (Sept. 14, 2011), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=10469>.

¹⁶⁴ See *Factsheet: RQ-11B Raven*, *supra* note 163.

¹⁶⁵ *Id.*

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

Fig. 3: DARPA Shrike QuadRotor¹⁶⁸

E. THE FAA BROADLY CATEGORIZES ALL DRONES AS AIRCRAFT LACKING AN ONBOARD PILOT

The FAA categorizes a drone as an aircraft with “no onboard pilot.”¹⁶⁹ The FAA recognizes that drones may be “as simple as a light, hand launched aircraft flown within line of sight of the operator or as complex as a high altitude surveillance aircraft patrolling our nation’s borders.”¹⁷⁰ The FAA understands that drone aircraft can be as small as a bird or have a wingspan over 240 feet.¹⁷¹ Impending regulation will cover aircraft that can weigh as little as “four ounces to over 32,000 pounds.”¹⁷² The FAA has expressed a belief that “regulatory standards need to be developed to enable current technology for unmanned aircraft, and unmanned aircraft operations, to comply with Title 14 of the Code of Federal Regulations.”¹⁷³ The FAA’s certification process for drones (before the FAA Modernization and Reform Act of 2012) considers them experimental aircraft and exempts them from compliance with many airworthiness regulations.

¹⁶⁸ *DARPA Shrike Programme*, UAS VISION, <http://www.uasvision.com/2011/09/02/darpa-shrike-programme/> (last visited Nov. 5, 2012).

¹⁶⁹ Unmanned Aircraft Operations in the National Airspace System, 72 Fed. Reg. 6,689 (Feb. 13, 2007).

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

¹⁷² *Id.*

¹⁷³ *Id.*

The FAA has not granted a type certificate to the Predator, Raven, or Shrike.¹⁷⁴ Moreover, as unmanned military aircraft, the Air Force does not certify them according to established comprehensive military standards for piloted aircraft; indeed, such military standards for unpiloted aircraft do not exist.¹⁷⁵ According to *The New Yorker*, a director at a major military drone manufacturer boasted, “We fly as soon as possible with whatever we have. . . . [S]lap stuff together, test it, get feedback. . . . Don’t spend months analyzing it.”¹⁷⁶

Prior to the passage of the FAA Modernization and Reform Act of 2012, the FAA would issue a “Special Airworthiness Certificate” for a drone by following FAA Order 8130.34.¹⁷⁷ This order authorized FAA representatives to grant “experimental airworthiness certificates and special flight permits” to builders and operators of unmanned aircraft.¹⁷⁸ Upon issuance of a certificate, the drone was issued a special identification number.¹⁷⁹

However, the certification process to obtain a special, experimental airworthiness certificate diverges widely from the process required to authorize production of a series of piloted aircraft.¹⁸⁰ The process does not require extensive design substantiation, but instead focuses on the aviation equivalent of “tire kicking.”¹⁸¹ The burden of proof, while still placed on the manufacturer, has been greatly reduced.

¹⁷⁴ See FAA, <http://www.faa.gov> (last visited Sept. 1, 2012) (search the approved type certificate database).

¹⁷⁵ See generally DEP’T OF DEFENSE, MILITARY SPECIFICATION—FLYING QUALITIES OF PILOTED AIRPLANES, MIL-F-8785C (1980); DEP’T OF DEFENSE, MILITARY SPECIFICATION—STANDARD AIRCRAFT CHARACTERISTICS AND PERFORMANCE, PILOTED AIRCRAFT, MIL-C-5011B(USAF) (1977).

¹⁷⁶ Nick Paumgarten, *Here’s Looking at You: Should We Worry About the Rise of the Drone?*, NEW YORKER, May 14, 2012, at 57.

¹⁷⁷ See generally, Airworthiness Certification of Unmanned Aircraft and Optionally Piloted Aircraft, FAA Order No. 8130.34B (Nov. 28, 2011).

¹⁷⁸ *Id.* § 1.1(a).

¹⁷⁹ *Id.* § 1.5(c).

¹⁸⁰ *Id.* § 2.1.

¹⁸¹ *Id.* ch. 2. This order specifically requires that the inspector authorize an experimental certificate after performing tasks such as: (1) “[o]btain[ing] from the applicant a properly executed [f]orm . . .”; (2) “[r]eview[ing] the maintenance records to determine” that the drone “has been inspected and found to be in condition for safe operation”; (3) documenting that “[t]he aircraft nationality and registration marks are in accordance with” regulations; (4) inspecting the aircraft to confirm that “[t]he flight control system operates properly” and “[t]he engine(s), propeller(s), and associated instruments operate in accordance with the manufacturer’s instructions”; and (5) verifying that “[a]ll elements of the control station operate properly, as demonstrated by normal preflight opera-

IV. HOW THE FAA MODERNIZATION AND REFORM ACT OF 2012 DEPARTS FROM THE TRADITIONAL REGULATORY BASIS FOR AIRCRAFT

In order to effectively determine the appropriate scope of federal regulation for unmanned aircraft, it is desirable to understand the current regulatory framework for piloted aircraft. In many instances, the modern regulations found in Title 14 of the Code of Federal Regulations trace directly to decisions made when experts promulgated the initial aviation laws during the 1920s.¹⁸²

A. HISTORICAL BASIS—WHY REGULATE?

Law and aviation technology have been entangled since the inception of human flight. On November 21, 1783, the Montgolfier brothers demonstrated a hot air balloon designed to carry human passengers.¹⁸³ A twenty-five-minute flight occurred outside of Paris, France with two men onboard.¹⁸⁴ The pilots averted near disaster by keeping the balloon envelope from catching fire.¹⁸⁵ As burning embers from the air heater scorched the balloon fabric, one pilot took off his coat and beat out the fire.¹⁸⁶ Although the press acclaimed this first manned flight as a success, it could have ended in tragedy with the fiery death of the brave pilots and significant property damage to landowners below.¹⁸⁷

Early tort treatises describe an 1822 New York lawsuit regarding damages consequential to manned flight.¹⁸⁸ In *Guille v. Swan*, a balloonist landed on private property.¹⁸⁹ The property owner sustained damages from a crowd that gathered to aid the balloonist.¹⁹⁰ The balloonist was held liable for trespass and property damage.¹⁹¹

tional transmit and receiver link checks of the control station to the [aircraft].”
Id.

¹⁸² Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568; DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49.

¹⁸³ CHARLES COULSTON GILLISPIE, *THE MONTGOLFIER BROTHERS AND THE INVENTION OF AVIATION* 51 (1983).

¹⁸⁴ *Id.* at 56.

¹⁸⁵ *Id.*

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ See *Guille v. Swan*, 19 Johns 381, 382 (N.Y. 1822).

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

Military use of flying machines dates back to 1794, when the French military formed a French Aerostatic Corps for battlefield observation.¹⁹² During the American Civil War, the Union Army Balloon Corps successfully deployed manned reconnaissance balloons during operations against the Confederate Army.¹⁹³ However, it was not until the First World War that public concern focused on the fact that aircraft could be used for offensive as well as defensive purposes.¹⁹⁴ Airships and airplanes could injure citizens when they were employed to attack ground targets.¹⁹⁵

Upon the conclusion of hostilities, it became clear that a broad legal framework was needed to regulate both aircraft and aviators in peacetime as well as during war. Consequently, members of the peace conference drafted the "International Convention Relating to the Regulation of Aerial Navigation" (Aerial Navigation Convention).¹⁹⁶ Among its provisions was the formal, international agreement that every nation-state "has complete and exclusive sovereignty in the air space above its territory and territorial waters."¹⁹⁷ This sovereignty exists because every nation-state "has the right, for military reasons or in the interest of public safety, to prohibit the aircraft of . . . other . . . States . . . from flying over certain areas of its territory."¹⁹⁸ As with maritime law, this treaty required every aircraft to "fly the flag" of the state under which it was registered.¹⁹⁹

In its formative epoch, aviation law developed out of the military need to protect and defend sovereign territory, with a secondary requirement that landowners should be protected against property damages incurred by errant aircraft.²⁰⁰ During this era, the safety of the aviator and the promotion of commerce were at best tertiary goals.

¹⁹² W.G. Fitzgerald, *War Balloons of Today*, in *THE WORLD TODAY* 749 (1905).

¹⁹³ *Id.* at 749–50.

¹⁹⁴ *See id.*

¹⁹⁵ *See id.*

¹⁹⁶ Van Vechten Veeder, *The Legal Relation Between Aviation and Admiralty*, 2 *AIR L. REV.* 29, 29 (1931); *see generally* Blewett Lee, *The International Flying Convention and the Freedom of the Air*, 33 *HARV. L. REV.* 23, 23 (1919).

¹⁹⁷ *See generally* Blewett Lee, *supra* note 196, at 23.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.* at 24.

²⁰⁰ *See id.*

B. HISTORICAL BASIS—WHAT TO REGULATE?

Before the Air Commerce Act of 1926, U.S. aviation law developed unevenly in two directions: common law from state and local court holdings and statutory law enacted at the state level.²⁰¹ During the 1920s, a legal consensus developed that a large amount of uncertainty might be eliminated if aviation law was trifurcated to include: (1) common law, (2) statutory law (at the federal and state level), and (3) regulatory law.²⁰² One of the first tasks of the Bureau of Air Commerce was to promulgate comprehensive federal air commerce regulations.²⁰³

The experts drafting the initial federal law wisely decided that the scope of regulation should comprise all facets of aviation: the instrumentalities of aviation (the aircraft), the airmen involved in the operation of the aircraft (the pilots and mechanics), and the rules of the sky.²⁰⁴ These attorneys modeled our federal law upon the principles enumerated in the draft specification from the Aerial Navigation Convention.²⁰⁵ That organization recommended laws that required that “every aircraft . . . shall be provided . . . (a) with a certificate of registration . . . (b) with a certificate of airworthiness . . . (c) with certificates and licences of the commanding officer, pilots, and crew . . . [and] with log books.”²⁰⁶

C. HISTORICAL BASIS—HOW TO REGULATE?

Because aircraft can effortlessly traverse state and national boundaries, a uniform aviation law was preferred to a patchwork quilt of local laws.²⁰⁷ Uniform regulation at the nation-state level was a logical choice due to the underlying need to regulate aviation for military purposes.²⁰⁸ Because federal aerial jurisdiction is not expressly defined by the U.S. Constitution, the inherent federalism of the American system as imposed by the Tenth Amendment raised serious legal issues.²⁰⁹

²⁰¹ George B. Logan, *The Present Status and the Development of Aviation Law*, 2 J. AIR L. 510, 510 (1931).

²⁰² *Id.*

²⁰³ *Id.*

²⁰⁴ DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49.

²⁰⁵ See Blewett Lee, *supra* note 196, at 24–26.

²⁰⁶ *Id.*

²⁰⁷ Frederic P. Lee, *The Air Commerce Act of 1926*, 12 A.B.A. J. 371, 371 (1926).

²⁰⁸ *Id.* at 376.

²⁰⁹ *Id.* at 374–75.

In the aftermath of Congress's decision not to ratify the Treaty of Versailles, President Wilson foreclosed presentation of the Aerial Navigation Convention to the Senate for further debate.²¹⁰ Therefore, during its formative period, federal jurisdiction of the air could not be based upon treaty obligations.²¹¹

In 1920, the American Bar Association successfully offered a resolution that "aeronautics . . . lie within the admiralty jurisdiction of the United States and should be entertained accordingly."²¹² Because just enough precedent existed to legally distinguish transport by air from transport by water, "the grant of jurisdiction over navigable waters [could not] possibly be construed to extend to navigation of the air."²¹³ This approach failed.

The American Bar Association sought other vehicles to establish federal jurisdiction over the skies. In 1922, it dabbled with the idea of recommending a constitutional amendment.²¹⁴ Ultimately, pragmatic minds ruled and air law divided along two paths: regulatory legislation that is nearly exclusively a federal responsibility²¹⁵ and non-regulatory legislation that is primarily a state responsibility.²¹⁶

D. HISTORICAL BASIS—WHO SHOULD REGULATE?

Absent decisive federal action, the 1920 Conference of Commissions on Uniform State Laws undertook a serious consideration of the requirements for durable, state-level aviation law.²¹⁷ Ultimately, Congress based the federal regulation of aviation upon the Commerce Clause of the Constitution.²¹⁸ However, "federal regulation of interstate and foreign commercial air navigation would accomplish little unless it applied to . . . corresponding regulation of intrastate and non-commercial air

²¹⁰ *Id.* at 372.

²¹¹ *Id.* The United States participated and ratified the Warsaw Convention, but that was after the passage of the Air Commerce Act of 1926. *Id.*

²¹² *Conference of Delegates of State and Local Bar Associations*, 12 A.B.A. J. 14, 42 (1920).

²¹³ Veeder, *supra* note 196, at 30.

²¹⁴ Frederic P. Lee, *supra* note 207, at 371.

²¹⁵ *Id.*

²¹⁶ *Id.* at 372.

²¹⁷ W.F. MacCracken, *The Growth of Aeronautical Law in America*, 1 J. AIR L. 415, 418 (1930).

²¹⁸ U.S. CONST. art. I, § 8; *see generally* Air Commerce Act of 1926, Pub. L. 69-254, 44 Stat. 568.

navigation.”²¹⁹ To conform with principles of federalism, each state voluntarily adopted a “uniform state law for aeronautics” that “expressly prohibit[ed] the navigation of any aircraft otherwise than in conformity with the [federal] air traffic rules.”²²⁰ Functionally, beginning in 1926, the United States has enjoyed a uniform aviation law system where federal rules are “applicable to all flying, commercial, non-commercial, intrastate and interstate.”²²¹ This situation “obviates the necessity of a separate [s]tate inspection, licensing, and an approval system with its attendant difficulties, complications and expenses.”²²²

Because federal aviation regulations were initially promulgated during the *Lochner* era of Commerce Clause jurisprudence, the oldest rules are dependent upon a much narrower holding of congressional regulatory authority than more recent laws that trace their precedent to *Wickard v. Filburn*.²²³ In *Swetland v. Curtiss Aircraft*, the constitutionality of the Air Commerce Act of 1926 and the Commerce Department’s associated rules were held valid and enforceable when applied to aircraft operated in interstate commerce.²²⁴ Similarly, in *Neiswonger v. Good-year*, a federal district court held that the federal aviation laws would apply to intrastate commerce insofar as was “necessary.”²²⁵ *Neiswonger* invoked the Supreme Court’s ruling in *Railroad Commission of Wisconsin*, a late *Lochner*-era case affirming the federal power to regulate instrumentalities of intrastate commerce when they are also used as instrumentalities of interstate commerce.²²⁶ In spite of the landmark holding in *National Federation of Independent Business v. Sebelius*, which upheld the Patient

²¹⁹ Veeder, *supra* note 196, at 30.

²²⁰ *Id.*

²²¹ MacCracken, *supra* note 217, at 418.

²²² Clarence M. Young, *The Province of Federal and State Regulation of Aeronautics*, 1 J. AIR L. 423, 425 (1930).

²²³ U.S. CONST. art. I, § 8, cl. 3 (Commerce Clause); *see generally* *Lochner v. New York*, 198 U.S. 45 (1905) (invalidating a local law limiting the work week of bakers on a theory of interference with private contract); *see generally* *Wickard v. Filburn*, 317 U.S. 111 (1942) (holding a very expansive view of the reach of the Commerce Clause that enables Congress to pass broad, national regulations regarding goods and services of commerce as well as the instrumentalities of interstate commerce).

²²⁴ 41 F.2d 929, 938 (N.D. Ohio 1930).

²²⁵ 35 F.2d 761, 763 (N.D. Ohio 1929).

²²⁶ *R.R. Comm’n of Wis. v. Chicago, B. & Q. R. Co.*, 257 U.S. 563, 590 (1922) (holding that the Transportation Act of 1920 was constitutional when construed to authorize the Interstate Commerce Commission to prescribe intrastate railroad rates).

Protection and Affordable Care Act of 2010 but also refused to broaden the constitutionally permissible breadth of Congress's commerce power,²²⁷ the regulatory power of the FAA appears to remain constitutional.

During the 1920s, attorneys and legislators federalized the codification of "best practices" so that decisions regarding "structural requirements, load factors, workmanship, soundness of materials, suitability of design and flight characteristics [could be made by] technically trained personnel."²²⁸ After the passage of the Air Commerce Act of 1926, the Department of Commerce began "a painstaking effort to organize such a system."²²⁹ The Air Commerce Regulations of 1928 represent a comprehensive set of regulations to ensure high-quality basic engineering, manufacture, maintenance, and operation of aircraft.²³⁰

Beginning with the Air Commerce Act of 1926, the federal government enshrined the concept that the basic privilege to fly may be "limited only by the fitness of the aircraft and operating personnel—in the interest of safety to those participating in aeronautics and to persons on the ground."²³¹ Because the government issues certificates of airworthiness and licenses to competent pilots, flight "must always be associated with *privilege* instead of *right*."²³² Flight is not a right, but a "*privilege* subject to administrative control, the degree of discretion . . . cover[s] more than *safety* matters—unless the administrative decision has been limited by a very detailed statutory standard."²³³

Subsequently, Congress passed the Civil Aeronautics Act of 1938, the Federal Aviation Act of 1958, and the Department of Transportation Act of 1966.²³⁴ These laws administratively reorganized the Bureau of Air Commerce into the Civil Aeronautics Board, the Federal Aviation Agency, and ultimately the FAA.²³⁵ Remarkably, despite the changes in name, the scope of agency regulations has remained consistently broad. The burden of

²²⁷ 132 S. Ct. 2566, 2591 (2012).

²²⁸ Young, *supra* note 222, at 426.

²²⁹ *Id.* at 427.

²³⁰ See DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49.

²³¹ Fred D. Fagg, Jr., *Legal Basis of the Civil Air Regulations*, 10 J. AIR L. & COM. 7, 9 (1939).

²³² *Id.*

²³³ *Id.*

²³⁴ See *supra* note 45.

²³⁵ See *id.*

proof for airworthiness has always fallen on the designer and the manufacturer.²³⁶

The FAA Modernization and Reform Act of 2012 aggressively commands the FAA to integrate “civil unmanned aircraft systems into the national airspace system” by compelling it to allow select users to operate drones in the public airspace outside of the traditional airworthiness certification process.²³⁷ This is unprecedented because the existing federal aviation regulations controlling airworthiness certification do not differentiate between the commercial and non-commercial utility of a design, nor do they explicitly require a pilot to be onboard the aircraft.²³⁸ Historically, certification standards for aircraft have been based on size and capability.²³⁹ Because local police enforce federal regulations, and all aircraft operating in navigable airspace are expected to have federal certification, the terms of the FAA Modernization and Reform Act that forbid the agency from regulating any non-commercial (hobbyist) unmanned aircraft serve only to confuse matters. Absent willing state participation, federal regulation of the operation of hobbyist, radio-controlled aircraft probably exceeds Congress’s commerce power.²⁴⁰

Congress may be motivated by a belief that at least some operators possess a right to fly, as opposed to a privilege to fly, and may be willing to test the constitutional limits of its authority in order to enable that right. With this legislation, the 112th Congress sharply breaks with tradition.

²³⁶ See Fagg, *supra* note 231.

²³⁷ FAA Modernization and Reform Act of 2012, Pub. L. No. 12-95, 126 Stat. 11.

²³⁸ Compare 14 C.F.R. § 23 (2011) (Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes), with 14 C.F.R. § 25 (2011) (Airworthiness Standards: Transport Category Airplanes).

²³⁹ Compare 14 C.F.R. § 23, with 14 C.F.R. § 25. Aircraft weighing more than 12,500 pounds at take-off generally are required to conform with 14 C.F.R. § 25 transport category rules, even if they are not intended for commercial operation. See 14 C.F.R. § 1.1 (2011).

²⁴⁰ See *United States v. Lopez*, 514 U.S. 549, 560–61 (1995) (ruling that a federal statute criminalizing the possession of guns in local public schools was unconstitutional because it exceeded the precedent of *Wickard v. Filburn* for Congress to regulate commerce). *Wickard*, in regulating private production of a commodity crop, pertained to economic activity in a way that the possession of a gun in a school zone does not. *Id.* Certainly there is no direct interstate commerce activity, in the *Wickard* sense, by even a flock of noncommercial hobbyist R/C aircraft. See *id.*

E. TECHNICAL ISSUES—AIRWORTHINESS OF
THE FLYING MACHINE

The requirement for federal airworthiness standards derives directly from the text of the Air Commerce Act of 1926 and remains in effect through modern statute.²⁴¹ With the passage of the Civil Aeronautics Act of 1938, the government required that every aircraft operating in navigable airspace possess a valid certificate of registration.²⁴² The basic concept behind federal airworthiness certificates remains good policy.

Since 1926, the federal government has issued several different certificates. The government may issue a "type certificate" to the "designer of aircraft (or [a] component part thereof) certifying that the type (or component), as represented by authenticated data in the form of specifications, descriptions, and drawings . . . has been found to be suitable as a basis for the manufacture of airworthy aircraft . . . constructed in accordance with such data."²⁴³ From its inception in 1926, federal airworthiness standards have required submission of "full particulars of the design and of the calculations upon which the design is based."²⁴⁴ By these reporting requirements, the government may demand due diligence from designers in proving that they have engineered flying machines of satisfactory strength.²⁴⁵ In addition, airworthiness certification has required a demonstrably competent design of instruments, control-systems, and power plants.²⁴⁶

The government may issue a "production certificate" to the "manufacturer certifying that he has complied with the prescribed requirements for the production of aircraft (or component part) in quantities of an exact similarity of type, structure, materials, assembly, and workmanship with the specifications, descriptions, and drawings forming the basis of the type certificate."²⁴⁷

²⁴¹ Air Commerce Act of 1926, Pub. L. No. 69-250, § 3(b), 44 Stat. 568, 569; *see also* Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 73.

²⁴² Fagg, *supra* note 231, at 12.

²⁴³ *Id.*

²⁴⁴ Air Commerce Act of 1926, Pub. L. No. 59-254, § 3(b)(1), 44 Stat. 568, 569.

²⁴⁵ COMM. ON INTERSTATE & FOREIGN COMMERCE, U.S. HOUSE OF REPRESENTATIVES, LAW MEMORANDA UPON CIVIL AERONAUTICS 151 (1928).

²⁴⁶ *Id.*

²⁴⁷ Fagg, *supra* note 231, at 12.

To operate in navigable airspace, an individual aircraft must feature an “airworthiness certificate.”²⁴⁸ Nevertheless, an “experimental certificate” may be issued to an aircraft whose qualities of airworthiness remain unknown.²⁴⁹ These experimental certificates are traditionally issued to allow a test flight of a prototype production aircraft (even if the design has been otherwise “certified” for production based upon analysis and ground test data).²⁵⁰ They are also granted on a case-by-case basis to owners of specific non-production (or modified-production) aircraft.²⁵¹

Possession of an “experimental certificate” denotes that the government has rated the aircraft “satisfactory for purposes of experimentation in flight because inspection on the ground has disclosed no unairworthy feature with respect to structural integrity, workmanship or flight characteristics.”²⁵² The legislative history of this rule indicates a desire for experimental certificates to be issued for “flights to demonstrate whether or not an aircraft is fit to receive [a proper] airworthiness certificate.”²⁵³ In recent years, it has been extended to permit flight of a wide variety of home-built and heavily modified aircraft.²⁵⁴ However, it is not accepted practice for the FAA to allow manufacturers to bypass the formal type certificate process by allowing end users of series-produced aircraft to self-certify under experimental airworthiness certificates.²⁵⁵

By compelling the FAA to allow otherwise series-produced, but uncertified aircraft to fly in public airspace, the 112th Congress marks a second sharp break with tradition.²⁵⁶

²⁴⁸ *Id.* at 11.

²⁴⁹ *Id.* at 13.

²⁵⁰ *Id.*

²⁵¹ See Airworthiness Certification of Aircraft and Related Products, FAA Order No. 8130.2G (July 2, 2012).

²⁵² Fagg, *supra* note 231, at 13.

²⁵³ *Id.*

²⁵⁴ Airworthiness Certification of Aircraft and Related Products, FAA Order No. 8130.2G (July 2, 2012).

²⁵⁵ See Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, FAA Order No. 8130.34B (Nov. 28, 2011).

²⁵⁶ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11.

F. TECHNICAL ISSUES—AIRWORTHINESS CONCERNS DUE TO
MAINTENANCE AND REPAIR

The Air Commerce Act of 1926 authorized the government to inspect and “from time to time, re-rate aircraft as to their airworthiness.”²⁵⁷ The Air Commerce Regulations of 1928 require daily pilot inspections of aircraft systems, controls, propellers, and visible structure.²⁵⁸ These early regulations also require periodic inspections by a licensed mechanic and the results of the inspection formally entered into the aircraft logbook.²⁵⁹ These early regulations strictly restrict the operation of an aircraft with any damage.²⁶⁰ They require government re-certification of an aircraft after repair or reconstruction from any major damage.²⁶¹ These rules remain in effect today.²⁶²

G. TECHNICAL ISSUES—OPERATIONS—MECHANICS STANDARDS

The Air Commerce Regulations of 1928 require aircraft mechanics to be examined and certified according to their area of specialization: engine or airframe.²⁶³ These early regulations specify minimum educational and experiential requirements as well as the need for a certified mechanic to have passed a graded, written test.²⁶⁴ These rules remain in effect today.²⁶⁵

H. TECHNICAL ISSUES—OPERATIONS—PILOTS STANDARDS

The Air Commerce Act of 1926 authorized the government to “provide for the periodic examination of and rating of [all] airmen serving in connection with aircraft.”²⁶⁶ The Air Commerce Regulations of 1928 required aircraft pilots to be examined and certified either as commercial pilots or as private pilots.²⁶⁷

To attain basic certification, a pilot must demonstrate the ability to take-off, land, and maneuver.²⁶⁸ Commercial pilots must demonstrate satisfactory skill to fly under certain emergency

²⁵⁷ Air Commerce Act of 1926, Pub. L. No. 69-254, § 3(b)(3), 44 Stat. 568, 569.

²⁵⁸ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 27(a).

²⁵⁹ *Id.* § 27(B).

²⁶⁰ *Id.* § 33.

²⁶¹ *Id.*

²⁶² See 14 C.F.R. § 43 (2011).

²⁶³ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 65.

²⁶⁴ *Id.* § 66.

²⁶⁵ See 14 C.F.R. § 65.71 (2011).

²⁶⁶ Air Commerce Act of 1926, Pub. L. No. 69-254, § 3(c), 44 Stat. 568, 569.

²⁶⁷ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 46.

²⁶⁸ *Id.* § 53.

conditions and in adverse (cross-wind) weather conditions.²⁶⁹ Pilots must pass a medical examination, a written test, and a practical piloting test.²⁷⁰ Since the 1920s, pilots must pass a background check.²⁷¹ These rules remain in effect today.²⁷²

I. TECHNICAL ISSUES—OPERATIONS—AIR TRAFFIC RULES

The Air Commerce Act of 1926 authorized the government to “by regulation . . . establish air traffic rules for the navigation, protection, and identification of aircraft, including rules as to safe altitudes of flight and rules for the prevention of collisions between vessels and aircraft.”²⁷³ The Air Commerce Regulations of 1928 require aircraft pilots to give way to opposing air traffic through rules regarding how to alter course, speed, or altitude.²⁷⁴ The initial rules prescribed minimum flight altitudes²⁷⁵ and etiquette for operations on and around active airports.²⁷⁶ The rules also require aircraft to run anti-collision lights that are visible at a distance.²⁷⁷ When operating in controlled airspace, pilots must maintain verbal radio contact with air traffic controllers.²⁷⁸ The basic rules in place by 1928 remain in effect today.²⁷⁹

The FAA Modernization and Reform Act of 2012, by compelling the FAA to integrate existing unmanned aircraft into the national airspace system,²⁸⁰ may create a safety hazard by granting an opportunity for aircraft lacking essential communication, navigation, and identification hardware to inadvertently traverse airspace occupied by an unsuspecting private or commercial aircraft. By this legislation, the 112th Congress makes a third break with tradition.

²⁶⁹ *Id.*

²⁷⁰ *Id.* § 51.

²⁷¹ *Id.* § 49.

²⁷² See 14 C.F.R. § 61.3 *et seq.* (2011).

²⁷³ Air Commerce Act of 1926, Pub. L. No. 69-254, § 3(c), 44 Stat. 568, 570.

²⁷⁴ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 74.

²⁷⁵ *Id.*; see 14 C.F.R. § 91.119 (2011).

²⁷⁶ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 75.

²⁷⁷ *Id.* § 76.

²⁷⁸ See 14 C.F.R. § 91.126.

²⁷⁹ See *id.* § 91.101–.193.

²⁸⁰ FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126 Stat. 11, 72–77.

V. THE FAA CAN PROMULGATE A DURABLE FEDERAL
REGULATION CODE FOR ROBOTIC,
DRONE AIRCRAFT

Durable new regulations to regulate unmanned aircraft systems must not upset the robust federalism of present aviation law. The FAA should be allowed to promulgate the new federal regulations necessary to certify drone designs, manufacturers, pilots, and mechanics through established, transparent processes compliant with the Administrative Procedures Act. Congress should avoid legislation directing the FAA to operate outside of its customary areas of discretion.

Aviation law was founded on a principle of harmonious, voluntary cooperation between the states and the federal government. Presently, the enforcement of aviation law is a task largely reserved to states and municipalities. Many local laws may need to be revised to permit the operation of drones. Congress should stay clear of any Tenth Amendment concerns by avoiding any temptation to commandeer the states or municipalities into action.

A. THE FAA SHOULD AMEND TITLE 14 OF THE CODE OF
FEDERAL REGULATIONS TO EMBRACE ROBOTIC AIRCRAFT
TECHNOLOGY. THE UNITED STATES SHOULD REMAIN A NATION
BOUND BY LAWS APPLICABLE TO ALL. GRANTING SELECTIVE
WAIVERS UNDERMINES THIS CORE PRINCIPLE
OF AMERICAN GOVERNMENT

In order to smoothly facilitate the integration of robotic, drone aircraft into the national airspace, the FAA should amend Title 14 of the Code of Federal Regulations. The FAA should promulgate a new airworthiness standard so that drones may obtain a formal type certificate because drones do not fit the definition of “Transport Category Aircraft” under 14 C.F.R. § 25, despite the relevance of many of these regulations to drone design (excluding those pertaining to pilots and cabin amenities).²⁸¹ The new standard is required because drones do not fit the catchall regulations either.²⁸²

Because autopilot systems existed prior to enactment of the Air Commerce Act of 1926, ample regulatory precedent exists to

²⁸¹ See 14 C.F.R. § 25 (2011).

²⁸² See 14 C.F.R. § 23 (2011) (These regulations are obsolescent and tailored to mechanically, rather than electronically, controlled aircraft.).

handle robotic control technology.²⁸³ Today, FAA-certified aircraft feature elaborate, semi-autonomous control systems.²⁸⁴ In addition, some of the regulations governing the basic piloting skills and airmanship deferred to the electronic control system should be incorporated into the equivalent drone airframe airworthiness standards.

The FAA Modernization and Reform Act of 2012 embraces the idea that drones should integrate into the national airspace system through selective waiver, a procedure technically permissible under the FAA's organic statute.²⁸⁵ This practice has some precedent. Under the Air Commerce Act of 1926, "waivers were granted to particular individuals which in effect gave them permission to do certain things despite the prohibition of the general regulations."²⁸⁶

By the late 1930s, the selective waiver was declared "legally unsound."²⁸⁷ Attorneys believed that because "the Supreme Court . . . made it clear that a law, being a law, must be general in its terms, equally binding upon all persons under similar circumstances; and hence, that no administrative officer can exempt an individual citizen [or entity] from obeying the general law."²⁸⁸ Thus, the FAA can only exempt specific products from strict compliance with individual regulations upon a specific petition.²⁸⁹

B. THE GOVERNMENT MUST CERTIFY EACH SERIES-PRODUCED
DESIGN TO RIGOROUS ENGINEERING STANDARDS;
POLITICALLY EXPEDIENT SHORTCUTS HAVE
LED TO TRAGEDY

The 1930 crash of the R101, a case concerning the abuse of discretionary power to grant or waive airworthiness certifications, influenced a generation.²⁹⁰ The R101 was a British-engineered prototype airship constructed to provide long distance passenger and mail service between the United Kingdom and its

²⁸³ Scheck, *supra* note 104.

²⁸⁴ See 14 C.F.R. §§ 23.672, 25.672. The FAA classifies and regulates cockpit automation systems, such as GPS, auto-pilot, auto-land, and auto-throttle systems as part of the airframe. *Id.*

²⁸⁵ 49 U.S.C. § 40109(b) (2006).

²⁸⁶ Fagg, *supra* note 231, at 26.

²⁸⁷ *Id.*

²⁸⁸ *Id.*

²⁸⁹ 14 C.F.R. § 11.61 (2011).

²⁹⁰ NEVIL SHUTE, SLIDE RULE 54-55 (1st ed. 1954).

overseas empire.²⁹¹ Although the initial design and construction of the R101 conformed to promulgated airworthiness regulations, the resultant airship proved too heavy to fly long distances.²⁹² Lord Thomson, who was the British Secretary of State for Air and widely anticipated to be the next Viceroy of India, made it clear that he would fly to the subcontinent aboard the R101.²⁹³

To comply with the political necessity to make the flight, the engineering team frantically modified the airframe to "improve" its performance; they significantly changed the R101 from its conforming design.²⁹⁴ After two brief test flights and a cursory inspection of the modified airship, the Air Ministry issued a certificate of airworthiness.²⁹⁵ Lord Thomson declared to the assembled press that the untested, non-conforming vehicle was "safe as a house—except for the millionth chance."²⁹⁶ He then boarded the airship for its flight to Karachi.²⁹⁷ Later that evening, he died along with forty-seven other souls in a fiery crash in the French countryside.²⁹⁸ The R101 succumbed to catastrophic structural failure while flying in adverse weather.²⁹⁹

C. A SET OF BROAD-BASED REGULATIONS FOR DESIGN, MANUFACTURE, MAINTENANCE, AND OPERATION OF DRONES NEED NOT HINDER THE DEVELOPMENT OF DRONE TECHNOLOGY

When the Air Commerce Act of 1926 was enacted, aircraft structures were made from wood, cloth, and wire.³⁰⁰ Instru-

²⁹¹ *Id.*

²⁹² *Id.* at 101.

²⁹³ *Id.* at 131–32. After the R101 crash, a government inquiry declared that it was "impossible to avoid the conclusion that the R101 would not have started for India on the evening of October 4 if it had not been that reasons of public policy were considered as making it highly desirable that she should do so." *R101 Inquiry Report*, GLASGOW HERALD, Apr. 1, 1931, at 12.

²⁹⁴ SHUTE, *supra* note 290, at 101–04. The modifications included cutting the airship in half and adding forty-two feet of length amidship, loosening retaining bracing for the gas bags to allow them to be overfilled, removing significant portions of the flight control system, and removing several large structural elements. *Id.*

²⁹⁵ *Id.* at 134–36.

²⁹⁶ JAMES LEASOR, *THE MILLIONTH CHANCE* 155 (1st ed. 1957).

²⁹⁷ SHUTE, *supra* note 290, at 134, 136.

²⁹⁸ *Id.* at 138–39.

²⁹⁹ *Id.* at 139 (Only six on board survived.).

³⁰⁰ See generally DAVID DONALD, *THE COMPLETE ENCYCLOPEDIA OF WORLD AIRCRAFT* (1st ed. 1998).

ments were made from brass, jewels, and leather.³⁰¹ Today, aircraft are made from exotic composite materials and flown by computers.³⁰² Overall, the march of technology was aided rather than hindered by federal regulation. In an attempt to limit property damage to persons on the ground, the regulations forced a quantum jump in the reliability of flying machines. Commercially viable, technologically advanced flying machines came as the byproduct, not as the intent of this regulation.

Moreover, these initial Air Commerce Regulations proved sufficiently durable to mature along with technology. The 2012 FAA regulations largely trace their origins to the initial operational and airworthiness regulations from the late 1920s.³⁰³ One may posit that drone technology presently exists at an immature level and that broad-based foundational rules will foster its most rapid development. These regulations may be derived from elements already in existence in Title 14.

Today, the FAA is regulated by the Federal Aviation Act of 1958.³⁰⁴ The statute mandates that the FAA prescribe and revise “minimum standards governing the design, materials, workmanship, construction, and performance of aircraft, aircraft engines, and propellers as may be required in the interest of safety.”³⁰⁵ In addition, the FAA must set “reasonable rules and regulations and minimum standards governing . . . the inspection, servicing, and overhaul of aircraft, aircraft engines, propellers . . . [and] the periods for, and the manner in, which such inspection, servicing, and overhaul shall be made.”³⁰⁶

A durable regulation series for robotic, drone aircraft should incorporate the following elements promulgated during the late 1920s, which remain in today’s Title 14:

- The FAA may issue a “type certificate” to the designer of a conforming drone aircraft.³⁰⁷

³⁰¹ *Id.*

³⁰² *Id.*

³⁰³ Compare 14 C.F.R. § 25 (2011), with DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49.

³⁰⁴ Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731.

³⁰⁵ *Id.* § 601(a)(1).

³⁰⁶ *Id.* § 601(a)(3).

³⁰⁷ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 11; 14 C.F.R. § 21.11–21.120 (2011).

- The designer must demonstrate compliance with all provisions of a series of unmanned aircraft airworthiness regulations.³⁰⁸
- In order to demonstrate compliance, the designer must submit authenticated data to the FAA. This data will be comprised of specifications, descriptions, and drawings as well as calculations and test data.³⁰⁹
- The FAA may then grant a type certificate upon an audit of the supplied data.³¹⁰
- The FAA may issue a “production certificate” to the manufacturer of a conforming drone aircraft.³¹¹
 - The government will certify that the manufacturer can produce the drone using quality materials, assembly, and workmanship.³¹²
 - The manufacturer must demonstrate to the government an ability to maintain series production in conformity with the specifications, descriptions, and drawings forming the basis of the type certificate.³¹³
- The FAA may issue a production drone aircraft an “airworthiness certificate.”³¹⁴
 - An “experimental certificate” should only be issued to prototype and one-off drones whose qualities of airworthiness remain unknown.³¹⁵
 - All series production drones should conform to the design specified by the type certificate.³¹⁶
- The FAA should deem flight without a valid airworthiness certificate unlawful.³¹⁷

³⁰⁸ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 11; 14 C.F.R. § 21.31; 14 C.F.R. § 25 (2011) (The author recommends Part 25 as a basis for the Unmanned Airworthiness Regulations.).

³⁰⁹ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 11(a); 14 C.F.R. § 21.31.

³¹⁰ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 11; 14 C.F.R. § 21.33.

³¹¹ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 11(b); 14 C.F.R. §§ 21.131, 21.165.

³¹² 14 C.F.R. § 21.139, 21.165.

³¹³ *Id.* § 21.143.

³¹⁴ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 28; 14 C.F.R. §§ 21.171, 21.225.

³¹⁵ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 14; 14 C.F.R. § 21.191.

³¹⁶ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 13; 14 C.F.R. § 21.183.

³¹⁷ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 1.

- The FAA should require drones to be maintained at government-authorized repair, reconstruction, and inspection facilities.³¹⁸
- The FAA should require each drone operator to keep a running operating log, listing all flights, maintenance, and repair.³¹⁹
- The FAA should certify that all drone aircraft operated in the national airspace are visible to other VFR pilots using collision avoidance lights.³²⁰
- The FAA should certify all “airmen” serving in connection with the drone.³²¹
 - The FAA should certify drone operators, which need not have conventional “piloting” skills. Drone operators should still be certified by direct examination for skills in theoretical airmanship as well as practical operating talent.³²² Background checks should be required.³²³
 - Mechanics and other ground crew should be certified by direct examination.³²⁴ The traditionally tested propulsion maintenance skills may not be appropriate to maintain electrically propelled drones. Background checks should be required.³²⁵
- The FAA should certify that the flight system, including both the aircraft and the ground station, is tamper-proof and operates in a manner that provides conformity with piloted aircraft air traffic rules.³²⁶ A drone offering VFR

³¹⁸ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 27; 14 C.F.R. § 43 (2011).

³¹⁹ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 35; 14 C.F.R. §§ 61.51, 145 (2011).

³²⁰ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 76; 14 C.F.R. § 91.209 (2011).

³²¹ See DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, §§ 44–62; *see generally* 14 C.F.R. §§ 61, 63, 65 (2011).

³²² DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 53; 14 C.F.R. § 61.33.

³²³ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 49; 14 C.F.R. § 61.15.

³²⁴ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 66.

³²⁵ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 69; 14 C.F.R. § 61.15.

³²⁶ DEP’T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, §§ 70–79; 14 C.F.R. § 91.101 (2011); *see also* *Researchers Use Spoofing to “Hack” into a Flying Drone*, BBC NEWS (June 29, 2012), <http://www.bbc.co.uk/news/technology-18643134> (where students at the radio navigation lab at the University of Texas at Austin demonstrated how simple it is to hack the GPS system of a drone belonging to the university).

flight capability requires reasonable situational awareness including, but not limited to, simple sense and avoid.

- A drone must be able to give way to other visually identified air traffic.³²⁷
- A drone must be able to conform with piloted-aircraft expectations when operating in proximity with another aircraft in uncontrolled airspace.³²⁸
- A drone aircraft must maintain minimum flight altitudes above terrain outside of take-off or landing operations.³²⁹
- A drone aircraft operating under IFR flight must abide by verbal command and control operations and radio chatter required for flight in controlled airspace.³³⁰
- A drone aircraft operating under VFR flight must abide by altitude restrictions inherent in Class G airspace.³³¹
- A drone must demonstrate ordinary piloting skills including: (1) following airport flight and ground procedure; (2) flying safely in the absence of external communications; and (3) flying competently during adverse weather.³³²

VI. CONCLUSION

Drones may be coming to the sky near you, but the FAA Modernization and Reform Act of 2012 does not provide the proper framework for us to celebrate their arrival. The most important flaw in the Act is that it directs the FAA to authorize the operation of drones by mass waiver. This represents a form of public policy repudiated seventy years ago.

A durable federal law for drones in the national airspace must comprise measured, incremental changes to the current framework. It should preserve:

1. the concept of flight as a privilege, not a right;

³²⁷ DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 74(b); 14 C.F.R. § 91.111.

³²⁸ DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 74(c); 14 C.F.R. § 91.113.

³²⁹ DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 74(g); 14 C.F.R. § 91.119.

³³⁰ 14 C.F.R. § 91.126.

³³¹ *Id.*

³³² DEP'T OF COMMERCE INFO. BULL. NO. 7, *supra* note 49, § 75; 14 C.F.R. § 61.127 (2011). The existing federal regulations regarding atmospheric turbulence have been formulated to be appropriate for human-sized aircraft. Very small drones will experience small-scale atmospheric disturbances in a manner entirely different from a drone the size of a conventional aircraft.

2. federalism, so as to avoid Tenth Amendment challenges to the FAA's authority. The states may voluntarily choose to enforce non-compliance with federal certification. Local government may choose to certify locally non-commercial drones or restrict drone operations beneath federal airspace;
3. the power of long-established statutes to require careful government scrutiny of the design of commercial flying machines. This maintains the traditional burden of proof placed on the engineering team to demonstrate the fundamental airworthiness of their design;
4. the power of long-established statutes to require regular government inspection of the airworthiness of all commercial flying machines;
5. the government certification of all "airmen" involved in the repair, maintenance, and operation of flying machines;
6. the traditional etiquette of 14 C.F.R. § 91 flight operations rules (they do not differentiate a piloted from a remotely-piloted or semi-autonomous aircraft).

It is understandable that business interests that construct military drones engineered on a trial-and-error basis would lobby the FAA for exemption from compliance with strict airworthiness standards. If these interests seek public acceptance of their drones, their drones should not crash regularly. It is in the industry's interest that drones are not seen as the product of hazardous engineering.

Conventional aircraft safely transport their passengers precisely because they do not injure property owners on the ground by frequently crashing. Production aircraft are safe precisely because they feature rigorous design, engineered to satisfy comprehensive government standards, which make them unlikely to crash. The FAA, as the arbiter of compliance backed by the U.S. judicial system, has brought us a world where the public may expect that all commercial flying machines are extremely reliable.

Comprehensive federal regulation of aviation inspired, rather than restricted, great advances in technology and safety. These practices are deeply rooted in our nation's traditions and history. Whether you consider a drone-filled future bright or bleak, drones are not so revolutionary as to warrant disregard for our nation's tried and true system of aviation law.

Comments