International Commercial Drone Regulation and Drone Delivery Services

Therese Jones

For more information on this publication, visit www.rand.org/t/RR1718z3

Published by the RAND Corporation, Santa Monica, Calif.

Preface

Delivery drones may become widespread over the next five to ten years, particularly for what is known as the "last-mile" logistics of small, light items. Amazon, Google, the United Parcel Service (UPS), DHL, Alibaba, and other companies have been running high-profile experiments testing delivery drone systems, and the development of such systems reached a milestone when the first commercial drone delivery approved by the Federal Aviation Administration took place on July 17, 2015. In the future, drones could augment, or in some situations even replace, truck fleets and could have important implications for energy consumption, public safety, personal privacy, air pollution, city noise, air traffic management, road congestion, urban planning, and goods- and service-consumption patterns in urban areas.

To support developing issues regarding delivery drones, the RAND Corporation launched an exploratory study that brings together RAND's expertise in unmanned aerial vehicle operations, transportation research, systems analysis, and behavioral analysis and applies it to this emerging and underexplored research area.

The larger project includes several complementary research efforts focused on different facets of the delivery drone system and their likely impact on the public. The other RAND publications in this series include the following:

- *What's the Buzz on Delivery Drones?* (Welser and Xu, 2016)
- *What's the Buzz? The City-Scale Impacts of Drone Delivery* (Lohn, 2017)
- *The Energy Implications of Drones for Package Delivery: A Geographic Information System Comparison* (Gulden, 2017)
- *Design Perspectives of Delivery Drones* (Xu, 2017)
- *Small Unmanned Aerial System Certification and Traffic Management Systems* (Kuhn, 2017).

In this report, we summarize the current status of the international regulatory environment for drone delivery services.

Questions or comments about this report should be sent to the project leaders, William Welser (William_Welser@rand.org) and Jia Xu (Jia_Xu@rand.org).

RAND Science, Technology, and Policy

The research reported here was conducted in the RAND Science, Technology, and Policy program, which focuses primarily on the role of scientific development and technological innovation in human behavior, global and regional decisionmaking as it relates to science and technology, and the concurrent effects that science and technology have on policy analysis and policy choices. The program covers such topics as space exploration, information and

telecommunication technologies, and nano- and biotechnologies. Program research is supported by government agencies, foundations, and the private sector.

This program is part of RAND Justice, Infrastructure, and Environment, a division of the RAND Corporation dedicated to improving policy and decisionmaking in a wide range of policy domains, including civil and criminal justice, infrastructure development and financing, environmental policy, transportation planning and technology, immigration and border protection, public and occupational safety, energy policy, science and innovation policy, space, and telecommunications.

For more information about RAND Science, Technology, and Policy, see www.rand.org/jie/stp or contact the director at stp@rand.org.

RAND Ventures

RAND is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

RAND Ventures is a vehicle for investing in policy solutions. Philanthropic contributions support our ability to take the long view, tackle tough and often-controversial topics, and share our findings in innovative and compelling ways. RAND's research findings and recommendations are based on data and evidence, and therefore do not necessarily reflect the policy preferences or interests of its clients, donors, or supporters.

Funding for this venture is provided by the generous contributions of the RAND Justice, Infrastructure, and Environment Advisory Board and other donors to that division. Collectively, their contributions reflect pooled grants from a range of sources, including corporations, trade and professional associations, individuals, government agencies, and private foundations.

Contents

Tables

Summary

Due to a sharp increase in drone use internationally, countries are struggling to incorporate drones into their aviation regulatory frameworks. This report draws on a literature review and discussions with subject-matter experts to summarize the rapidly changing body of commercial drone regulations worldwide. It also highlights the primary obstacles to delivery drone use in each country.

For countries that have drone regulations, these regulations typically incorporate a pilot's license, registration of the drone, restricted zones, and insurance; regulation requirements vary based on such parameters as drone mass, population density, altitude, and use cases. In looking at the variation in these four requirements across countries, six broad approaches to national commercial drone regulation become apparent. Table S.1 defines five of these approaches and lists the countries using each approach; the sixth, a "wait-and-see" approach, applies to the set of countries not in this table, which have enacted very little drone regulation and intend to monitor the efficacy of other nations' regulations.

Table S.1. Drone Regulation Approaches, by Country

Approach	Definition	Countries	
Outright ban	Countries do not allow drones at all for commercial use.	• Argentina • Barbados • Cuba • India	• Morocco • Saudi Arabia • Slovenia • Uzbekistan
Effective ban	Countries have a formal process for commercial drone licensing, but requirements are either impossible to meet or licenses do not appear to have been approved.	• Algeria • Belarus • Chile • Colombia	• Egypt • Kenya • Nicaragua • Nigeria
Visual line of sight (VLOS) required	Drones must be operated within VLOS of the pilot, thus limiting their potential range.	• Belgium • Bermuda • Bhutan • Botswana • Croatia • Ecuador • Jamaica • Latvia • Lithuania	• Luxembourg • Mexico • Nepal • Netherlands • Slovakia • South Africa • South Korea • Switzerland • Thailand

Approach	Definition	Countries	
Experimental beyond visual line of sight (BVLOS)	Exceptions to the constant VLOS requirement are possible with certain restrictions and pilot ratings.	• Australia • Austria • Brazil • Canada • China • Czech Republic • Denmark • Finland • France • Germany • Greece • Guyana • Ireland	• Japan • New Zealand • Panama • Poland • Rwanda • Singapore • South Africa • Sri Lanka • Russia • Trinidad and Tobago • Uganda • United Kingdom • United States
Permissive	Countries have enacted relatively unrestricted legislation on commercial drone use. These countries have a body of regulation that may give operational guidelines or require licensing, registration, and insurance, but upon following proper procedures it is straightforward to operate a commercial delivery drone.	• Costa Rica • Iceland • Italy	• Norway • Sweden • United Arab Emirates

We found that the regulatory methodologies for incorporating drones into legal systems range from outright bans on the use of commercial drones, through permissive legislation, to a strategy of waiting to observe the efficacy of other nations' policies before acting.

The primary obstacle to using delivery drones in most nations is a requirement that drones stay within the pilot's VLOS. Some countries, such as Japan, are experimenting with delivery BVLOS in restricted areas, with the hope of expanding the program countrywide once effective regulations become apparent.

Even for countries with existing drone legislation, laws are constantly being reevaluated; almost all the laws listed were written or amended within the past two years. While drone laws almost always move toward a more-permissive approach to regulation, the creation of new basic infrastructure may aid in the success of such a transition. Specialized training courses, pilot exams based on the type of unmanned aerial vehicle and the conditions under which it operates, and liability insurance to protect against mishaps over populated areas are all mechanisms for ensuring the safety of the general population as usage laws become more permissive.

Acknowledgments

I am grateful for the funding this work received from the fiscal year 2016 RAND-Initiated Research program, overseen by Susan Marquis and Howard Shatz. The study benefited greatly from the thorough comments of the reviewers: Richard Mason from RAND and Juan Alonso from Stanford University.

Abbreviations

BVLOS	beyond visual line of sight
LOS	line of sight
UAV	unmanned aerial vehicle
VLOS	visual line of sight

Chapter One

Introduction

As unmanned aerial vehicles (UAVs) rapidly evolve, regulators around the world are scrambling to keep up with new uses, capabilities, and technology. Understanding international drone legislation is critical to determine which countries will be the most open to the use of delivery drones and what sort of precedent is set for late-acting countries to adopt legislation. The United States, for example, has found itself scrambling to satisfy the regulatory relaxation requested by commercial drone companies; at least half a dozen countries with permissive drone laws allow for deliveries either in low-population zones or universally. These countries may become targets for further drone investment if the U.S. regulatory environment does not become friendlier toward delivery drone companies.

Commercial drone regulations vary substantially from country to country and regulatory bodies are struggling to adapt current laws to new technology. To address this issue, this report summarizes national-level commercial drone regulations across the world, discusses the regulatory approaches taken by different countries, and examines how such approaches might help or hinder the use of delivery drones. This report answers the following questions:

- What international drone regulations exist?
- What strategies are both developed and developing countries taking with regard to drone regulation?
- Are these regulatory strategies permissive, allowing for the easy adoption of new technologies, or restrictive, preventing the adoption of new technologies until potential repercussions are understood?

To answer these questions, we relied on a literature review of all relevant international legislation and, in the case of non-English texts, expert forums and translation services.

In Chapter Two, we discuss different approaches to international drone regulation and review country-specific legislation. We provide brief conclusions in Chapter Three.

Chapter Two

International Drone Regulations

In this chapter, we focus first on what drone regulations are used globally before turning to an examination of how specific countries apply those approaches.

Approaches to Drone Regulation

We found that approaches to regulation differ dramatically across the globe, but the elements of regulation are largely the same from country to country, with wide ranges on the level of restrictiveness of each element that are often dictated by whether a country favors the promotion of new technology or a safety-first approach. The standard example of national drone regulation tends to have the following four elements:

1. pilot's license
2. aircraft registration
3. restricted zones
4. insurance.

The requirements of these four elements vary based on drone mass, drone altitude, drone use, and pilot license level. Licensing, registration, and insurance requirements are often nonexistent for recreational small drones; however, for commercial drone usage, a sporting pilot license has become the standard for countries without drone-specific licensing procedures. Airspace is typically restricted around airports or other sites of national importance, and the use of drones over heavily populated areas is often either forbidden or severely restricted. Visual line of sight (VLOS) is often required for all users, restricting the horizontal and vertical distance of drone operation, as well as meteorological and lighting conditions for operation. Liability insurance is required across much of Europe but is not a requirement in the United States.

In looking at the variation in these four components of regulations across countries, six broad approaches to national commercial drone regulation become apparent:

1. **Outright ban:** Countries do not allow drones at all for commercial use.
2. **Effective ban:** Countries have a formal process for commercial drone licensing, but requirements are either impossible to meet or licenses do not appear to have been approved.
3. **Requirement for constant VLOS:** A drone must be operated within the pilot's VLOS, thus limiting potential range.

4. **Experimental uses of beyond visual line of sight (BVLOS):** With certain restrictions and pilot ratings, exceptions to the constant VLOS requirement are possible.
5. **Permissive:** Countries have enacted relatively unrestricted legislation in commercial drone use. These countries have a body of regulation that may give operational guidelines or require licensing, registration, and insurance, but upon following proper procedures it is straightforward to operate a commercial delivery drone.
6. **Wait-and-see:** Countries have enacted little, if any, drone-related legislation and monitor the outcomes of other countries' regulations.

International Application of the Approaches to Regulation

In this section, we provide an overview of the six regulation approaches, examples, and their variants. In this discussion, *commercial* implies drone use for profit; governmental use for surveillance or use by emergency responders is often explicitly exempt from commercial legislation.

Table 2.1 gives an overview of which approach specific countries have taken to commercial drone legislation. Not all countries with drone legislation are represented in this table, either because there is not enough detail about legislation or legislation information is not accessible. (Many of these unlisted countries fall under the "wait-and-see" approach.) As the table shows, eight countries have an outright ban on commercial drone use: Argentina, Barbados, Cuba, India, Morocco, Saudi Arabia, Slovenia, and Uzbekistan. Until recently, Belgium had banned commercial drones only (use for scientific testing and recreation was allowed). Both India and Belgium indicated that they have enacted bans for safety reasons while they wait for more-permissive legislation to be written. In the case of India, this approach has proven to be almost entirely unenforceable, suggesting that an all-out ban could jeopardize the distribution of safety-related information to drone users.

Eight countries have enacted effective bans on commercial drones: Algeria, Belarus, Chile, Colombia, Egypt, Kenya, Nicaragua, and Nigeria. In the cases of Algeria and Egypt, the two countries formally permit the use of all drones upon government approval; however, there is no indication that such approval has been given to any specific operator. Kenya had substantial drone use prior to 2015 legislation, but it has since been reported that delays in receiving the required government approval are indefinite. Colombia and Belarus both formally allow the use of drones, but legal obstacles—such as the inability to procure proper certification or insurance—make these rules into an effective ban.

Table 2.1. Drone Legislation Approaches, by Country

Approach	Definition	Countries	
Outright ban	Countries do not allow drones at all for commercial use.	• Argentina • Barbados • Cuba • India	• Morocco • Saudi Arabia • Slovenia • Uzbekistan
Effective ban	Countries have a formal process for commercial drone licensing, but requirements are either impossible to meet or licenses do not appear to have been approved.	• Algeria • Belarus • Chile • Colombia	• Egypt • Kenya • Nicaragua • Nigeria
VLOS required	Drones must be operated within VLOS of the pilot, thus limiting their potential range.	• Belgium • Bermuda • Bhutan • Botswana • Croatia • Ecuador • Jamaica • Latvia • Lithuania	• Luxembourg • Mexico • Nepal • Netherlands • Slovakia • South Africa • South Korea • Switzerland • Thailand
Experimental BVLOS	Exceptions to the constant VLOS requirement are possible with certain restrictions and pilot ratings.	• Australia • Austria • Brazil • Canada • China • Czech Republic • Denmark • Finland • France • Germany • Greece • Guyana • Ireland	• Japan • New Zealand • Panama • Poland • Rwanda • Singapore • South Africa • Sri Lanka • Russia • Trinidad and Tobago • Uganda • United Kingdom • United States
Permissive	Countries have enacted relatively unrestricted legislation on commercial drone use. These countries have a body of regulation that may give operational guidelines or require licensing, registration, and insurance, but upon following proper procedures it is straightforward to operate a commercial delivery drone.	• Costa Rica • Iceland • Italy	• Norway • Sweden • United Arab Emirates

Chile permits all drones on a case-by-case basis, but the present government has declared that no commercial drones are permitted at this time. Other countries also require the permitting of commercial drones on a case-by-case basis; however, they have allotted permits. Both the United States and the Netherlands are examples of such countries. In the United States, Section 333 of the FAA Modernization and Reform Act of 2012 "grants the Secretary of Transportation the authority to determine whether an

airworthiness certificate is required for a UAS to operate safely."[1] The United States' approval of Section 333 exemptions has dramatically increased, signaling a more relaxed atmosphere toward commercial drone use. In 2016, the United States enacted Code of Federal Regulations Title 14, Part 107, which governs drones under 55 lb. As of August 24, 2017, almost exactly one year after its enactment, seven companies have been given Part 107.31 exemptions, allowing them to operate BVLOS.[2] In October 2017, President Donald Trump advocated the creation of an Unmanned Aircraft System Integration Pilot Program, which seeks to ease commercial use of drones by calling on state, local, and tribal authorities to give input on commercial use alongside interested public and private parties.[3] The creation of an effective ban, or permitting and licensing on an ad hoc basis while watching the trajectory of drone technology, may allow for regulatory flexibility without the need for additional legislation.

One of the most common requirements for both private and commercial drone use is maintaining VLOS with the UAV, with a limit of one UAV per pilot. Maintaining VLOS is a requirement within 18 countries, as shown Table 2.1. While this approach allows for effective collision avoidance, and perhaps minimizes required training for pilots, it drastically reduces possibilities for commercial use.

Population restrictions often accompany both VLOS and experimental BVLOS operations (11 countries in the table). In the case of Austria, Canada, Denmark, Finland, France, and Poland, drones are forbidden from flying over heavily populated areas (e.g., cities, large gatherings of people) or are only permitted in certain specialized zones. Many of these countries have looked to expand upon their experimental BVLOS programs after a trial phase. Japan has gone as far as to allow Amazon delivery drones to operate in the special exemption city of Chiba, with Prime Minister Shinzō Abe declaring that drones would be a significant part of the "Fourth Industrial Revolution."[4] In the opposite direction, China permits some BVLOS operations, but it has explicitly banned drone delivery in major cities because of the need of delivery drone operators to improve collision avoidance systems.

Six countries have a legislatively permissive approach to commercial drones: Costa Rica, Iceland, Italy, Norway, Sweden, and the United Arab Emirates. Each sees the technological development that comes along with drones as vital to its future and each

---

[1] Federal Aviation Administration, "Section 333," webpage, U.S. Department of Transportation, February 10, 2017a.

[2] Federal Aviation Administration, "Part 107 Waivers Granted," webpage, U.S. Department of Transportation, August 24, 2017b.

[3] Federal Aviation Administration, "UAS Integration Pilot Program," webpage, U.S. Department of Transportation, November 8, 2017c.

[4] Prime Minister of Japan and His Cabinet, "Public-Private Dialogue Towards Investment for the Future," November 5, 2015.

has carefully regulated licensing and permitting procedures to accompany the use of experimental BVLOS technology. The United Arab Emirates regulations explicitly list parcel delivery as a possible use.

While other countries have drafted or enacted drone legislation, it is largely vague because of a lack of need, capacity, or technical expertise. A more complete list of countries with legislation applicable to commercial drones is shown in Tables 2.2–2.7. Each table represents a different region of the world. In each table, we indicate requirements for operations, including line of sight (LOS) requirements, population restrictions, licensing or training requirements for pilots, registration or operational requirements, insurance requirements, any requirements for the distribution of material goods, and obstacles for using commercial drones. Colors in the table represent how permissive the country is based on its legislation. Red means that there are strict restrictions (e.g., a ban on drone use or VLOS requirements); yellow means that a country allows for the potential use of commercial drones (e.g., experimenting with BVLOS); and green means that the country is permissive (e.g., enacted permission for commercial use in some capacity). Countries with no color could not be assigned one of the three permissiveness ratings because they have vague legislation that is currently in development. We list our sources for the legislation described in these tables in the appendix.

Table 2.2. International Drone Laws: North America

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Bahamas		Cannot fly over large crowds or within 175 ft of a person without permission		Registration required			
Barbados							Ban; supposed to be one year as of April 2016 but no new regulations in place
Belize[a]			Commercial license required	Commercial registration required; temporarily not allowed to import any drones without license for locally commissioned services			
Bermuda	LOS required		Commercial license required	Special work permit, operations manual for commercial use required			LOS operations
Canada	BVLOS accepted on case-by-case basis—certificate determines IFR/VFR restrictions	Not applicable for LOS operations	SFOC required if commercial and > 25 kg or in populated areas and 1–25 kg	Registration required for individual use for 2–25 kg UAVs	Required for > 2 kg or with SFOC		BVLOS operations not yet standardized

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Costa Rica	No	Authorization required to fly over large groups	$94 license required	$1,874 commercial permit fee required for unlimited drones	Yes, for commercial	Go Pato Now messenger/ personal assistant company authorized for drone delivery	
Cuba							Ban
Dominican Republic	Yes			Commercial permit required			LOS operations
Grenada				Permission from police required; indication that this policy will be permissive rather than restrictive			
Jamaica	Yes			Commercial Special Aerial Work permit required before each flight			LOS operations
Mexico	Yes		Pilot's license required > 25 kg	Required: permit for 2–25 kg, > 25kg type authorization for commercial use. Display of license plate required			LOS operations
Nicaragua[b]	Yes						Virtual ban
Panama	It appears it is possible to get a BVLOS exemption		Operator certificate required	Permission for commercial use required		Specific reference to "transport of cargo" and verification of weight	BVLOS

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Trinidad and Tobago	May request an exemption		Unmanned Aircraft Operator Certificate required	Registration, records of operational activities required	Yes		LOS operations
United States	Yes, but waivers possible	Prohibited from flying over people	Examination required every two years	Registration required, no license needed < 55 lb			LOS operations

NOTE: IFR = instrument flight rules. VFR = visual flight rules. SFOC = Special Flight Operations Certificate. Colors represent permissiveness rating: red = strict restrictions; yellow = potential for use; green = permissive. Countries with no color have vague legislation that is currently in development.
[a] It is believed that Belize will update its drone policies soon.
[b] Virtual ban; need a permit to import, which, based on anecdotal evidence, is not issued; cannot use above 100 ft.

Table 2.3. International Drone Laws: South America

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Argentina							Commercial use banned
Brazil	Possible under 25 kg if authorized; must apply for permit for each project	Required to be 30 m from people	License required if > 25 kg as well as medical certificate for > 25 kg	Registration required if > 25 kg or operating above 400 ft	Yes		LOS operations
Chile[a]	Yes		License required	Present policy is no commercial use is authorized; need permit, approved on case-by-	Yes		LOS operations; registration; operational requirement

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
				case basis			
Colombia	Yes		Training course required, but none authorized as of 2015.	Flight plan required 15 days in advance; must justify versus use of a plane	Yes, but none available as of 2015		LOS operations; licensing/training requirements for pilots; registration; operational requirement; insurance
Ecuador	Yes						LOS operations
Guyana	Permitted with advanced permission		Training and testing required; proof of training from other ICAO member state acceptable	Aerial Work Operator Certificate, map of area of use and details of operation required	Yes	Prohibition from towing objects or dropping objects from drone	Ban on towing or dropping object from drones
Peru				Probably need permission; laws vague			
Uruguay				Need permission	Yes		

NOTE: ICAO = International Civil Aviation Organization. Colors represent permissiveness rating: red = strict restrictions; yellow = potential for use; green = permissive. Countries with no color have vague legislation that is currently in development.
[a] Require a parachute attached to a drone.

Table 2.4. International Drone Laws: Europe

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Austria	No for trial phase		Pilot's license required for populated areas	Technical description and safety analysis required	Yes		LOS operations
Belarus[a]				Not needed, but must mark models > 500 g with name and address; limited to 100 m in altitude			
Belgium	Yes		Drone pilot license required	Manufacturer's certificate, registration required; maximum height 90 m for commercial use	Yes	Transport of mail or cargo prohibited	LOS operations, transport of mail or cargo prohibited
Croatia	Yes		License required in populated areas	Operating manual and risk analysis required	Yes		LOS operations
Czech Republic	BVLOS possible under certain conditions		License required	Work permit, registration of 1,500 euros required; registration takes four months	Yes		LOS operations
Denmark	BVLOS only in restricted airspace with special permission		Training required, but not specified	Special permit required	Required for 7–25 kg		LOS operations
Estonia				Required if > 500 ft or in restricted areas			

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Finland	BVLOS only in restricted airspace with special permission	< 25 kg may fly over unpopulated areas, < 7 kg populated	RPAs license required	Manual and log required			LOS operations
France	BVLOS in unpopulated areas, < 50 m in altitude and < 1,000 m in distance for 2–25 g, < 150 m in altitude all distances < 2 kg	Populated areas < 7 kg	Required if BVLOS: 20 hours training	Required plan filed prior to first use, log of each flight	Yes		LOS operations
Germany	Yes, but exemptions possible		License required if > 2 kg	Official permission required above 100 m			
Greece	Commercial operator may submit BVLOS safety assessment plan	Commercial drones allowed to fly above crowds	License required	Registration required if more than 50 m from operator	Yes		LOS operations
Iceland				Requires permission > 5 kg, maximum height 130 m	Yes, > 20 kg	Delivery already starting, with deliveries for online marketplace Aha	

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Ireland	Yes, exemption possible		License required	30-day advance notice of operation and permit required	Yes		LOS operations
Italy	No		License required > 25 kg or for BVLOS use; certificate if < 25 kg	Required to display ID that transmits/ records data in real time; license plate and declaration of vehicle competence required			LOS operations
Latvia	Yes			Requires a flight permit if > 25 kg in unpopulated areas or > 1.5 kg in populated areas	Yes, in 2018 if > 1.5 kg		LOS operations
Liechtenstein	BVLOS with permission if first-person view	With permission if closer than 100 m		Required if > 30 kg; need permission if taking video in populated areas due to privacy laws	Yes, if > 500 g		
Lithuania	Yes		License required		Yes		LOS operations
Luxembourg	Yes			Permission required for every mission	Yes		LOS operations
Netherlands	Yes	Controlled regions around airports cover nearly all cities	RPAs license required (different for different weight classes)	Special exemption for commercial use required unless < 4 kg, manual required			LOS operations

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Norway	No		License required, dependent on VLOS/BVLOS, mass, type, class	Required: flight plan, manual for operation, aerial photography permit (if applicable)	Yes		
Poland	BVLOS in segregated air space	Must exclude risk to people	License required	Registration required > 25 kg	Yes		LOS operations
Romania				Registration required	Yes		
Russia				Registration required; flight plan required, as are crew, observer		Developing drone control network to enable delivery drones	
Slovakia	Yes		License required	Permission required if drone weighs more than 20 kg or has a camera		Explicitly banned	LOS operations; distribution of goods banned
Slovenia							Ban on commercial use
Spain	Yes	Unpopulated area	Pilot's license required > 25 kg, training course < 25 kg	Identification plate, authorization to operate required if > 25 kg	Yes		LOS operations
Sweden	No		License required for BVLOS, IFR certification if using instruments	Operations manual required for BVLOS, airworthiness certificate, log book required	Yes		LOS operations

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Switzerland	May grant exemptions	May grant exemptions	None required < 30 kg	None required < 30 kg	Yes		LOS operations
Ukraine				> 20 kg, those for commercial use should register			
United Kingdom[a]	Yes		License required	Permission for commercial use required			

NOTE: RPA = remotely piloted aircraft. IFR = instrument flight rules. Colors represent permissiveness rating: red = strict restrictions; yellow = potential for use; green = permissive. Countries with no color have vague legislation that is currently in development.
[a] Test permit granted to Amazon for BVLOS, sense-and-avoid technology in controlled spaces.

Table 2.5. International Drone Laws: Africa

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Algeria				Permission required for all drones			Registration, operational requirement
Botswana	Yes			Registration required		Banned cargo	LOS operations, distribution of goods
Egypt				Permission required for all drones			Registration, operational requirement
Kenya[a]				Permit required; basically banned due to processing time			Registration, operational requirement

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Madagascar				Special permission required			
Malawi				No known laws, but government working to develop drone corridor for medical supplies			
Morocco				Ban on import of drones; in practicality, commercial use may be allowed, but authorization appears frozen			Ban
Namibia[b]				Should register			
Nigeria				Registration required; required to show proof of N20,000,000 in capital shares, pay N500,000 processing fee 6 months prior to use; license valid 3 years with annual fee of N100,000	Yes, for foreign operator		Registration, operational requirement
Rwanda[c]	Yes, according to FAQs, but have tested delivery systems	Flying over congested areas prohibited without permit	Permit or certificate required	Registration required	Yes		
South Africa	BVLOS with special license (does not yet seem to be issued)		Special license required for commercial use; costly (up to $4,000)	Registration required for commercial use, manual and log book needed			LOS operations

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Tanzania				Written permission required for commercial use			

NOTE: FAQs = frequently asked questions. Colors represent permissiveness rating: red = strict restrictions; yellow = potential for use; green = permissive. Countries with no color have vague legislation that is currently in development.
[a] Likely to issue new regulations in several months.
[b] Regulations in preparation.
[c] Testing medicine delivery.

Table 2.6. International Drone Laws: Asia

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Bangladesh				Permission required 45 days prior to use			
Bhutan	Yes		Required to sign an undertaking	Registration required			LOS operations
Brunei Darussalam				Permission required for all flights			
Cambodia		Banned in Phnom Penh		Permission required for use			
China[a]	BVLOS allowed		Required if > 7 kg	Registration, filing of flight plan required; flight worthiness certificate required for 25–100 kg		Banned in crowded cities	Distribution of goods
India[b]							Ban

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Indonesia			License required	Operating details, purpose of use, flight plan required; approval required from relevant government agencies for many commercial purposes			
Israel[c]							Lack of drone laws, although at least one company operating BVLOS now
Japan[d]	Yes, except in special zones	Prohibited over populated areas				Special zone in Chiba allowing for trial of delivery drones	Distribution of goods
Malaysia			Private pilot's license required if > 20 kg	Permit required if > 20 kg			
Nepal	Yes			Permission required for all aerial work			LOS operations
Oman				Must apply			
Philippines			Training course; air traffic control license or flight crew license required	Registration, operations manual, airworthiness certificate required	Yes		
Qatar				Permission required			
Saudi Arabia							Ban

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Singapore						Permit required	Companies appear to be operating commercial services
South Korea	Yes		Commercial license required if > 12 kg	Registration required			LOS operations
Sri Lanka[e]	Yes, but FPV okay		Pilot registration required	Prior approval required for commercial purposes		Approval required to drop	
Thailand	Yes			License required	Yes		LOS operations
Turkey				Permission required for commercial use			
United Arab Emirates	No			Registration required, permission needed for commercial use		Explicitly mentioned as a possibility in law	LOS operations
Uzbekistan							Ban
Vietnam				Permission required for commercial use			

NOTE: FPV = first-person view. Colors represent permissiveness rating: red = strict restrictions; yellow = potential for use; green = permissive. Countries with no color have vague legislation that is currently in development.

[a] Some companies are using delivery drones in rural areas to bring packages to depots.

[b] Ban noted to be hard to enforce; legislation expected soon.

[c] Airobotics commercially flying drones BVLOS.

[d] Prime Minister Abe has said that drones are a significant part of the “Fourth Industrial Revolution.”

[e] Takas.lk has approval to delivery within 500 m.

Table 2.7. International Drone Laws: Oceania

Country	LOS Operations Required	Flight Permitted Over Populated Areas	Licensing/ Training Requirements for Pilots	Regulations Regarding Registration, Operational Requirements	Insurance Required	Distribution of Goods Allowed	Obstacles to Delivery Drone Use (if any)
Australia	Yes, but BVLOS testing is easier than in United States	Flight over populated areas prohibited	License required for commercial operations	Permit required for commercial operations			LOS operations
New Zealand[a]	Yes			Certificate required if > 15 kg			LOS operations

NOTE: Colors represent permissiveness rating: yellow = potential for use; green = permissive.
[a] Commercial pizza delivery is available but is limited because of LOS requirement.

Even for countries with existing drone legislation, laws are constantly being reevaluated: Almost all of the laws listed were written or amended within the past two years. While drone laws almost always move toward a more permissive approach to regulation, new critical infrastructure may aid in the success of such a transition. Specialized training courses, pilot exams based on the type of UAV and the conditions under which UAVs operate, and liability insurance to protect against mishaps over populated areas are all mechanisms for ensuring the safety of the general population as usage laws become more permissive.

Chapter Three

Conclusions

Due to a sharp increase in drone use internationally, countries are struggling to incorporate drones into their aviation regulatory frameworks. This report summarizes the rapidly changing body of commercial drone regulations worldwide and highlights the primary obstacles to delivery drone use in each country. We find that the regulatory methodologies for incorporating drones into legal systems range from outright bans on the use of commercial drones, through permissive legislation on the use of commercial drones, to a "wait-and-see" strategy whereby nations wait to observe the efficacy of other nations' policies before acting. For countries that have drone regulations, these regulations typically incorporate a pilot's license, registration of the drone, restricted zones, and insurance; regulation requirements vary based on such parameters as drone mass, population density, altitude, and use cases. The primary obstacle to using delivery drones in most nations is a requirement that drones stay within the pilot's VLOS. Some countries, such as Japan, are experimenting with delivery BVLOS in restricted areas, with the hope of expanding the program countrywide once effective regulations become apparent.

Monitoring the evolution of international drone regulations, along with technology trends and security and safety incidents, in the studied countries over the next several years will provide insight into the ways that gradual or all-or-nothing approaches to regulation affect technology adoption, and whether gradual approaches to introducing untested technology mitigate potential hazards.

Appendix

Drone Legislation, by Country

Legislation is listed alphabetically by country.

Algeria

Etablissement National de la Navigation Aérienne, "Loi n° 98-06 du 3 Rabie El Aouel 1419," June 27, 1998. As of June 29, 2017: https://www.enna.dz/telechargement/textes_legislatifs/Lois/loi-98-06.pdf

Argentina

Markert, Francis, "Drone Laws in South America," *Drone Traveller* blog, August 14, 2016. As of August 27, 2017: https://drone-traveller.com/drone-laws-south-america/#peru

Australia

Australian Government Civil Aviation Safety Authority, "Flying Drones/Remotely Piloted Aircraft in Australia," August 13, 2017. As of August 28, 2017: https://www.casa.gov.au/aircraft/landing-page/flying-drones-australia

Szal, Andy, "Amazon Could Test More Drone Deliveries with Australia Expansion," *Manufacturing.net*, May 24, 2017. As of August 28, 2017: https://www.manufacturing.net/news/2017/05/amazon-could-test-more-drone-deliveries-australia-expansion

Austria

Austro Control, "Betrieb von unbemannten Luftfahrzeugen–Drohnen," undated. As of August 28, 2017: https://www.austrocontrol.at/luftfahrtbehoerde/lizenzen__bewilligungen/flugbewilligungen/unbemannte_lfz

Bahamas

Civil Aviation Department, *Special Regulation No 1 of 2016*, February 1, 2016. As of August 27, 2017: https://www.bahamas.gov.bs/wps/wcm/connect/936b2597-1492-4036-9465-3c9e89baf0aa/Civial+Aviation+Department+special+regulations.pdf?MOD=AJPERES

Bangladesh

"Flying Drone in Bangladesh Airspace Banned," *Dhaka Tribune*, October 27, 2016. As of August 29, 2017:
http://www.dhakatribune.com/bangladesh/2016/10/27/flying-drone-bangladesh-airspace-banned/

Barbados

"Government Announces Ban on Drones," *Barbados Today*, March 10, 2016. As of August 27, 2017:
https://www.barbadostoday.bb/2016/03/10/government-announces-ban-on-drones/

Belarus

"New Rules for Civil Drone Owners in Belarus," Belarusian Television Channel CTV Stolichnoe Televidenie, August 17, 2016. As of August 28, 2017:
http://en.ctv.by/en/1471517090-new-rules-for-drone-owners-in-belarus

Belgium

Belgian Civil Aviation Authority, "Aviation Safety Information Leaflet: Drone Flying," Federal Public Service Mobility and Transport, No. 1, 2017. As of August 28, 2017:
https://mobilit.belgium.be/sites/default/files/resources/files/asil_2017_01_drone_flying.pdf

Belize

Belize Tourism Board, "Belize Drone Requirements," 2017. As of August 27, 2017:
http://www.belizetourismboard.org/tourism-resources/belize-drone-requirements/

Bermuda

Bermuda Civil Aviation Authority, "Small Unmanned Aircraft (Drones)," undated. As of August 27, 2017:
http://www.dca.gov.bm/small-unmanned-aircraft-drones

Bhutan

Ministry of Information and Communications, "Frequently Asked Questions," undated. As of August 29, 2017:
http://www.moic.gov.bt/en/frequently-asked-questions-bhutan-civil-aviation-authority/

Botswana

Civil Aviation Authority of Botswana, "Legal Requirements for Remotely Piloted Aircraft in Botswana," undated. As of August 29, 2017:
http://www.caab.co.bw/tempx/REMOTELY%20CONTROLLED%20AIRCRAFT%20A2%20Poster.pdf

Brazil

Agéncia Nacional De Aviaçao Civil, "Requisitos Gerais Para Aeronaves Não Tripuladas De Uso Civil," May 2, 2017. As of August 27, 2017:
http://www.anac.gov.br/assuntos/legislacao/legislacao-1/rbha-e-rbac/rbac/rbac-e-94-emd-00/@@display-file/arquivo_norma/RBACE94EMD00.pdf

Brunei Darussalam

Department of Civil Aviation, Ministry of Communication, Brunei Darussalam, home page, undated. As of August 29, 2017:
http://www.mincom.gov.bn/dca/_layouts/15/start.aspx#//dca/Theme/Home.aspx

Cambodia

Markert, Francis, "Drone Regulations in Cambodia," *Drone Traveller* blog, April 18, 2017. As of August 29, 2017:
https://drone-traveller.com/drone-laws-cambodia/

Canada

Transport Canada, "Getting Permission to Fly Your Drone," July 20, 2017. As of August 27, 2017:
http://www.tc.gc.ca/eng/civilaviation/opssvs/getting-permission-fly-drone.html

Chile

Global Drone Regulations Database, "Chile," March 2, 2017. As of August 27, 2017:
https://www.droneregulations.info/Chile/CL.html#country-search

China

Aleem, Zeeshan, "The Chinese Version of Amazon Is Already Using Drones to Deliver Stuff to Customers," *Vox*, May 26, 2017. As of August 29, 2017:
https://www.vox.com/world/2017/5/26/15677522/jd-amazon-drones-china-bezos

Wei, Jun., E. Tazewell Ellett, Lisa Ellman, Patrick R. Rizzi, and Lu Zhou, "China Launches First Operational Rules for Civil Unmanned Aircraft," Hogan Lovells, January 21, 2016. As of August 29, 2017:
http://www.hlmediacomms.com/2016/01/21/china-launches-first-operational-rules-for-civil-unmanned-aircraft/

Colombia

Castro, Pablo, "Colombia: A Pioneer in Drone Regulation. . . But in the Worst Way Possible," *PetaPixel*, September 20, 2017. As of August 27, 2017:
https://petapixel.com/2015/09/20/columbia-a-pioneer-in-drone-regulation-but-in-the-worst-way-possible/

Mackinnon, Kerr, "Flying your Drone in Colombia," *Flyte* blog, March 31, 2017. As of August 27, 2017:
http://blog.flyte.ie/blog/latin-america-colombia

Costa Rica

Alvarado, Laura, "Costa Rican Company Will be the First in Latin America to Offer Drone Delivery Service," *The Costa Rica Star*, June 22, 2017a. As of August 27, 2017:
http://news.co.cr/costa-rican-company-go-pato-will-be-the-first-company-in-latin-america-to-offer-drone-delivery-service/62436/

Alvarado, Laura, "New Regulations for Operating Drones Will be Implemented as of August 13 in Costa Rica," *The Costa Rica Star*, July 7, 2017b. As of August 27, 2017:
http://news.co.cr/
new-regulations-operating-drones-will-implemented-august-13-costa-rica/63041/

Croatia

Narodne Novine, "Ministarstvo Pomorstva, Prometa I Infrastrukture," May 6, 2015. As of August 28, 2017:
http://narodne-novine.nn.hr/clanci/sluzbeni/2015_05_49_974.html

Cuba

Aduana General de la República Cuba, "Nota Sobre Medios Aereos no Tripulados," May 10, 2017. As of August 27, 2017:
http://www.aduana.gob.cu/index.php/395-nota-sobre-medios-aereos-no-tripulados

Czech Republic

DJI Forum, "Let's Talk: Drone Laws in Your Country," October 18, 2016. As of August 28, 2017:
https://forum.dji.com/thread-66883-2-1.html

Úřad pro Civilní Letectví, "Letecké Práce," 2011. As of August 28, 2017:
http://www.caa.cz/letadla-bez-pilota-na-palube/letecke-prace

Úřad pro Civilní Letectví, "Směrnice SLS, Postupy Pro Vydání Povolení K Létání Letadla Bez Pilota," CAA/S-SLS-010-0/2012, March 1, 2012. As of August 28, 2017:
http://webdav.agents.fel.cvut.cz/data/teaching/bep/smernice_caa-s-sls-010-0-2012.pdf

Denmark

Njord Law, "Njord Insight: New Danish Drone Rules in 2016 and 2017," January 2017. As of August 28, 2017:
https://www.njordlaw.com/wp-content/uploads/2017/01/new-danish-drone-rules-in-2016-and-2017.pdf

Dominican Republic

Institute Dominicano de Aviación Civil, "Año de la Atención Integral a la Primera Infancia," Resolución No. 008-2015, 2015. As of August 27, 2017: http://idac.gob.do/descargas/4318/

Ecuador

Dirección General De Aviación Civil, "Resolución No. 251/2015," 2015. As of August 28, 2017: http://www.aviacioncivil.gob.ec/wp-content/uploads/downloads/2015/09/Resol.-251-2015-Normas-Operacion-Drones.pdf

Egypt

Egyptian Civil Aviation Authority, *Egyptian Civil Aviation Law, Law 28 of 1981*, November 2012. As of August 28, 2017: http://www.civilaviation.gov.eg/Laws/LAW%2028-ENGLISH-2012.doc

Estonia

Republic of Estonia Civil Aviation Administration, "How to Operate UA," February 6, 2017. As of August 28, 2017: https://www.ecaa.ee/en/news/how-operate-ua

Finland

Trafi Finnish Transport Safety Agency, "Use of Remotely Piloted Aircraft and Model Aircraft," Regulation 1(8) TRAFI/90924/03.04.00.00/2016 OPS M1-32, January 1, 2017. As of August 28, 2017: https://www.trafi.fi/filebank/a/1483970125/4a6ac53bf4b1cb434d7f85a15f36dde0/23661-OPS_M1-32_RPAS_2016_eng.pdf

France

Legifrance, "Decree of 17 December 2015 on the Use of Airspace by Aircraft Operating on Board," JORF n°0298, December 24, 2015. As of August 28, 2017: https://www.legifrance.gouv.fr/eli/arrete/2015/12/17/DEVA1528469A/jo/texte

Germany

Bundesanzeiger Verlag, "Verordnung zur Regelung des Betriebs von Unbemannten Fluggeräten," March 30, 2017. As of August 28, 2017: https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl117s0683.pdf#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl117s0683.pdf%27%5D__1503953042102

Grenada

"Possible Use of Drones in Grenada," *The New Today*, April 21, 2016. August 28, 2017: http://thenewtoday.gd/local-news/2016/04/21/drones-grenada/#gsc.tab=0

Guyana

Guyana Civil Aviation Authority, Directive No. GCAA/AS/DIR/2017-01, February 26, 2017.

Iceland

Ackerman, Gwen, "Iceland Gets On-Demand Drone Deliveries," August 23, 2017. As of August 28, 2017: https://www.bloomberg.com/news/articles/2017-08-23/iceland-set-to-become-island-of-drone-deliveries

AIC Iceland, "Starfræksla Ómannaðra Loftfara," AIC A 001/2014, February 6, 2014. As of August 28, 2017: https://www.samgongustofa.is/media/log-og-reglur-i-flugmalum/A_001_2014_eAIP_einn_dalkur.pdf

India

Padmanabhan, Ananth, "Civilian Drones and India's Regulatory Response," *Carnegie India*, March 10, 2017. As of August 28, 2017: http://carnegieindia.org/2017/03/10/civilian-drones-and-india-s-regulatory-response-pub-68218

Indonesia

Hanafiah Ponggawa & Partners, "Updated Drone Regulations in Indonesia: Now, a Specific Rule for a Specific Drone," July 12, 2016. August 29, 2017: http://hprplawyers.com/updated-drone-regulations-in-indonesia-now-a-specific-rule-for-a-specific-drone/

Ireland

Irish Aviation Authority, "Drone Regulations & Guidance," Statutory Instruments S.I. No. 563, 2015. As of August 28, 2017: https://www.iaa.ie/docs/default-source/publications/legislation/statutory-instruments-(orders)/small-unmanned-aircraft-(drones)-and-rockets-order-s-i-563-of-2015.pdf?sfvrsn=26f50bf3_6

Israel

Kolodny, Lora, "Airobotics Scores Authorization to Fly Autonomous Drones in Israel," March 27, 2017. As of August 28, 2017: https://techcrunch.com/2017/03/27/airobotics-scores-authorization-to-fly-autonomous-drones-in-israel/

Library of Congress, "Regulation of Drones: Israel," July 22, 2016. As of August 28, 2017: https://www.loc.gov/law/help/regulation-of-drones/israel.php

Italy

ENAC, "Remotely Piloted Aerial Vehicles," No. 2, July 2015. As of August 28, 2017: http://www.enac.gov.it/repository/ContentManagement/information/N1220929004/Regulation_RPAS_Issue_2_Rev%202_eng.pdf

Jamaica

Jamaica Civil Aviation Authority, "Flight Safety Notification General," FSN-GN-2015-01 Revision 2, April 14, 2016. As of August 28, 2017: http://www.jcaa.gov.jm/wp-content/uploads/2017/02/FSN-GN-2015-01.pdf

Japan

Ministry of Land, Infrastructure, Transport and Tourism, Civil Aviation Bureau, "Japan's Safety Rules on Unmanned Aircraft (UA)/Drones," 2015. As of August 28, 2017: http://www.mlit.go.jp/en/koku/uas.html

Osborne, Charlie, "Japan Pushes Forward with Countrywide Drone Delivery Service," *ZDNet*, March 15, 2017. As of August 29, 2017: http://www.zdnet.com/article/japan-pushes-forward-with-countrywide-drone-delivery-services/

Kenya

Ng'ang'a, David, "Government Makes New Announcement on Flying Drones in Kenya," *Business Insider*, June 22, 2017. As of June 29, 2017: http://www.plive.co.ke/bi/tech/drones-government-makes-new-announcement-on-flying-drones-in-kenya-id6880074.html

Liechtenstein

Landeswerwaltung Fürstentum Liechtenstein, "Drohnen und Flugmodelle," Amt für Bau und Infrastruktur, 2017. As of August 28, 2017: http://www.llv.li/#/110870/drohnen-und-flugmodelle

Lithuania

Direktorius Įsakymas, "Dėl Bepiločių Orlavių Naudojimo Taisyklių Patvirtinimo," Civilinės Aviacijos Administracijos, January 23, 2014. As of August 28, 2017: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/7bb14b10849f11e39d2dc0b0e08d5f21

Luxembourg

Direction De L'aviation Civile Grand-Duché Luxembourg, "General Conditions for Unmanned Aircraft System (UAS) Operations Within the Luxembourg Airspace," May 2, 2017. As of August 28, 2017: https://dac.public.lu/actualites/2016/11/UAS-2016/index.html

Madagascar

AirportUAV, "Regulations—Madagascar," 2017. As of August 29, 2017: https://www.airport-uav.com/drone-rules/legislation-africa/regulations-madagascar/

Malawi

"Malawi and Unicef Launch Drone Air Corridor," BBC News, June 29, 2017. As of August 29, 2017: http://www.bbc.com/news/world-africa-40441790

Mexico

Dirección General De Aeronautica Civil Mexico, "Que Establece los Requerimientos para Operar un Sistema de Aeronave Pilotada a Distancia (RPAS) en el Espacio Aereo Mexicano," CO AV-23/10 R4, July 25, 2017. As of August 27, 2017: http://www.sct.gob.mx/fileadmin/DireccionesGrales/DGAC-archivo/modulo3/co-av-23-10-r4.pdf

Malaysia

Department of Civil Aviation, Aeronautical Information Services, "Unmanned Aerial Vehicle (UAV) Operations in Malaysian Airspace," February 18, 2008. As of August 29, 2017: http://aip.dca.gov.my/aip%20pdf%20new/AIC/AIC%20200804.pdf

Morocco

Association Drone Maroc, "Drone Imports Authorisations for Morocco: We Say Yes!" January 12, 2015. As of August 27, 2017: http://dronemaroc.ma/imports-authorisations-moroccan-drone-say-yes/

Namibia

"Essential Drone Regulation Lacking," *Namibian Sun*, April 24, 2017.

Noci, Gisela, and Joe Noci, "Nambian UAV Draft Regulations Presented Last Week by Department of Civil Aviation," *DIY Drones* blog, March 23, 2016. As of August 29, 2017: http://diydrones.com/profiles/blogs/namibian-uav-draft-regulations-presented-last-week-by-department

Nepal

Civil Aviation Authority of Nepal, "Flight Operations Directives No. 07," May 2015. As of August 29, 2017: https://www.caanepal.org.np/wp-content/uploads/2016/03/fod7Flight-Operations-Directives.pdf

Netherlands

Voorn, Niels, "Drone Wetgeving en Regelgeving 2017 in Nederland," *Dronenerds*, November 14, 2016. As of August 27, 2017: https://www.drone-nieuws.nl/drone-wetgeving-en-regelgeving-in-nederland.html

Nicaragua

Instituto Nicaraguense De Aeronautica Civil, "Restricción para Uso de Drones en Nicaragua," November 29, 2014. As of August 27, 2017: http://www.inac.gob.ni/2014/11/restriccion-para-uso-de-drones/

Mavic Pilots, "Nicaragua. Drones Allowed?" February 12, 2017. As of August 27, 2017: https://mavicpilots.com/threads/nicaragua-drones-allowed.7625/page-2

Nigeria

Arinze Eze, Ndubisi, "Managing NCAA Airworthiness and Certification for Your Commercial Drone Business," *LinkedIn*, May 22, 2016. As of August 29, 2017: https://www.linkedin.com/pulse/managing-ncaa-airworthiness-certification-your-drone-ndubisi-arinze

Kazeem, Yomi, "It is Now Illegal to Fly Drones in Nigeria Without Government Approval," *Quartz*, May 9, 2016. As of August 29, 2017: https://qz.com/678985/it-is-now-illegal-to-fly-drones-in-nigeria-without-government-approval/

New Zealand

Feller, Stephen, "Domino's Tests Drone Delivery of Pizza in New Zealand," UPI, November 17, 2016. As of August 29, 2017: https://www.upi.com/Business_News/2016/11/17/Dominos-tests-drone-delivery-of-pizza-in-New-Zealand/4271479363638/

Civil Aviation Authority of New Zealand, "Part 101 CAA Consolidation," March 10, 2017. As of August 29, 2017: https://www.caa.govt.nz/rules/Rule_Consolidations/Part_101_Consolidation.pdf

Norway

Luftfartstilsynet Civil Aviation Authority – Norway, "Regulations Concerning Aircraft Without a Pilot on Board, etc.," December 14, 2015. As of August 28, 2017: http://www.luftfartstilsynet.no/caa_no/Regulations_concerning_aircraft_without_a_pilot_on_board_etc

Oman

"Fly Drones in Oman with a License," *Y Magazine*, March 2, 2017. As of March 29, 2017: https://www.y-oman.com/2017/03/fly-drones-oman-license/

Panama

El Director General De La Autoridad Aeronáutica Civil, Resolucion No. 120/DSA/DJ/DG/AAC, April 30, 2016. As of August 28, 2017: http://www.aeronautica.gob.pa/images/seguridad_aerea/norma%202016/Requisito%20para%20las%20Operaciones%20de%20los%20Sistemas%20de%20Aeronaves%20Pilotadas%20a%20Distancia.pdf

Peru

Markert, Francis, "Drone Laws in South America," *Drone Traveller* blog, August 14, 2016. As of August 27, 2017: https://drone-traveller.com/drone-laws-south-america/#peru

Philippines

Philippine Council for Industry, Energy, And Emerging Technology Research and Development, "Unmanned Aerial Vehicle (UAV)," undated. As of November 1, 2017: http://pcieerd.dost.gov.ph/images/glad/UAVPresentation-CAAP.pdf

Poland

Civil Aviation Authority of the Republic of Poland, "Current Status of RPAS Regulations in the Republic of Poland," October 2014. As of August 27, 2017: http://jarus-rpas.org/sites/jarus-rpas.org/files/current_status_of_rpa_regulations.pdf

Urzad Lotnictwa Cywilnego, "Safe Sky—Regulations on Flying Drones in Poland," October 2, 2015. As of August 28, 2017:
http://www.ulc.gov.pl/en/270-english/current-information/3806-safe-sky-regulations-on-flying-drones-in-poland

Qatar

Kovessy, Peter, "Flying Drones Without Official Permission is a Crime in Qatar," *Doha News*, May 9, 2016. As of August 28, 2017:
https://dohanews.co/flying-drones-without-official-permission-is-a-crime-in-qatar/

Romania

Sinka, Paul, "New Romanian Drone Regulation Raises Questions Among Users," *Romania-Insider.com*, January 27, 2014. As of August 28, 2017:
https://www.romania-insider.com/new-romanian-drone-regulation-raises-questions-among-users/113749/

Rwanda

Rwanda Civil Aviation Authority, "Unmanned Aircraft Operations in Rwanda," 2017. As of August 29, 2017:
http://www.caa.gov.rw/index.php?id=110

Simmons, Dan, "Rwanda Begins Zipline Commercial Drone Deliveries," BBC News, October 14, 2016. As of August 29, 2017:
http://www.bbc.com/news/technology-37646474

Russia

Ingham, Lucy, "Russia Announces Testing of Country-Wide Drone Network, Paving Way for Commercial Boom," Factor, April 26, 2017. As of August 28, 2017:
http://factor-tech.com/drones/26153-russia-announces-testing-of-country-wide-drone-control-network-paving-way-for-commercial-boom/

"Russia Introduces Obligatory Drone Registration," *RT*, December 31, 2015. As of August 28, 2017:
https://www.rt.com/politics/327536-russian-introduces-obligatory-registration-of/

Saudi Arabia

"Drones Banned from Saudi Skies," *Arab News*, December 6, 2015. As of August 28, 2017:
http://www.arabnews.com/saudi-arabia/news/846186

Singapore

Ong, Justin, "'Sky's the Limit' in Singapore's Bid to Become a Drone Hub," *Channel NewsAsia*, March 14, 2017. As of August 28, 2017: http://www.channelnewsasia.com/news/singapore/sky-s-the-limit-in-singapore-s-bid-to-become-a-drone-hub-7714274

Slovakia

Cuprik, Roman, "Drone Users Complain About Strict Regulations," *The Slovak Spectator*, September 21, 2015. As of November 1, 2017: https://spectator.sme.sk/c/20060452/drone-users-complain-about-strict-regulations.html

"Slovakia Bans Drones for Distribution of Goods," Drone-RSS.com, August 27, 2015.

Slovenia

Civil Aviation Agency of the Republic of Slovenia, "Safety Directive on Unmanned Aircraft," May 13, 2016. As of August 28, 2017: http://caa.si/fileadmin/user_upload/pageuploads/Slike/Agencija/Safety_Directive_on_Unmanned_Aircraft2016.pdf

South Africa

South African Civil Aviation Authority, "Remotely Piloted Aircraft Systems," 2017. As of August 28, 2017: http://www.caa.co.za/Pages/RPAS/Remotely%20Piloted%20Aircraft%20Systems.aspx

"South Africa's Commercial Drone Business Takes Off," *UAS Vision*, March 9, 2016. As of August 29, 2017: http://www.uasvision.com/2016/03/09/south-africas-commercial-drone-business-takes-off/

South Korea

Shin & Kim, "New Korean Drone Laws," *KBLA* blog, February 8, 2017. As of August 29, 2017: http://www.kbla.info/index.php/the-kbla-blog/1079-new-korean-drone-laws

Spain

Boletín Oficial Del Estado, Num. 252, Sec. I. Pág. 83976, October 17, 2014. As of August 28, 2017: http://www.seguridadaerea.gob.es/media/4389070/ley_18_2014_de_15_octubre.pdf

Sri Lanka

Civil Aviation Authority of Sri Lanka, "Requirements for Operation of Pilotless Aircraft," CA-IS-2017-Gen-01, January 10, 2017. As of August 29, 2017: http://www.caa.lk/images/stories/pdf/implementing_standards/sn053.pdf

"Takas.lk Drone Deliveries Is the Next New 'Thing,'" *Sunday Times (Sri Lanka)*, April 2, 2017. As of August 29, 2017: https://www.pressreader.com/sri-lanka/sunday-times-sri-lanka/20170402/282845075858616

Sweden

Transport Styrelsen, "Drönare," undated. As of August 28, 2017: http://www.transportstyrelsen.se/sv/luftfart/Luftfartyg-och-luftvardighet/Obemannade-luftfartyg-UAS/

Switzerland

Federal Office of Civil Aviation, "Drones and Aircraft Models," undated. As of August 28, 2017: https://www.bazl.admin.ch/bazl/en/home/good-to-know/drones-and-aircraft-models.html

Tanzania

Tanzania Civil Aviation Authority, "Unmanned Aircraft Systems," Document No: TCAA/FRM/ANS/AIS-30, January 1, 2017. As of August 29, 2017: http://www.tcaa.go.tz/files/Air%20Navigation%20Services/Aeronatical%20Information%20Circulars/AIC%2005%20-%202017%20Unmanned%20Aircraft%20Systems.pdf

Thailand

Barrow, Richard, "Quick Look at the New Drone Law in Thailand," August 29, 2015. As of August 29, 2017: http://www.richardbarrow.com/2015/08/quick-look-at-the-new-and-updated-drone-law-in-thailand/

Trinidad and Tobago

"Civil Aviation [(No. 19) Unmanned Aircraft Systems] Regulations," 2016. As of August 28, 2017: http://www.news.gov.tt/archive/E-Gazette/Gazette%202016/Legal%20Notice/Legal%20Notice%20No.%20183%20of%202016.pdf

Turkey

Baker McKenzie, "Turkey Launches Drone Regulation," *Lexology*, February 29, 2016. As of August 29, 2017: https://www.lexology.com/library/detail.aspx?g=40686dae-d473-4218-8e6a-4d6575b94b4c

Ukraine

"Drones vs. Ukrainian Legislation," *50° North*, January 13, 2016. As of August 28, 2017: http://www.50northspatial.org/drony-ta-ukrayinske-zakonodavstvo/

United Arab Emirates

United Arab Emirates General Civil Aviation Authority, "An Unmanned Aerial System (UAS)," 2017. As of August 29, 2017: https://www.gcaa.gov.ae/en/Pages/uas_old.aspx

United Kingdom

Civil Aviation Authority, "Unmanned Aircraft and Drones," 2015. As of August 28, 2017: https://www.caa.co.uk/Consumers/Unmanned-aircraft-and-drones/

Uruguay

Ministerio De Defensa Nacional Dirección Nacional De Aviación Civil E Infraestructura Aeronáutica-D.I.N.A.C.I.A., Resolución 291/2014, September 4, 2014. As of August 28, 2017: http://dinacia.gub.uy/ciudadania/diario-oficial-impo/publicaciones-realizadas/item/844-diario-oficial-n-29-039-de-4-de-setiembre-de-2014-ordenamiento-basico-drones-uav-etc.html

Uzbekistan

"Uzbekistan Bans Drone Aircraft," *Radio Free Europe*, December 2, 2014. As of August 29, 2017: https://www.rferl.org/a/uzbekistan-bans-drones-aircraft/26720863.html

Vietnam

Ministry of Justice, "Decree on Management of Unmanned Aircraft and Ultralight Aircraft," March 28, 2008. As of August 29, 2017: http://moj.gov.vn/vbpq/en/Lists/Vn%20bn%20php%20lut/View_Detail.aspx?ItemID=2867

References

Federal Aviation Administration, "Section 333," webpage, U.S. Department of Transportation, February 10, 2017a. As of November 16, 2017: https://www.faa.gov/uas/beyond_the_basics/section_333/

———, "Part 107 Waivers Granted," webpage, U.S. Department of Transportation, August 24, 2017b. As of August 28, 2017: https://www.faa.gov/uas/request_waiver/waivers_granted/

———, "UAS Integration Pilot Program," webpage, U.S. Department of Transportation, November 8, 2017c. As of November 14, 2017: https://www.faa.gov/uas/programs_partnerships/uas_integration_pilot_program/splash/

Gulden, Timothy, *The Energy Implications of Drones for Package Delivery: A Geographic Information System Comparison*, Santa Monica, Calif.: RAND Corporation, RR-1718/1-RC, 2017. As of October 5, 2017: https://www.rand.org/pubs/research_reports/RR1718z1.html

Kuhn, Kenneth, *Small Unmanned Aerial System Certification and Traffic Management Systems*, Santa Monica, Calif.: RAND Corporation, PE-269-RC, 2017. As of November 14, 2017: https://www.rand.org/pubs/perspectives/PE269.html

Lohn, Andrew J., *What's the Buzz? The City-Scale Impacts of Drone Delivery*, Santa Monica, Calif.: RAND Corporation, RR-1718-RC, 2017. As of October 5, 2017: https://www.rand.org/pubs/research_reports/RR1718.html

Prime Minister of Japan and His Cabinet, "Public-Private Dialogue Towards Investment for the Future," November 5, 2015. As of August 29, 2017: http://japan.kantei.go.jp/97_abe/actions/201511/05article3.html

Welser, William, IV, and Jia Xu, *What's the Buzz on Delivery Drones?* Santa Monica, Calif.: RAND Corporation, PE-230-RC, 2016. As of October 5, 2017: https://www.rand.org/pubs/perspectives/PE230.html

Xu, Jia, *Design Perspectives on Delivery Drones*, Santa Monica, Calif.: RAND Corporation, RR-1718/2-RC, 2017. As of October 5, 2017: https://www.rand.org/pubs/research_reports/RR1718z2.html