



DRONE REGISTRATIONS

A PRELIMINARY ANALYSIS

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On November 14, 2017, the Federal Aviation Administration publicly released a database of every drone registration up to October 31, 2017. This preliminary report is the first detailed analysis of the dataset.

[Announced in December 2015](#), the drone registration rule required that all persons operating a drone weighing more than 250 grams for either hobbyist or non-hobbyist operations in U.S. airspace must fill out a simple registration form and pay a \$5 fee. Users would be given a unique aircraft tail number to be affixed to their drone. Thousands of drone users quickly registered under the new rule. In July 2016, [the FAA released a database with](#) the location of the 464,158 drone users and drones that had been registered in the first six months of the program. In December 2016, one year after implementing the registration rule, the [FAA announced that over 600,000 drone operators](#) and drones had been registered. Today, the total number of registrations has swelled to 943,535. This includes 106,739 registered non-hobbyist drones and 836,796 registered hobbyists.

The registration dataset in this report is current up to October 31, 2017. It contains the country, state, city, zip code, and status (hobbyist or non-hobbyist) of every registered drone user and non-hobbyist drone. Non-hobbyist drone registrations also include the system type and registration timestamp. While hobbyist drone users are only required to

KEY TAKEAWAYS

- As of October 31, 2017, there are 836,796 hobbyist users and 106,739 non-hobbyist drones registered with the Federal Aviation Administration.
- Non-hobbyist drone registrations have increased in 2017, while hobbyist user registrations have slowed.
- States with low population densities are more likely to have high rates of non-hobbyist drone registrations.
- The 30 most common non-hobbyist drones account for 88 percent of all non-hobbyist registered systems.
- The most popular non-hobbyist drone is the DJI Phantom 4. Drones made by the China-based DJI account for at least 70 percent of all non-hobbyist drones.
- The data contains registrations from users in 123 countries.

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Summary

	All Registrations	Hobbyist Users	Non-Hobbyist Drones
U.S. States and Territories	929,406	823,600	105,806
International	14,129	13,196	933
Total	943,535	836,796	106,739

register once regardless of how many drones they own, non-hobbyist users and entities must file a separate registration for every single drone they operate; as such, the total number of registered non-hobbyist drones in the database does not represent the total number of non-hobbyist drone users and entities. The database also includes 13,196 hobbyists and 933 non-hobbyist drones registered in 123 foreign countries who have presumably operated drones within the U.S. The database does not include any further identifying information, such as the street address, name of each registrant, or the intended use of the drone.

Though the database does not represent every single drone user in the U.S. (by some estimates, over 5 million drones have been sold in the country in recent years), the registration database offers an unparalleled insight into the geographic spread of people who operate drones in the U.S. In particular, it lends itself to a number of possible conclusions around the non-hobbyist drone sector. For example, drones made by the China-based manufacturer DJI make up over three-quarters of non-hobbyist drone registrations. The data also point to a number of curious anomalies. For example, there are 18 registered hobbyist users and nine non-hobbyist drones in Doral, Florida (33122) even though, according to the 2010 U.S. Census, there is one resident that area. Similarly, in zip code 90095, home to the University of California, Los Angeles, there are three residents but six hobbyist users and eight non-hobby drones.

Registration Categories



The Federal Aviation Administration data is divided between hobbyist *user* and non-hobbyist *drone* registrations. While hobbyist users could own more than one drone, they were only required to register once. Non-recreational users are required to register each system they intend to use.



October 31 Registration Data Analysis

The FAA's October 31, 2017 dataset contains 836,796 registered hobbyists and 106,739 registered non-hobbyist drones. The majority of these registered hobbyists and non-hobbyist drones are based in the U.S. and its territories, but a small number (13,196 hobbyists and 933 non-hobbyist drones) are based outside of the U.S. This report presents a preliminary analysis of the full dataset.

Non-Hobbyist Activity

Registrations by Date

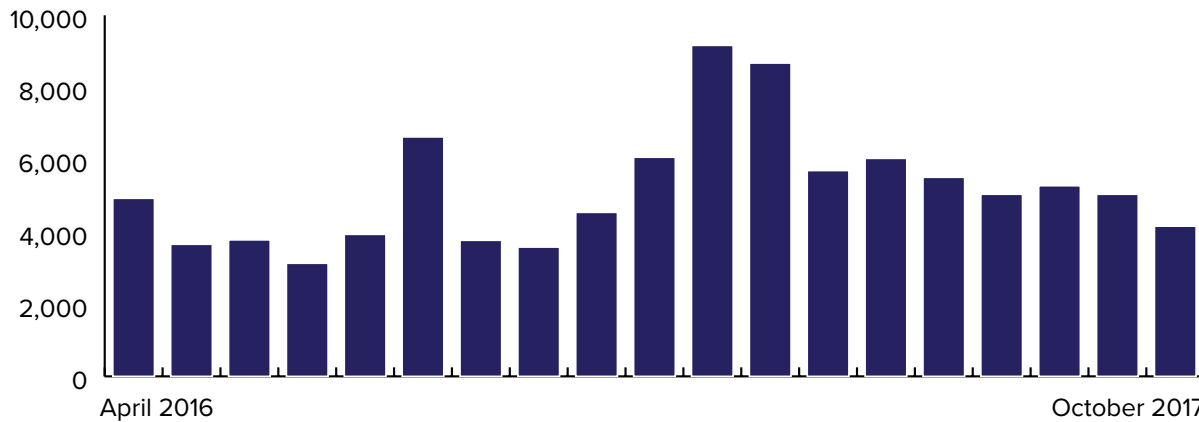
Between April 2016—the first full month in which a registration timestamp is available—and October 2017, an average of 5,346 new non-hobbyist drones were registered per month. Non-hobbyist drone registrations peaked in February and March 2017, which saw 9,387 new and 8,676 new drones registered, respectively. This spike can largely be attributed to the fact that in these two months, a company in California—presumably Intel Corporation—registered 4,800 Shooting Star 2 drones, which are used in Intel's drone swarm displays. Even outside of California, where Intel is based, the period from February 2017 to April 2017 was a busy one for registrations—25 states had their highest number of registrations to date in that period.

While the number of registrations per month are on average higher in 2017 (an average of 6,146 per month) than in 2016 (4,300 per month), the rate of growth in registrations has slowed somewhat this year. The compound annual growth rate (CAGR) for the last six months of 2016 for all states was 22.3 percent, while the CAGR for the first six months of 2017 was 5.7 percent, a change of -16.6 percent. The five states with the highest growth rate during the first six months of 2017 are Wyoming (13 percent), Idaho (9.9 percent), California (9.8 percent), Virginia (7.6 percent), Florida (6.8 percent) and Alaska (6.8

percent). The five states with the lowest growth rate are New Mexico (1 percent), North Dakota (0.8 percent), Mississippi (0.7 percent), Delaware (-0.9 percent), and Rhode Island (-3 percent). When compared to the national rate change from the end of 2016 to the start of 2017 (-16.6 percent), Alabama, West Virginia, Idaho, Wyoming, and New Hampshire saw the smallest negative change between 2016 and 2017, while the rate of registrations slowed the most in Rhode Island, Delaware, New Mexico, Nebraska, and Mississippi.



Non-Hobbyist Drones Registrations Per Month



Registrations by Location

The ten states with the largest number of registered non-hobbyist drone systems are California, Texas, Florida, New York, North Carolina, Georgia, Colorado, Illinois, Pennsylvania, and Virginia. Collectively, these states are home to 55 percent of all registered non-hobbyist drones. California alone accounts for nearly 20 percent of all registered non-hobbyist drones. The ten states with the fewest registered users are Rhode Island, Vermont, Delaware, Wyoming, South Dakota, West Virginia, North Dakota, New Hampshire, Maine, and Alaska.

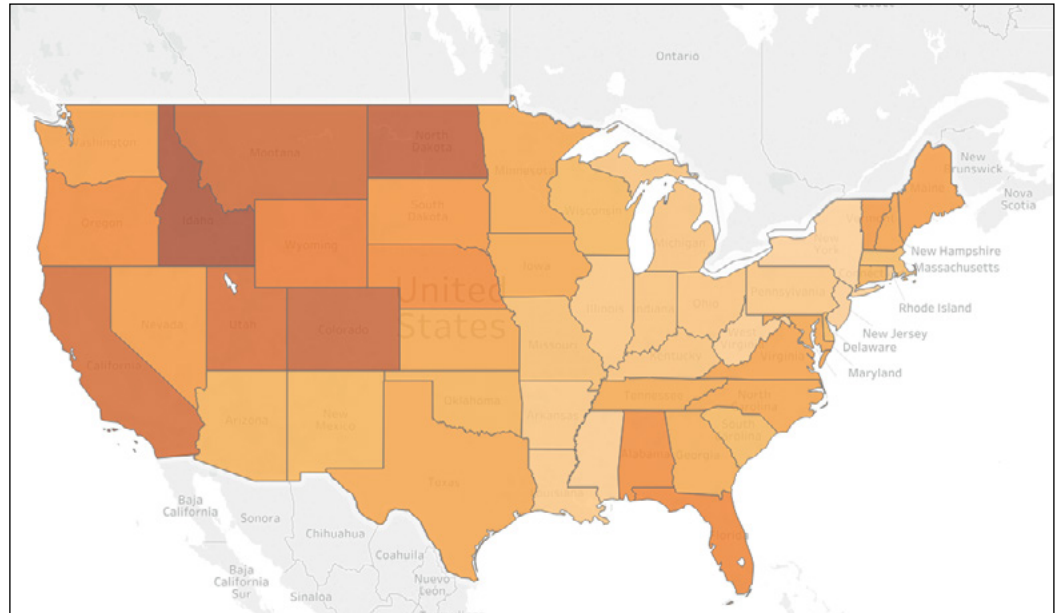
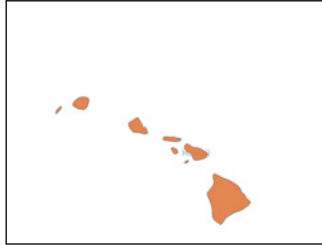
A more telling metric of how common non-hobbyist registered drones are in each state is the number of drones per capita. The five states with the greatest number of non-hobbyist drones per capita are, in descending order, Alaska (71 drones per 100,000 residents), Idaho (71 per 100,000), North Dakota (64 per 100,000), Colorado (61 per 100,000), and Montana (59 per 100,000). Together, these states' account for 5.4 percent of all drones, even though they only make up about three percent of the U.S. population. Curiously, Washington, D.C. has over 98

Non-Hobbyist Drones Per 100,000 Residents*

State	Drones	State	Drones	State	Drones
DC	98.4	WA	36.7	DE	28.7
AK	71.2	ME	36.7	SC	28.3
ID	71.2	NH	35.4	MA	26.6
ND	63.6	VA	35.1	MO	26.2
CO	60.9	NC	34.6	KY	24.0
MT	58.5	IA	34.1	IN	23.8
CA	55.6	MN	34.1	MI	23.7
UT	54.9	KS	34.0	OH	23.3
HI	51.6	MD	33.8	IL	22.8
WY	47.5	TX	33.8	AR	22.6
FL	43.6	TN	32.8	PA	22.4
NE	43.2	GA	32.4	LA	21.7
OR	43.0	OK	30.8	RI	20.6
AL	41.8	AZ	30.6	MS	20.5
SD	39.5	CT	30.6	WV	20.3
VT	38.0	NM	29.6	NJ	18.9
NV	37.9	WI	28.7	NY	18.3

*As of the 2010 U.S. Census.

Non-Hobbyist Drones Per 100,000 Residents



drones per 100,000 residents, even though the city falls within restricted airspace where drone operations are prohibited without a special permission.

Meanwhile, the five states with the fewest drones per capita are New York, New Jersey, West Virginia, Missouri, and Rhode Island. These states have between 18 and 21 registered non-hobbyist drones per 100,000 people. Together, these states' share of total drone registrations is about six times smaller than their share of the U.S. population.

States with a low population density appear to have more non-hobbyist drones per capita than densely populated states. In Alaska, the population density is one person per square mile. In North Dakota, there are 10 people per square mile. Meanwhile, in New York and New Jersey, which both ranked poorly in terms of per capita non-hobbyist drones, there are 420 and 1,218 people per square mile, respectively. The average population density for the top 25 states with the most registered non-hobbyist drones per capita is about 110 people per square mile, while the average population density for the 25 states with the fewest registered drones per capita is 287 people per square mile.

Some states grew more than the national average in 2017. The five states with the largest increase in non-hobbyist registrations this year relative to 2016 are Nebraska (185 percent more registrations than the previous year), Wyoming (164 percent), Idaho

(139 percent), Alaska (137 percent), and Montana (136 percent). Washington D.C. saw registrations rise by 403 percent this year, which potentially points to D.C.-based providers of drone services; for example, 121 DJI Inspire drones were registered in D.C. on July 10, 2017. The five states with the lowest growth are Vermont (58 percent), Rhode Island (56 percent), New Mexico (55 percent), Delaware (43 percent), and Alabama (39 percent).

There are 16,075 U.S. zip codes with registered non-hobbyist drones, meaning that around 37 percent of zip codes in the U.S. have a registered non-hobbyist drone (there are approximately 43,000 zip codes in the U.S.). The individual zip codes with the greatest number of non-hobbyist drones are 94043 (Mountain View, California), 94025 (Menlo Park, California), 32114 (Daytona Beach, Florida), 36112 (Montgomery, Alabama), 27615 (Raleigh, North Carolina).

While the FAA does not publish identifying information about each registrant, it is clear that certain organizations are driving the high numbers of drones in these top zip codes. For example the vast majority of the 6,871 registered non-hobbyist drones (seven times as many than the next top zip) in Mountain View, California are Shooting Star swarming drones, which are produced by Intel. Montgomery, Alabama (605 registered drones), meanwhile, is home to Maxwell Air Force Base, which has active research programs involving

small unmanned aircraft. Daytona Beach is Home to Embry Riddle Aeronautical University. Precision-Hawk, drone manufacturer and services company, is based in Raleigh, North Carolina.

The individual zip codes with the highest number of drones per capita are 33122 (Doral, Florida), 90095 (Los Angeles, California), 36112 (Montgomery, Alabama), 82801 (Sheridan, Wyoming), and 81612 (Aspen, Colorado). There are 147 zip codes where there is at least one non-hobbyist drone per 100 residents.

There are 933 non-hobbyist drones registered in 76 countries and territories outside the U.S. The non-U.S. countries with the most registered drones are Canada (207), the U.K. (112), Germany (72), Australia (52), France (46), and Israel (41).

Data Comparisons

For another perspective on non-hobbyist drone activity, we considered the number of Part 107 Remote Pilot certifications per 100,000 people in each state. States with a high number of drone registrations per capita also have a high number of certified Part 107 pilots per capita. Alaska, North Dakota, Colorado, Idaho, and Montana—the five states that lead per capita drone registrations—also lead in terms of Part 107 pilot certifications per capita. Rhode Island, New York, New Jersey, West Virginia, and Louisiana have the lowest number of Part 107 pilots per capita.

By comparing the number of registered drones to the number of certified pilots, one can get a rough sense of how many drones exist per pilot in the country as a whole, and in each state. As of early April 2017 (the last month of the available Part 107 pilot data), there were 32,121 Remote Pilots in the U.S., meaning that there are approximately 1.7 registered drones for every certified Part 107 pilot in the country. In Washington, D.C. there are 4.5 registered drones per Part 107 pilot and in California there are over four drones per pilot (this is likely because of the various large companies located there such as Intel). In Alabama, Rhode Island, Idaho and South Carolina, there were over two drones per pilot. On the other end of the scale, in Alaska, New Hampshire, and Delaware there were less than 1.5 drones per pilot.

Top 20 Non-Hobbyist Drones Zip Codes

State	Zip	Drones	State	Zip	Drones
CA	94043	6871	TX	77845	261
CA	94025	1505	MD	20794	222
FL	32114	994	PA	15206	203
AL	36112	605	DC	20005	173
NC	27615	389	CA	95630	139
CA	94061	343	GA	31833	138
ID	83706	331	VA	20166	134
TN	38018	308	WA	98605	133
DC	20001	277	FL	34744	132
CA	93065	276	CA	94104	115

Non-Hobbyist Drones Per Part 107 Pilots*

State	Pilots	Ratio	State	Pilots	Ratio
CA	3687	4.01	MI	804	1.62
AL	512	2.50	IN	532	1.60
RI	53	2.28	MT	192	1.60
ID	305	2.19	AR	244	1.58
SC	380	2.09	KY	390	1.58
MD	570	2.03	OR	597	1.57
UT	417	2.00	OH	978	1.57
NC	960	1.94	NM	232	1.56
SD	99	1.92	HI	258	1.55
WI	492	1.92	NJ	619	1.54
MA	528	1.89	MS	233	1.54
GA	981	1.88	NE	242	1.53
FL	2752	1.88	NV	401	1.52
CT	310	1.76	ME	182	1.51
PA	983	1.76	OK	442	1.51
TN	618	1.75	WV	137	1.50
NY	1122	1.73	IL	1131	1.47
MN	583	1.73	WY	102	1.42
TX	2666	1.73	KS	397	1.42
VA	970	1.71	ND	162	1.41
IA	365	1.69	WA	988	1.41
VT	84	1.65	AZ	855	1.41
MO	564	1.65	DE	118	1.35
LA	350	1.65	NH	213	1.25
CO	1029	1.63	AK	239	1.13

*The “ratio” figure represents the number of drones per registered pilot as of early April 2017.

Non-Hobbyist Drone Systems

Unlike previous registration datasets published by the FAA, this latest release includes the drone model type for all non-hobbyist registrations. The table presents the 30 most common registered models, which together account for 88 percent of all drones in the non-hobbyist registration dataset. Thirteen of these systems are made by DJI, the China-based manufacturer of popular consumer systems. Following DJI, drones made by Intel Corporation and 3DR are among the most common. Of the top 30 systems, 28 are multirotor drones and two are a fixed-wing drones.

The most common non-hobbyist drones are the DJI Phantom 4 and Phantom 3. There are at least 26,189 Phantom 4 drones and 16,944 Phantom 3 drones in the data. These two systems comprise 46 percent of the top 30 non-hobbyist drone registrations, and 40 percent of all registered non-hobbyist drones.

The data indicate that DJI has a firm lock on the non-recreational drone market. DJI drones account for 78 percent of the systems in the top 30 and at least 70 percent of all non-hobbyist drones. This figure is not altogether inconsistent with estimates of DJI's share of the global civilian market, which [some analysts put at 70 percent](#), and it has remained virtually unchanged from the previous year.* Although the pace of registrations of older

Phantom models has lagged in 2017, this has been compensated by the introduction of new models such as the DJI Mavic, as well as by an 80 percent increase in Phantom 4 registrations in 2017.

The most common non-DJI drone in the registration data is the Intel Shooting Star, a small quadrotor drone made by Intel Corporation. There are 6,638 Shooting Star and Shooting Star 2 drones registered in zip code 94043 (Mountain View, California). Although the data do not contain identifying information about the owner of the drones, the Shooting Star is not yet available to the public, indicating that Intel is the likely registrant. If true, this would make the technology company is the largest single owner of drones in the United States besides the U.S. military. Intel is known for fielding the Shooting Star in its aerial light performances, such as when it lit up the sky with 300 drones at the [2017 Super Bowl Halftime Show](#).

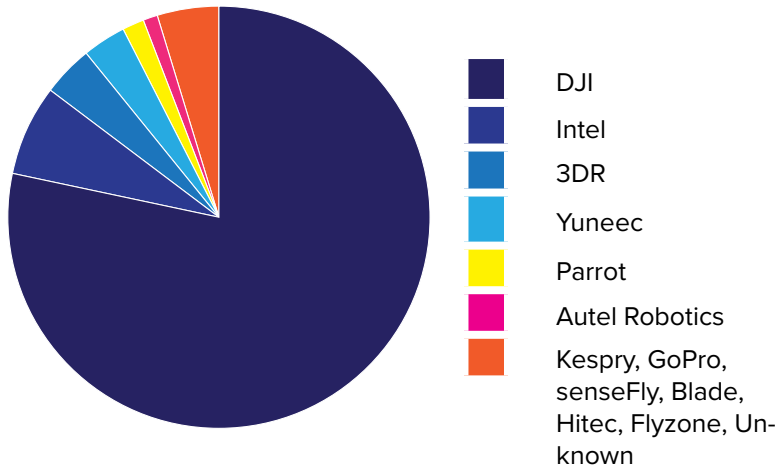
Other drones were similarly registered en masse in a single location. In California, there are 329 R1 drones in Redwood City and 426 Hamilton2 drones in Menlo Park. Neither the R1 nor the Hamilton2 appear to be commercially available systems, suggesting that these drones may be prototypes or demonstrator vehicles not yet available on the market.

Top 30 Non-Hobbyist Drones

Manufacturer	Model	Quantity
DJI	Phantom 4	26189
DJI	Phantom 3	16944
DJI	Mavic	13902
DJI	Inspire 1	7787
Intel	Shooting Star 2	4800
3DR	Solo	3269
DJI	Inspire 2	2669
DJI	Phantom 2	2272
Intel	Shooting Star	1838
Yuneec	Typhoon H	1609
Yuneec	Typhoon Q500	1505
Autel Robotics	X-Star Premium	1234
Kespry	Kespry Drone 2.0	1042
GoPro	Karma	938
DJI	Matrice 600	883

Manufacturer	Model	Quantity
DJI	Matrice 100	801
DJI	Spark	747
senseFly	eBee	686
DJI	Phantom 1	676
Parrot	AR Drone 2.0	540
Parrot	Bebop 2	450
3DR	Iris	439
Unknown	Hamilton2	426
Parrot	Bebop	401
DJI	S1000	380
Unknown	R1	329
Blade	Chroma	300
Hitec	Q-Box 450	272
Flyzone	FLZA-3000	215
DJI	F450	208

Top 30 Non-Hobbyist Drone Manufacturers



Top 30 Non-Hobbyist Drone Types

Engines	Number
Single	2
Quadrotor	23
Hexacopter	2
Octocopter	1
Unknown	2

Category	Number
Consumer	13
Prosumer	5
Commercial	9
DIY	1
Unknown	2

Hobbyist Registrations

Registrations by Location

The ten states with the most total registered hobbyist drone users are California, Texas, Florida, New York, and Pennsylvania. Collectively, these states are home to 38 percent of all registered hobbyist drone users. Besides the District of Columbia—which has 817 registered hobbyists—the ten states with the fewest registered users are South Dakota, Delaware, North Dakota, Vermont, and Wyoming.

The five states with the most registered hobbyist users per capita are, in descending order, Hawaii, Alaska, Utah, Colorado, and Washington. Hawaii has 457 registered hobbyist users per 100,000 residents, while Alaska, Utah, Colorado, and Washington have between 369 and 455 hobbyists per 100,000 residents. Meanwhile, the five states with the fewest hobbyist users per capita are Mississippi, Louisiana, Kentucky, New Mexico, and Arkansas. These states have between 142 and 200 registered hobbyists per 100,000 residents.

There are 28,672 U.S. zip codes with at least one registered hobby drone user in the database, meaning that about 67 percent of zip codes in the U.S have a registered hobbyist. There are 598 zip codes where there is at least one hobbyist per 100 residents. The individual zip codes with the greatest number of hobbyists are 89117 (Las Vegas, Nevada), 77494 (Katy, Texas), 75070 (McKinney, Texas), 98052 (Redmond, Washington), and 78613 (Cedar

Park, Texas). The zip codes with the highest number of hobbyists per capita, excluding zip codes with less than ten residents, are 94105 (San Francisco, California), 32081 (Ponte Vedra, Florida), 34211 (Manatee County, Florida), 77441 (Fort Bend County, Texas), and 11109 (Long Island City, New York).

There are 13,196 hobbyist users registered in 123 countries and territories outside the U.S. The non-U.S. countries with the most registered hobbyists are Canada (2253), Germany (1860), the U.K. (963), China (796), and Japan (752).

Top 20 Hobbyist User Zip Codes

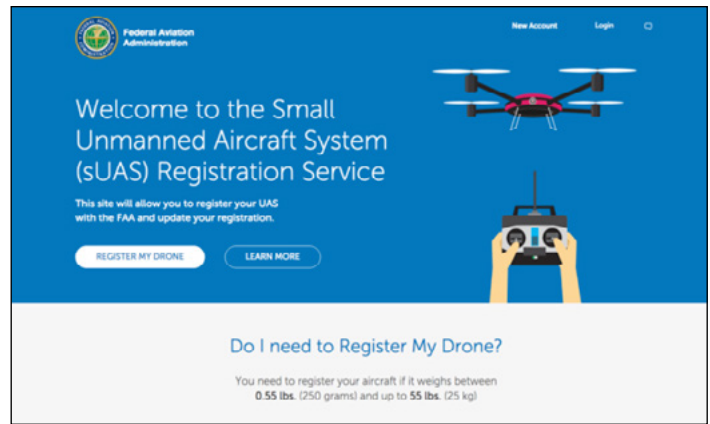
State	Zip	Users
NV	89117	672
TX	77494	476
TX	75070	453
NV	98052	424
TX	78613	395
TX	77573	378
CO	80134	372
HI	96706	365
TX	77479	362
GA	30024	356
CA	92677	354
OR	97229	353
CA	95014	351
TX	77433	349
TX	77429	339
CA	93065	335
TX	78660	333
CA	92126	327
CA	95035	325
AZ	76244	323

The Registration Requirement

In recent months, fewer hobbyists appear to be registering each month compared to previous months. Between May 2016 and February 2017, the number of hobbyist registrations grew at an average monthly rate of 5.9 percent. But between February 2017 and October 2017, the average monthly growth rate of registrations was 1.7 percent.

This slowing growth rate may be related to the uncertain legal status of the registration requirement for hobbyists. On May 19, 2017, the D.C. Court of Appeals [struck down the Federal Aviation Administration's rule](#) requiring all hobbyist drone owners to register with the government, [finding that the program violated](#) the 2012 [FAA Modernization and Reform Act](#), which bars the FAA from imposing any new regulations on model aircraft. Ever since the ruling, hobbyist drone users are not required to register with the FAA, [though they still have the option to do so](#). According to an FAA spokesperson, as of early October 2017, 843 hobbyists have deactivated their registrations since the May ruling.

This may not represent the end of the legal battle over the status of hobbyist drone users. The 2018 National Defense Authorization Act (NDAA) [includes a provision \(Section 1092\)](#) that would reinstate the registration requirement for hobbyist drone users. As of publication of this report, the 2018 NDAA has passed the House of Representatives and the Senate. If signed into law by the president, hobbyist drone users will once again be required to register in order to fly in U.S. airspace.



The FAA's drone registration website.

Local Laws

In a [report released in March 2017](#), the Center for the Study of the Drone found 133 localities in 29 states with laws and ordinances regulating drones. These laws and ordinances impose a number of restrictions on drone operations; some require that users obtain additional permits while others prohibit operating a drone in certain public areas. Of these 133 localities, 24 localities in 10 states prohibit drone use over private property and prohibit or restrict drones use over public spaces. According to the registration data, a rough estimate suggests that there are 6,810 hobbyist users and 834 non-hobbyist drones registered in localities with one of these ordinances.

**This is a rough estimate, seeing as some zip codes straddle two different municipalities.*



Data Notes

The drone registration data is available at the Federal Aviation Administration’s Freedom of Information Act online reading room. The analysis in this report is based on the raw, unedited dataset published by the FAA, which may contain errors such as misspelled place names or duplicative registrations.

The non-hobbyist drone dataset only includes the model name of each aircraft. As a result, the manufacturer of some drone systems was difficult to identify with certainty. Furthermore, while numbered versions of the same named model were treated as different systems (i.e. Phantom 1 and Phantom 2), no distinction was made between the “Standard,” “Advanced,” and “Professional” variants of a drone. Because registrants often misspell the model names at the time of registration, it is hard to obtain exact

counts for many of the most popular drones in the dataset. For example, the dataset includes at least 354 spellings for the DJI Inspire 1. These misspellings, which are difficult to catch, can be statistically significant; for example, over 200 registrants entered their drone model name as “Phanton.” It is therefore possible that some of these tallies might slightly differ from the exact number of registered aircraft of a particular model.

The state population data—including population density—is based on the 2010 U.S. census. The Part 107 Remote Pilot dataset covers the location by state of the 32,214 individuals who, as of April 2017, have obtained a Part 107 Remote Pilot certificate, which permits an individual to use drones for commercial applications. This data was released by the FAA in April and is available at sUAS News.

Hobbyist Users and Non-Hobbyist Drones by State

State	Hobby	Non-H
AK	3236	506
AL	10450	1999
AR	5831	659
AZ	19317	1959
CA	107649	20704
CO	19171	3064
CT	9929	1094
DC	817	592
DE	2315	258
FL	62425	8192
GA	23723	3139
HI	6216	702
IA	8397	1038
ID	4940	1116
IL	28172	2927
IN	15496	1544
KS	8158	971

State	Hobby	Non-H
KY	7754	1043
LA	7756	986
MA	17463	1742
MD	15487	1954
ME	3549	487
MI	25143	2343
MN	14802	1806
MO	14191	1570
MS	4216	609
MT	2904	579
NC	23171	3298
ND	2242	428
NE	5115	789
NH	4643	466
NJ	22198	1661
NM	3948	610
NV	8681	1024

State	Hobby	Non-H
NY	41570	3542
OH	26788	2687
OK	9554	1154
OR	13532	1646
PA	29885	2843
RI	2582	217
SC	10951	1310
SD	2512	322
TN	15105	2080
TX	66147	8489
UT	11201	1516
VA	23403	2812
VT	1762	238
WA	24830	2468
WI	15423	1635
WV	3852	376
WY	1623	268

Gettinger, Dan and Arthur Holland Michel, “Drone Registrations: A Preliminary Analysis.” *Center for the Study of the Drone at Bard College*, November 17, 2017, <http://dronecenter.bard.edu/drone-registrations/>.

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