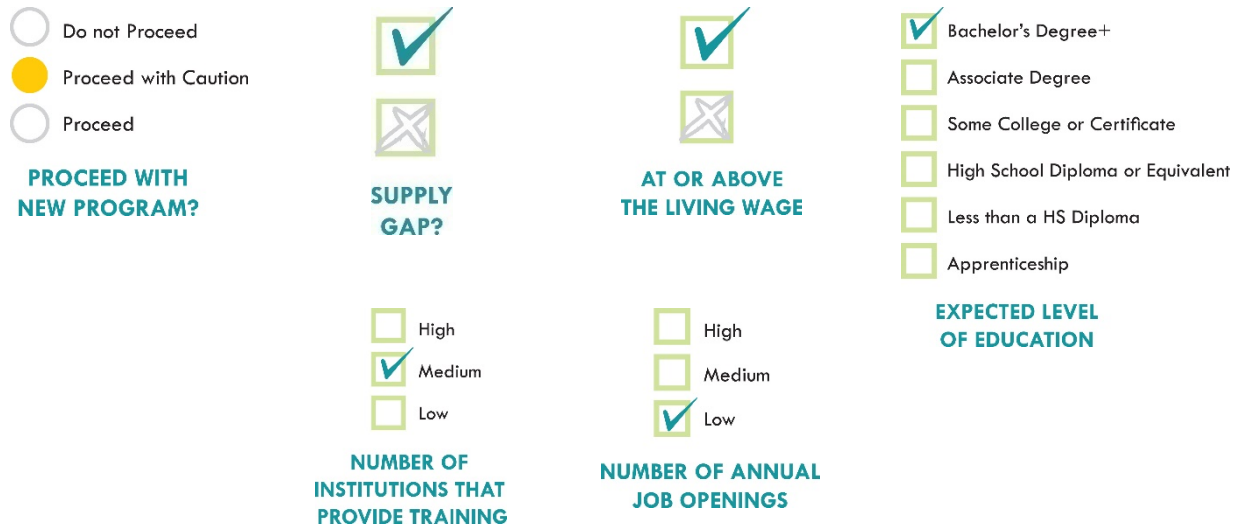


Unmanned Aerial Vehicle (UAV) Pilots

Labor Market Analysis: San Diego County

May 2020

Summary



The San Diego-Imperial Center of Excellence for Labor Market Research (COE) developed this brief to assist community colleges in the region with decision-making in processes such as program development. According to available labor market information, *UAV Pilots* has a potential labor market demand of 91 annual job openings based on online job postings, while average demand for an occupation in San Diego County is 277 annual job openings. Four educational institutions in San Diego County supply awards for this occupation; however, due to the small size of these programs, the supply from these colleges cannot be calculated. As of April 2020, there were 51 registered UAVs in San Diego County, with 25 registered to corporations, eight registered to individuals and 18 registered to the government. Based on this information, it could be argued that a supply gap exists for *UAV Pilots*. In recent conversations with employers, the term “LiDaR” was mentioned as an in-demand skill that is necessary for the occupation. To confirm that hypothesis, the COE analyzed online job postings and found only one posting in 2018 and nine postings in 2019 for “LiDAR.” Despite its high wages and potential supply gap, the COE recommends that the colleges to proceed with caution for a new program for this occupation because the typical education level for *UAV Pilots* is a bachelor’s degree. However, there may be an opportunity for the

community colleges to market these types of program to incumbent (existing) workers who may already have a bachelor's degree and simply need upskilling or additional training to qualify for these positions.

Introduction

This report provides labor market information in San Diego County for *Unmanned Aerial Vehicle (UAV) Pilots*. Depending on the company, *UAV Pilots* may have other titles, such as UAV Operators, Unmanned Aircraft Pilots, Unmanned Aircraft Systems Operators, Commercial Drone Pilots/Operators and Remote Pilots/Operators. In this report, these occupations are collectively referred to as *UAV Pilots*.

Unmanned aerial vehicles are remote-controlled airships and include four primary aerial platforms: fixed-wing aircrafts like airplanes; single-rotor helicopters; fixed-wing hybrid aircraft that include a rotor component; and multi-rotor multicopters, like quadcopters or octocopters.¹ In this report, a multicopter will be referred to as a *drone*.²

Until recently, UAVs were predominantly used by the defense industry. Now, UAVs have significant commercial and personal use.

Most drones fall under the following categories:

- Toy drone
- Hobby drone
- Professional/commercial drone
- Racing drone
- Military drone
- Photography drone

Unmanned aircraft obstacle detection systems include:³

- Vision Sensor
- Ultrasonic
- Infrared
- LiDAR
- Time of Flight (ToF)
- Monocular Visio

This report will review online job postings, including postings for pilots of LiDAR-equipped UAVs. Light Detection and Ranging or LiDAR is a state-of-the-art remote sensing technology that emits a pulsed laser beam to detect surfaces and avoid collisions. LiDAR can also record precise three-dimensional topographical information that has wide applications in fields such as agriculture, construction, autonomous vehicle development, and environmental management.⁴

¹ M. Hassanalian and A. Abdelkefi, "Classifications, Applications and Design Challenges of Drones: A Review," *Progress in Aerospace Sciences*, no. 91 (May 2017): 99-131, ResearchGate, accessed May 15, 2020, [researchgate.net/publication/316673697](https://www.researchgate.net/publication/316673697).

² "Drone Glossary," Air Drone Craze, accessed May 15, 2020, airdronecraze.com/quick-reference-guide-of-drone-terminology.

³ Fintan Corrigan, "How Do Drones Work And What Is Drone Technology," DroneZon, May 10, 2020, accessed May 15, 2020, dronezon.com/learn-about-drones-quadcopters/what-is-drone-technology-or-how-does-drone-technology-work.

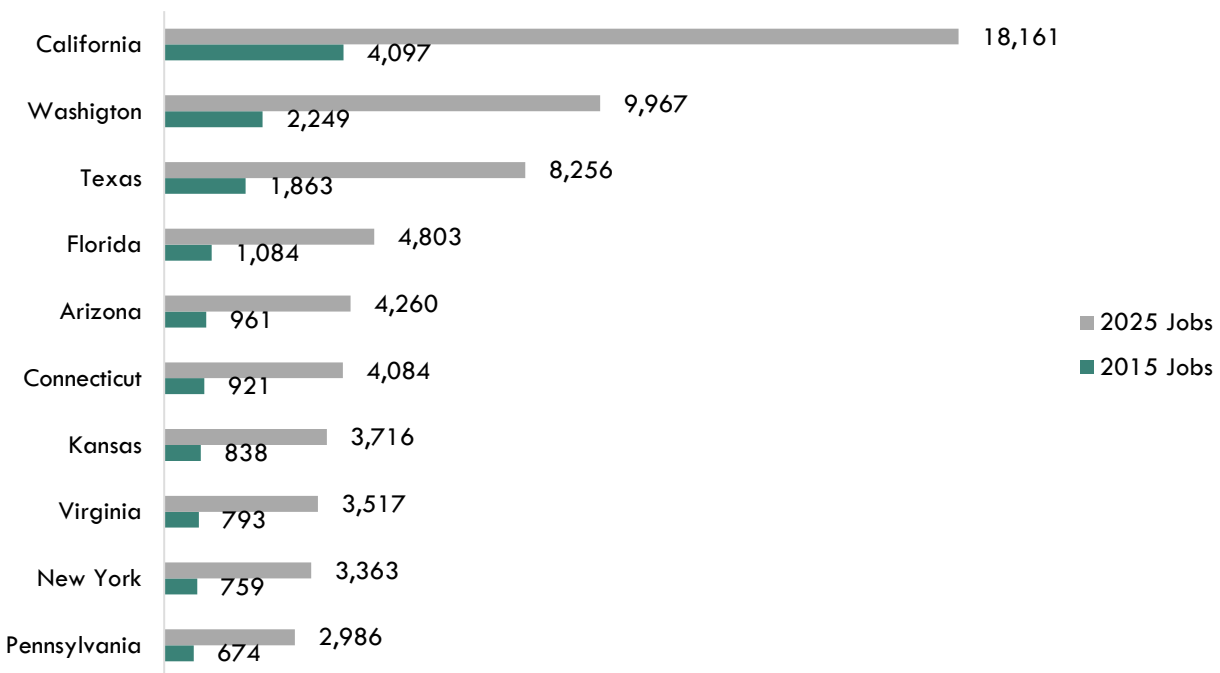
⁴ LiDAR uses a laser to scan the environment and measure the reflection time of the signal from the object back to the detector. Leah A. Wasser. "The Basics of LiDAR: Light Detection and Ranging: Remote Sensing," Neon Science, accessed May 15, 2020, neonscience.org/lidar-basics.

Projected Occupational Demand

Typically, labor market demand for an occupation could be projected if the occupation has a code within the federal Standard Occupational Classification (SOC) system. Because there is no SOC code associated with *UAV Pilots*, no projected occupational demand is provided in this report. However, according to the Federal Aviation Administration’s General Aviation and Commercial Division, fixed-wing piston aircraft pilots are expected to decline at a one percent rate over the next two decades. Conversely, *UAV Pilot* registrations are expected to increase from 116,027 to 350,000 or 300% in the next five years and could potentially increase further if unmanned aerial systems are used in commercial industries.⁵

According to the Association for Unmanned Vehicle Systems International (AUVSI), California is expected to create 14,064 jobs between 2015 and 2025 that are directly related to unmanned aircraft systems. Related jobs include flying, building, developing, selling, maintaining, and customizing drones, as well as training people to use drones. Exhibit 1 shows the top 10 states projected to have the most direct employment increase in unmanned aircraft systems.

Exhibit 1: Top 10 States with Jobs Directly Related to Unmanned Aircraft Systems by Number of Jobs⁶



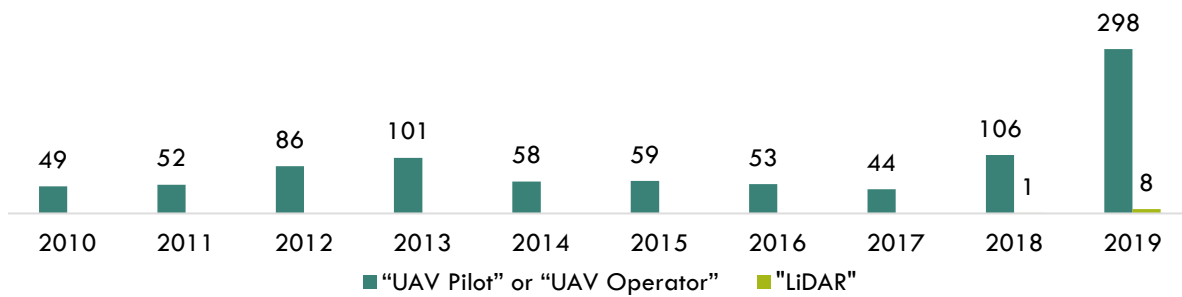
⁵ "FAA Aerospace Forecast: Fiscal Years 2019-2039," Federal Aviation Administration, accessed May 15, 2020, [faa.gov/data_research/aviation/aerospace_forecasts/media/FY2019-39_FAA_Aerospace_Forecast.pdf](https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2019-39_FAA_Aerospace_Forecast.pdf).

⁶ Darryl Jenkins and Bijan Vasigh, "The Economic Impact of Unmanned Aircraft Systems Integration in the United States," The Association for Unmanned Vehicle Systems International, March 2013, accessed May 15, 2020, [auvsi.org/our-impact/economic-report](https://www.auvsi.org/our-impact/economic-report).

Online Job Postings

This report analyzes recent data from online job postings, which is also known as real-time labor market information. Online job postings may provide additional insight about recent changes in the labor market demand that are not captured by historical data. Between 2010 and 2019, there was an average of 91 online job postings per year for jobs with the keywords “UAV Pilot” or “UAV Operator” in San Diego County. In recent conversations with employers, the term “LiDaR” was mentioned as an upcoming, in-demand skill that is necessary for the occupation. To confirm that hypothesis, the COE analyzed online job postings and only found one posting in 2018 and nine postings in 2019 for “LiDAR” (Exhibit 2).

Exhibit 2: Number of Online Job Postings with Keyword “UAV Pilot” or “UAV Operator” in San Diego County (2010-2019)⁷



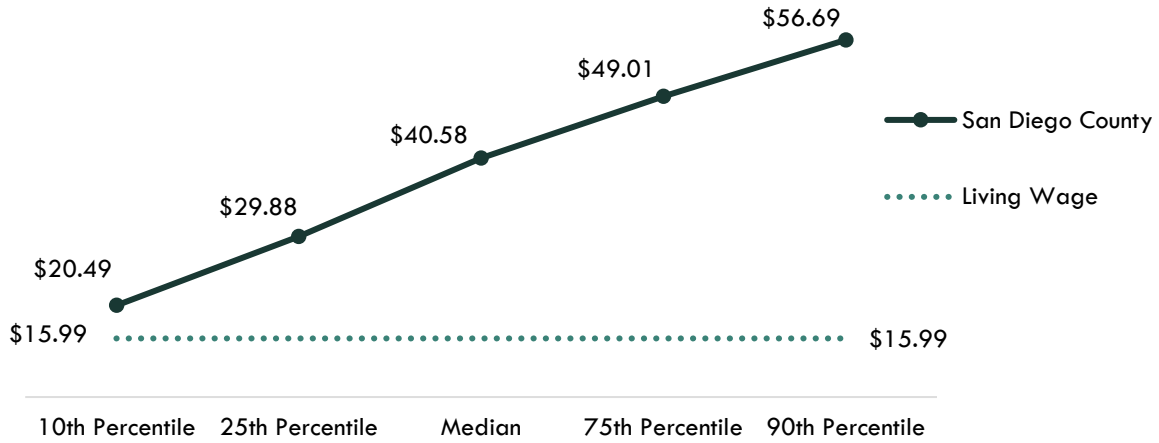
Earnings

UAV Pilots earn median hourly earnings of **\$40.58**; this is higher than the Self-Sufficiency Standard for a single adult in San Diego County which is **\$15.99** per hour (Exhibit 3).⁸

⁷ Burning Glass Technologies, “Labor Insight Real-Time Labor Market Information Tool.” 2010-2019.

⁸ The self-sufficient wage in San Diego for one adult is \$15.99 (insightcced.org/tools-metrics/self-sufficiency-standard-tool-for-california).

Exhibit 3: Hourly Earnings for UAV Pilots in the San Diego County⁹



Supply

Educational supply for an occupation can be estimated by analyzing the number of related program completions, graduations, or awards. There are **four** community colleges in San Diego County that provide training for UAV-related jobs: Palomar College, Grossmont College, San Diego City College, and San Diego Miramar College. However, due to the small size of these programs, the supply from these colleges cannot be calculated.

Because the Federal Aviation Administration (FAA) requires that drone pilots have licenses and registered drones, this report analyzes data from the FAA registry to estimate the labor supply based on the number of registered unmanned aerial vehicles in San Diego County.

As of April 2019, there were **51** registered UAVs (up to 55 pounds) in San Diego County, with **25** registered to corporations, **eight** registered to individuals and **18** registered to the government (Exhibit 4). That is **223 (81 percent)** fewer registered UAVs than in April 2017.¹⁰

⁹ "Unmanned Aerial Vehicle (UAV) Pilot Salary in San Diego, California," Salary, accessed May 15, 2020, <https://www.salary.com/research/salary/posting/unmanned-aerial-vehicle-uav-pilot-salary/san-diego-ca>.

¹⁰ Daniel Wheaton, "San Diego is Mostly a No-Drone Zone, at Least According to the Rules," *San Diego Union Tribune*, April 6, 2017, accessed May 15, 2020, sandiegouniontribune.com/news/data-watch/sd-me-faa-drone-20170406-story.html.

Exhibit 4: Registered Unmanned Aircraft Vehicles in San Diego County as of April 2020¹¹



The average cost of a UAV registered in San Diego County is [\\$4,944.56](#) and the median cost is [\\$2,124.00](#). Refer to Appendix A for more information on registered drone models in San Diego County and their respective costs.

Demand vs. Supply

A complete labor market demand and supply analysis could not be completed for this report due to a lack of data. However, based on online job postings San Diego County saw an average of 91 online job postings per year since 2010; therefore, it could be estimated that employers have a labor market demand of 91 *UAV Pilots* per year. Additionally, because the FAA requires that drone or UAV pilots register with the Federal Aviation Administration, it could be estimated that only eight registered individuals constitute the supply for *UAV Pilots*. With only eight registered drone pilots and over 90 job postings per year for *UAV pilots*, it could be argued that there is a supply gap for this occupation.

Top Employers and Work Locations

Between January 1, 2017 and December 31, 2019, the top five employers in San Diego that posted online job listings for “UAV Pilot” and “UAV Operator” were the [U.S. Army](#), [General Atomics](#), [Northrop Grumman](#), [Raytheon](#), and [Solute](#) (Exhibit 5).

¹¹ “FAA Registry: State and County Inquiry,” Federal Aviation Administration, last modified April 30, 2020, accessed May 1, 2020, registry.faa.gov/aircraftinquiry/statecounty_inquiry.aspx.

Exhibit 5: Top Employers in San Diego County for UAV Pilots and UAV Operators¹²

Top Employers (Online Job Postings)	
<ul style="list-style-type: none"> • US Army (96) • General Atomics (61) • Northrop Grumman (11) • Raytheon (9) • Solute (3) 	<ul style="list-style-type: none"> • Repair A Drone (3) • Code 3 Drone (3) • VScenario (2) • Nv5 (2)

Skills, Education, and Certifications

Because there is no SOC code associated with *UAV Pilots*, no national educational attainment data illustrating the typical education obtained by individuals employed in this occupation is provided in this report.¹³ However, based on online job postings between January 1, 2017 and December 31, 2019, the top listed educational requirement for *UAV Pilots* and *UAV operators* is a bachelor’s degree (Exhibit 6).¹⁴

Exhibit 6: Educational Requirements for UAV Pilots and UAV Operators in San Diego County¹⁵

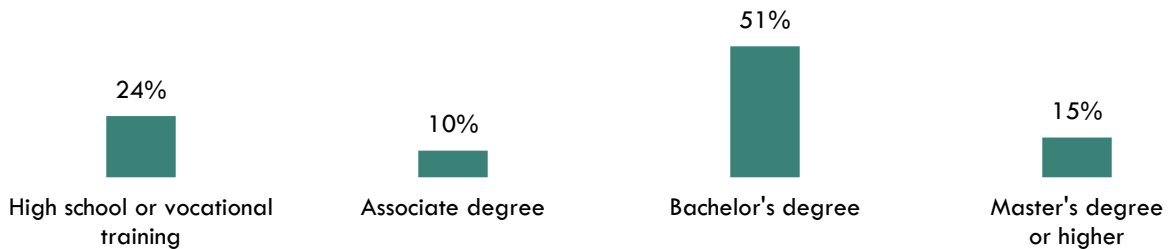


Exhibit 7 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2017 and December 31, 2019.

¹² Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.
¹³ Emsi 2020.01; QCEW, Non-QCEW, Self-Employed.
¹⁴ Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.
¹⁵ Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.

Exhibit 7: Top Skills for UAV Pilots and UAV Operators in San Diego County¹⁶

Specialized Skills	Soft Skills	Software Skills
<ul style="list-style-type: none"> • Training Materials • Engineering Drawings • Teaching • Surveillance • Technical Writing / Editing 	<ul style="list-style-type: none"> • Planning • Research • Written Communication • Communication Skills • Computer Literacy 	<ul style="list-style-type: none"> • Flickr • Microsoft Excel • Software Engineering • Java • C++

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Important Disclaimers

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor’s Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.

This workforce demand report uses state and federal job projection data that was developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.

¹⁶ Burning Glass Technologies, “Labor Insight Real-Time Labor Market Information Tool.” 2017-2019.

Appendix A: Drone Models, Cost, and Website

Of the drone models registered in San Diego County, the following table lists the model name, cost, and website used to determine the cost. Models with “Experimental” in the “Cost” column have no cost associated because they are not sold commercially. An “X” in the “Cost” column means that no cost was found for the associated model name. The information listed is subject to change.

Model Name	Cost	Website
INDAGO	\$25,000.00	https://bit.ly/2K79PcQ
EBEE	\$17,990.00	https://bit.ly/3ep0hb2
INSTANTEYE MK-2 GEN3	\$7,800.00	https://bit.ly/2V9miDq
E386	\$6,890.00	https://bit.ly/2xxEsVy
S1000+	\$4,319.00	https://bit.ly/34yK4M8
SPREADING WINGS S900	\$3,593.00	https://bit.ly/2XD3UEq
TORNADO H920	\$2,499.00	https://amzn.to/2ybfEUq
NIMBUS VTOL V2	\$2,149.00	https://bit.ly/2RCy46R
PHANTOM 4 PRO	\$2,099.00	https://amzn.to/2XxplXz
MAVIC PRO	\$1,599.00	https://amzn.to/2kCukl5
INSPIRE 1	\$1,400.00	https://bit.ly/2JkZYkZ
PHANTOM 2 FPV Kit	\$1,053.00 \$427.90	https://amzn.to/2LdhS6L and https://bit.ly/3a4cKO1
PHANTOM 3 PROFESSION	\$949.00	https://amzn.to/2slbq6s
TAROT T15	\$649.00	https://bit.ly/2J2vi4z
PHANTOM 2	\$625.00	https://amzn.to/2LdhS6L
SOLO	\$499.00	https://amzn.to/2xrpPmy
UER97000-5	Experimental	https://bit.ly/2VsfJL4
URBANE FLYER 30 MKII	Experimental	https://bit.ly/2KhpQxf
VIREO	Experimental	https://bit.ly/3aaWtqy
APH-22	X	N/A
APQ-18	X	N/A
HEAVY LIFTER	X	N/A
P2 MULTIROTOR	X	N/A