DART
DRONE AUTOMATION & ROBOTICS TECHNOLOGIES

MONTEREY BAY REGION ADVANCED MANUFACTURING WORKFORCE TRAINING CENTER FEASIBILITY STUDY

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MONTEREY BAY REGION ADVANCED MANUFACTURING WORKFORCE TRAINING CENTER FEASIBILITY STUDY

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SECTION 1

EXECUTIVE SUMMARY

The Monterey Bay Advanced Manufacturing Workforce Development Training Center Feasibility Study was conducted to determine the need and demand for the creation of a workforce training center within Monterey, San Benito, and Santa Cruz counties. Based upon key findings developed as a result of extensive data analysis, independent review, regional survey results, and stakeholder interviews, the following recommendations are set forth:

1. Develop a collaborative partnership with Monterey Bay Region community colleges and universities to provide distributed workforce training courses based upon their existing and available curriculum.

2. Develop a specific advanced manufacturing training curriculum working in partnership with Monterey Bay region community colleges and universities, with input from an advisory board of local employers, industry leaders, and community-based organizations that meet their respective workforce needs now and into the future.

3. Plan, Design, and Implement an advanced manufacturing workforce training center that is centrally located and accessible to those in need of training and will be the site to deliver the specific advanced curriculum.

The Hatamiya Group, an expert economics and strategic advisory consulting firm located in Davis, California (see Bios attached), was retained by the Monterey Bay Drone Automation and Robotics Technology ("MB DART") initiative to perform an independent and objective feasibility analysis for the creation of an advanced manufacturing workforce training center in the Monterey Bay Region of California, including Monterey, San Benito, and Santa Cruz counties. The continued growth of Joby Aviation's advanced manufacturing operations at the Marina Airport, along with the presence of a growing cluster of advanced air mobility, AgTech, and national security-oriented firms throughout the California Central Coast are driving increased interest in career technical education, and demand for workers with future-relevant skills.

We have attempted to: (1) assess the need and demand for a regional workforce training center focused on preparing the local workforce for the jobs of the future in advanced manufacturing,

drones, automation, and robotics technical fields; (2) analyze the current and future regional demographic make-up to determine the current skill set of the local workforce; (3) identify gaps in existing local and regional workforce training programs; and (4) determine the appropriate workforce training programs and facilities to meet the needs of regional advanced manufacturing requirements.

METHODOLOGY

To identify and develop recommendations for the practical creation of a Monterey Bay regional advanced manufacturing workforce training center, we analyzed various publicly available sources of demographic and socio-economic data. First, we needed to accurately determine various measurements across Monterey, San Benito, and Santa Cruz counties, including total population; total population by race; selected economic characteristics, such as employment status (employed vs. unemployed and workforce participation rates); and educational attainment. This was accomplished by analyzing the most up-to-date online United States Bureau of Census data as well as JobsEQ estimates.

Second, we performed online regional Surveys targeting industry and employers, academia and labor, and community-based organizations and local government, including a Spanish language version across the three counties. Each Survey was made up of a series of multiple choice and short answer questions directed to solicit input from a wide array of Monterey, San Benito, and Santa Cruz counties respondents with a primary focus to measure interest and need in the development of a regional advanced manufacturing workforce training facility.

Third, we reviewed and analyzed existing workforce training centers across California and the United States to determine their scope, size, programs, and relevance to a potential facility in the Monterey Bay region (e.g., Monterey, San Benito, and Santa Cruz Counties). Additionally, we examined the availability of current, potential, or prospective entities that reside within concentric regions of 0-50 miles, 51-100 miles, 101-200 miles, and 201-300 miles (within California only) from the MB DART location, to identify if gaps were present in workforce training availability for robotics, drone, and EV related technologies. We additionally assessed the availability of current, potential, or prospective entities within the Monterey Bay Region three-county area as separate from the 0-50 miles concentric area to further refine the gap assessment. An Interactive Map by category and entity type was created that allows the reader to view and select categories

of interest to visually assess the gaps in available training for the respective areas as described.

We also identified potential sites to locate a regional workforce training center ("RWTC") within the three-county area, primarily focused on convenient proximity, potential readiness, land availability, and willing partnerships.

Finally, we relied upon extensive data collection and significant analysis to develop a preliminary advanced manufacturing workforce training center concept, including a combination of: (i) Classrooms; (ii) Labs, including but not limited to computers, engineering design, and CAD software; (iii) Workshops, including but not limited to laser 3D Printers, composite manufacturing equipment, robots, EV automotive and aviation equipment, electronic and mechatronics-related equipment e.g., appropriate engineering, electronics, repair, and maintenance equipment, machine fabrication equipment, and any other assembly and service equipment; (iv) Common use areas, affording collaborative space for student and instructor interaction and flexibility for multiple uses; and (v) Meeting spaces and conference rooms.

KEY FINDINGS AND RECOMMENDATIONS

KEY FINDINGS

- **Manufacturing jobs in the Monterey Bay Region have been increasing over the last five years** to over 17,000 by 2023Q1, and Manufacturing has become the 7th highest industry by employment.[1] As a comparison, Agriculture remains the largest regional employer with more than 68,000 workers, and Health Care and Social Assistance follow with nearly 42,000 workers.

- **The Monterey Bay Region maintains a vibrant Civilian Labor Force**, including nearly 142,000 people without jobs actively looking for work.[2] This would indicate a significant pool of trainable and interested workers to be served by a regional workforce training center.

- **The population of the Monterey Bay Region (and more so in Monterey and San Benito counties) is younger** - with more individuals (by percentage) below the age of 18 than the rest of California and the entire United States. This would indicate a greater number of potential individuals entering the workforce over the next decade with increasing workforce training needs.

- **The Monterey Bay Region, including Monterey and San**

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[1] *JobsEQ, http://www.chmuraecon.com/jobseq , August 2023*
[2] *Ibid.*

Benito Counties, has a higher concentration of Hispanic/Latino population than the rest of California and the entire United States, indicating a growing and more diverse community.

- **The Monterey Bay Region, including Monterey County has a higher rate of individuals without a high school diploma** than the rest of California and the entire United States. Moreover, the Monterey Bay Region, including Monterey and San Benito Counties has a lower rate of college graduates than the rest of California and the entire United States. Again, this data would indicate a significant need for a regional workforce training center targeting a less educated workforce seeking jobs of the future.

- **Computer Skills and Communications Skills** were perceived to be the most in need across all three Surveys, including (i) Industry and Employers, (ii) Community-based Organizations and Local Government, and (iii) Community-based Organizations (Spanish language).

- **Artificial Intelligence followed by Complex Computer-Aided Design and 3D Printing** were the greatest perceived workforce training needs of Industry and Employers for the future.

- **Robotics, Software, Classrooms, Labs, and 3D Printers** in varying priority were also identified in the Surveys as equipment and facilities required within a regional training center.

- **Results in the Gap Assessment** of available workforce training in the areas of robotics, drone, and EV technologies in the Monterey Bay Region, as compared to immediate areas outside the three-county area, indicates a stark contrast in the general lack of available workforce training in the target technologies – suggesting a strong need for such training within the Monterey Bay Region. The assessment also indicated the presence of multiple entities that could potentially or prospectively be capable of providing or partnering with a dedicated regional workforce training center to service the needs for the required training associated with robotics, drone, and EV certifications/training.

- **Five potential sites** were identified as locations for the Regional Workforce Training Center based on convenient proximity, potential readiness, land availability, and willing partnerships.

- **A 50,000 to 60,000 square foot free-standing building** equipped to meet the needs of the advanced manufacturing jobs of the future should be developed, including classrooms, conference and meeting rooms, workshops, labs, and flexible common spaces.

RECOMMENDATIONS

Based upon the aforementioned analysis and consideration, the following recommendations are set forth in a simple tri-level strategy:

1. **Develop a collaborative partnership** with Monterey Bay Region community colleges and universities to provide distributed workforce training courses based upon their existing and available curriculum.

2. **Develop a specific advanced manufacturing training curriculum** working in partnership with Monterey Bay Region community colleges and universities, with input from an advisory board of local employers, industry leaders, and community-based organizations that meet their respective workforce needs now and into the future.

3. **Plan, Design, and Implement** an advanced manufacturing regional workforce training center that is centrally located and accessible to those in need of training and will be the site to deliver the specific advanced curriculum.

CONCLUSIONS

The continued growth of Joby Aviation's advanced manufacturing operations at the Marina Airport, along with the presence of a growing cluster of advanced air mobility, AgTech, and national security-oriented firms throughout the California Central Coast are driving increased needs and requirements in current and future career technical education, and demand for workers with future-relevant skills. This is further borne out with the increasing numbers of manufacturing jobs across the Monterey Bay Region.

As the extensive data collection and thorough analysis of the Monterey Bay Region's demographic and socio-economic makeup concludes, the Region retains the fundamental attributes for the potential development of a regional workforce training center. The conclusions highlight a younger, diverse, and less educated workforce actively seeking employment within the region. This conclusion is further supported by the various survey responses and stakeholder outreach highlighting the need for current and future workforce training opportunities across Monterey, San Benito, and Santa Cruz counties.

Moreover, the Gap Assessment of available workforce training in the areas of robotics, drone, and EV technologies in the Monterey Bay Region, as compared to immediate areas outside the three-county area, indicates a general lack of available workforce training in the target technologies – suggesting a strong need for such advanced manufacturing training within the Monterey Bay Region. This need could be filled with the development of a distributed training model along with more specialized

training relevant to advanced manufacturing. The development of a distributed workforce training program utilizing existing classroom curriculum along with distance education courses to provide the basic and fundamental skills development in close collaboration with regional community college and university partners may be the ideal solution for an initial phase of training.

Lastly, the feasibility analysis concludes that a single regional advanced manufacturing workforce training center should be established to meet the needs outlined above. A multi-facility distributed training program is not recommended due to the specialized nature of advanced manufacturing skill development and training to be provided by the RWTC. The Monterey Bay Region Advanced Manufacturing Workforce Training Center will be a purpose build state-of-the-art multiuse facility that could be designed to provide multiple stakeholders access to facilities and equipment to allow for current and future workforce training needs and requirements.

SECTION 2

THE NEED AND VISION FOR MONTEREY BAY ADVANCED MANUFACTURING REGIONAL WORKFORCE TRAINING CENTER

OVERVIEW

The Monterey Bay Drone Automation and Robotics Technology ("MB DART") initiative is a non-profit public benefit corporation dedicated to promoting innovation, future-relevant workforce, and economic development solutions. Through a generous research and development grant from the James Irvine Foundation in support of their ongoing Priority Communities Initiative in the Salinas Valley, MB DART was enabled to commission this feasibility study to explore opportunities in the development of a regional advanced manufacturing workforce training facility to serve Monterey, San Benito, and Santa Cruz counties ("Monterey Bay Region"). The study will assess the need and demand for a regional workforce training center focused on preparing the local workforce for the jobs of the future in advanced manufacturing, drones, automation, and robotics technical fields.

The continued growth of Joby Aviation's advanced manufacturing operations at the Marina Airport, along with the presence of a growing cluster of advanced air mobility, AgTech, and national security oriented firms throughout the California Central Coast are driving increased interest in career technical education, and demand for workers with future-relevant skills including carbon fiber manufacturing, electric drive train assembly and maintenance, robot operations and maintenance, and skills generally grouped under the mechatronics heading. As part of MB DART's mission, it recognizes the need to invest in the local workforce and prepare them for the jobs of the future. The feasibility study will consider existing local, regional, and national training facilities; programs, structures, site options, and other factors to assess the need and demand for a new regional workforce training center that will provide the necessary training for individuals seeking employment in the advanced manufacturing, drones, automation, and robotics technology fields.

NEED FOR AN ADVANCED MANUFACTURING WORKFORCE TRAINING CENTER

According to the U.S. Department of Education, domestic manufacturing employment dropped nearly 30% from 2000 to 2010 with foreign competition picking up the slack[1]. Revitalizing domestic manufacturing is essential to national security, global competitiveness, and to a robust recovery from the Covid-19 crisis. The world is undergoing a fourth industrial revolution and advanced manufacturing technology presents an opportunity to build an industry with a highly skilled, well-paid workforce[2].

> *The Fourth Industrial Revolution (4IR) is a term coined in 2016 by Klaus Schwab, Founder and Executive Chairman of the World Economic Forum (WEF). It is characterized by the convergence and complementarity of emerging technology domains, including nanotechnology, biotechnology, new materials, and advanced digital production (ADP) technologies. The latter includes 3D printing, human-machine interfaces (HMIs) and artificial intelligence and is already transforming the global industrial landscape. Incorporating ADP technologies into industrial production processes has given rise to the concept of Industry 4.0, also known as the Smart Factory – one that learns as it works, continuously adapting and optimizing its own processes accordingly[3].*

Technology, however, is only half of the Industry 4.0 equation. To thrive in the Fourth Industrial Revolution, companies must ensure that their workers are properly equipped through upskilling and reskilling and then hire new people when necessary. Upskilling means that employees learn new skills to help them in their current positions as the skills they need evolve. Reskilling is the real challenge: workers are retrained with new skills that will enable them to fill different positions within their companies[4].

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[1] *https://www.ed.gov/sites/default/files/documents/stem/210728-adv-manuf.pdf*

[2] *Ibid.*

[3] *https://iap.unido.org/articles/what-fourth-industrial-revolution*

[4] *"What are Industry 4.0, the Fourth Industrial Revolution, and 4IR?," McKinsey & Company, August 12, 2022.*
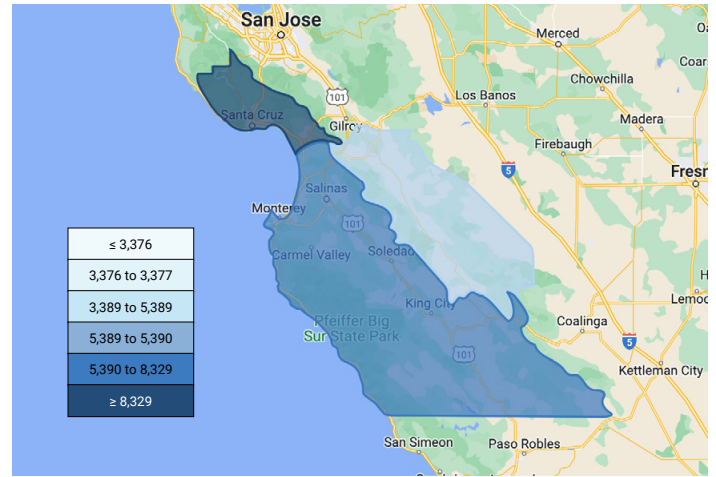
MANUFACTURING JOBS IN THE MONTEREY BAY REGION

Manufacturing jobs in the Monterey Bay Region experienced a similar decline following the national trend of losing jobs throughout the early 2000's. However, over the last five-year period, manufacturing jobs have rebounded and have seen a steady increase reaching over 17,000 jobs by 2023Q1[5].

REGION	JOBS
Santa Cruz, California	8,329
Monterey County, California	5,389
San Benito County, California	3,376

Map 1: Geographic Distribution – Manufacturing Jobs

| ≤ 3,376 |
| 3,376 to 3,377 |
| 3,389 to 5,389 |
| 5,389 to 5,390 |
| 5,390 to 8,329 |
| ≥ 8,329 |

Source: JobsEQ®

As Map 1 above indicates, a majority of these manufacturing jobs are located in Santa Cruz County with the remaining in Monterey and San Benito Counties. Additionally, in 2022, there were 708 Manufacturing establishments in the Monterey Bay Region, an increase from 580 establishments ten years earlier in 2012. (See TABLE 1 right)[6].

The increasing number of jobs and consistent growth in manufacturing establishments over the last decade across the Monterey Bay Region are strong indicators of a stabilizing manufacturing sector for the future. However, this sector can only continue to flourish with a well-trained and equipped workforce meeting the demands of the 4IR/Industry 4.0 evolution through the consistent creation of advanced manufacturing companies and jobs within the Region.

Table 1: Manufacturing Jobs
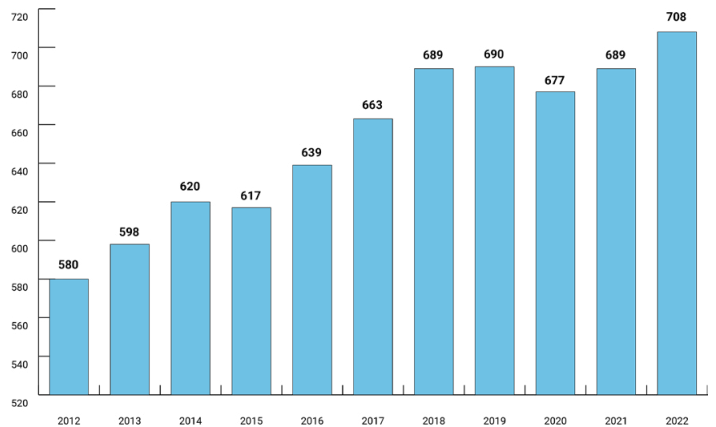
Source: JobsEQ®

WORKFORCE TRAINING NEEDS IN THE MONTEREY BAY REGION

To determine the need for a regional advanced manufacturing workforce training facility, a series of surveys and direct interviews with employers, educators, public agencies, elected officials, and community organizations were conducted across the three-county region. This includes a Spanish language Survey for local and regional Community-based Organizations and leaders.

These confidential on-line Surveys were conducted via SurveyMonkey to gather information on current perceptions, existing programs, and anticipated needs regarding workforce training in the Monterey Bay Region. Each Survey was made up of a series of multiple choice and short answer questions directed to solicit input from a wide array of Monterey, San Benito, and Santa Cruz counties respondents

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[5]*JobsEQ, http://www.chmuraecon.com/jobseq, August 2023*

[6]*JobsEQ, http://www.chmuraecon.com/jobseq August 2023*

with a primary focus to measure interest in the development of a regional advanced manufacturing workforce training facility.

The Survey results and personal interviews were informative and insightful. (See Appendices 1 through 3 for Executive Summaries of Survey Results). The Surveys are divided into four separate target audiences within the Monterey Bay Region, including: 1) Industry and Employers; 2) Community-based Organizations and Local Government; 3) Community-based Organizations and Leaders (Spanish language); and 4) Academia and Labor Unions.

Each of the Surveys were conducted to gather specific information for the optimal creation of an effective and efficient advanced manufacturing regional workforce training facility and were made up of questions directed specifically to the appropriate target group. (Since respondents were able to answer affirmatively to a number of questions, percentages of answers often total more than 100%).

The following highlights some of the key findings from each of the Surveys:

INDUSTRY AND EMPLOYERS SURVEY

Chart 1: Industry Represented (Number of respondents (N) = 22)
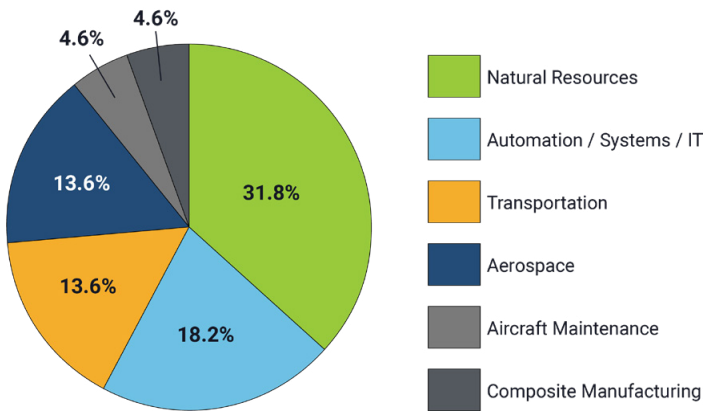
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

As indicated from Chart 1 above, the twenty-two respondents to the Industry and Employer Survey came from a wide range of representative industries within the Monterey Bay Region, led by Natural Resources and Automation/Systems/IT, followed by Transportation and Aerospace. Although to a much lesser extent, Aircraft Maintenance and Composite Manufacturing companies also responded to the Survey. In total, these all represent

a cross-section of current industries and potential employers throughout the Region.

Table 2 below provides a list of the top 10 industries by employment across the Monterey Bay Region:

Table 2: Top Ten Industries by Employment, Monterey Bay Region, 2023Q1

INDUSTRY	EMPLOYMENT	AVERAGE ANNUAL WAGES
1. Agriculture, Forestry, Fishing	68,177	$49,946
2. Health Care and Social Assistance	41,828	$70,228
3. Accommodation and Food Service	35,983	$34,870
4. Educational Services	30,184	$65,485
5. Retail Trade	29,968	$43,827
6. Public Administration	19,310	$87,672
7. Manufacturing	17,094	$74,321
8. Construction	16,811	$66,745
9. Waste Management and Remediation	16,105	$46,277
10. Other Services (Non-Public)	13,878	$43,347

Source: JobsEQ, Employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics, and imputed where necessary. Data are updated through 2022Q4 with preliminary estimates updated to 2023Q1.

Chart 2 below indicates the current workforce training needs by percentage of responses of Industry and Employers, ranging from the most important (listed on top) - Computer Skills and Communications Skills, to the least important (listed on bottom) – Soft Skills and Mathematics. Local and regional employers are in the greatest need for workers to be better trained in the skills listed below.

Chart 2: Current Basic Workforce Training Needs (N=22)
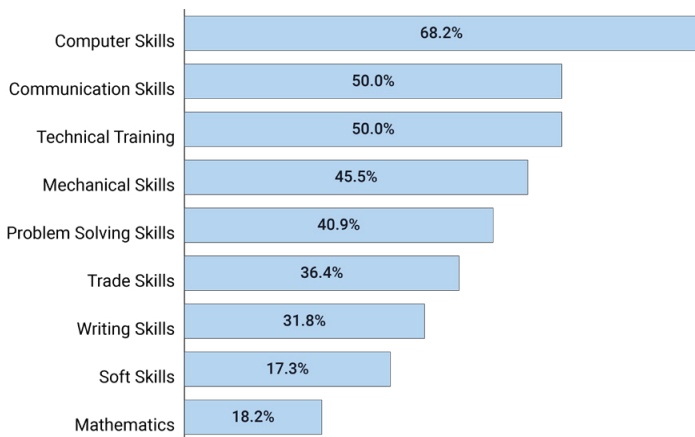
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 3 below highlights the emergent workforce training needs over the next ten years as anticipated by local and regional industry and employers. Nearly 70% of respondents prioritized training in Artificial Intelligence as the greatest perceived significance over the next decade followed by Complex Computer-Aided Design and 3D Printing, and Other skills (including mechatronics, food safety, electrical engineering, data science, ag science, and machining).

Chart 3: Emergent Workforce Training Needs over Next Ten Years (N=22)
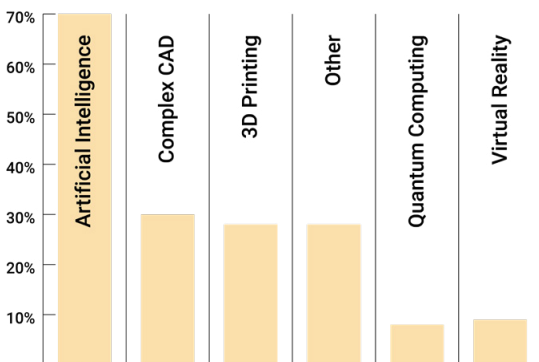
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 4: Required Workforce Training Facilities and Equipment Needs (N=22)
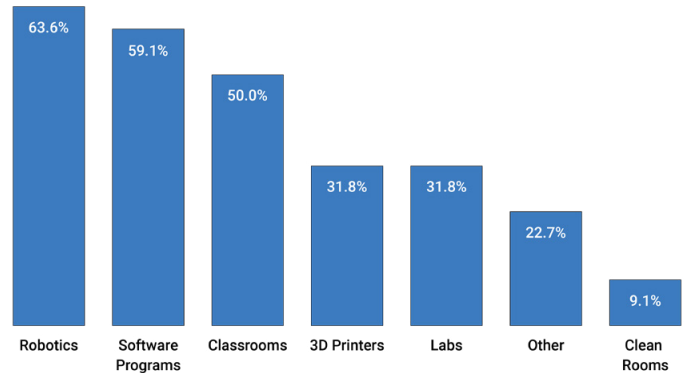
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 4 above provides the anticipated needs for workforce training facilities and equipment, highlighted by Robotics, Software, Classrooms, and 3D Printers. Labs and Other (including research farms and processing facilities; welding and machine shops; electrical troubleshooting, etc.) followed closely behind in perceived need by region employers.

More specifically, as a prime example of a potential employer of trained advanced manufacturing workers within the Monterey Bay Region, Joby Aviation provided a list of required equipment. This includes an assorted list of equipment for electronics, composites, maintenance, 3D Laser Printer additives, manufacturing robots, fabrication and machining, maintenance, assembly, and miscellaneous other items to be used in training.

COMMUNITY-BASED ORGANIZATIONS AND LOCAL GOVERNMENT SURVEY

Chart 5: Type of Community-based Organization (N=12)
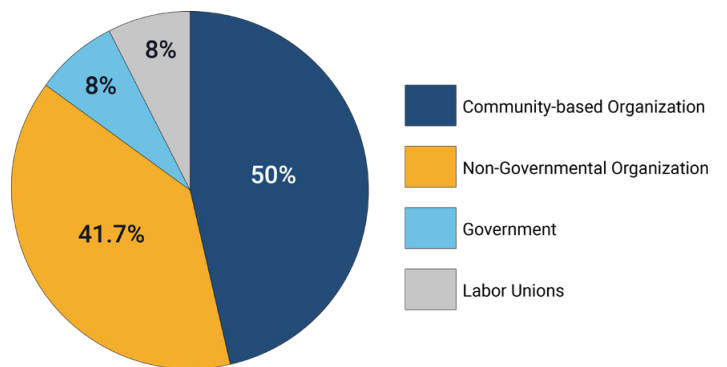
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

As Chart 5 above indicates, the twelve Respondents to the Community-based Organizations ("CBO") Survey come mainly from CBO's and Non-Governmental Organizations ("NGO's), and to a far lesser extent from Government and Labor Unions across the Monterey Bay Region.

Chart 6: Basic Training Needs Within the Community (N=12)
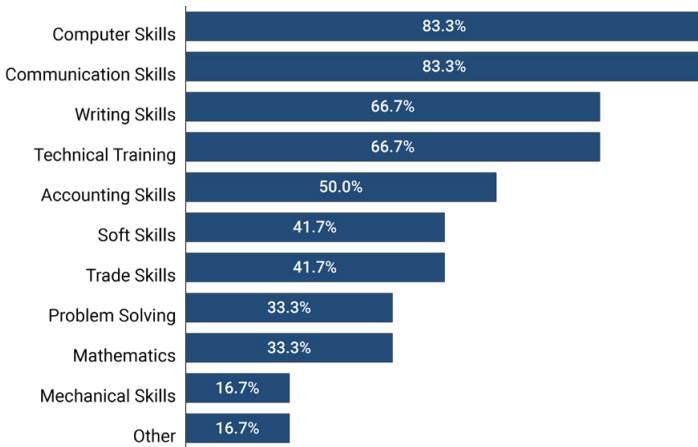
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Interestingly, as Chart 6 indicates, CBO respondents agree with Industry and Employers across the Region – Computer Skills, Communications Skills, and Technical Training are among the most important workforce training needs. However, CBO respondents express a higher priority for Writing Skills and Accounting Skills as well as Soft Skills (including appropriate attire, on time for work, proactive communication, etc.)

Chart 7: Who Needs to be Trained within the Community (N=12)
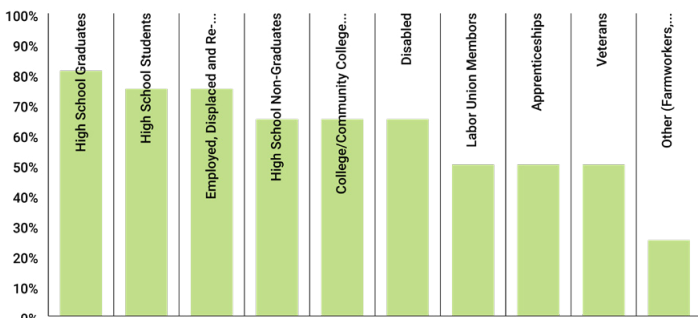
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 7 above highlights CBO respondents' perception of who needs to be trained within the community. High School Graduate, High School Students, and Employed, Displaced, and Re-Em-

ployed Workers have the highest perceived need for training, followed by High School "Non-Graduates," College/Community College Students, and Individuals with Disabilities.

Chart 8: Workforce Training Needed and Not Available within the Community (N=12)
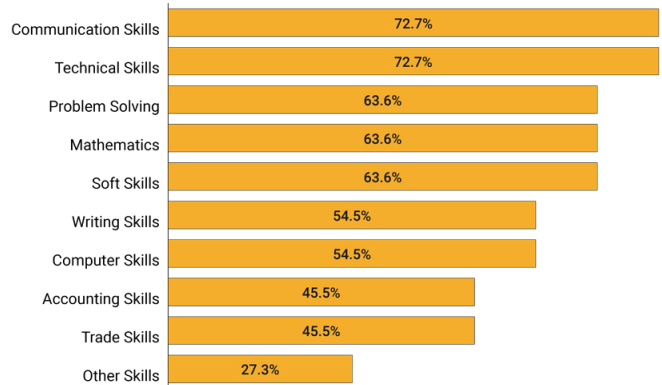
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 8 reflects a key component within the Region – Workforce Training Needed But Not Available. CBO respondents believe that Communication Skills, Technical Skills, Problem Solving, Mathematics, Soft Skills, Writing Skills, and Computer Skills are most in need and not currently available or not available to the extent needed.

*Chart 9: What Type of Workforce Training Facilities and Equipment are Needed (N=12)*
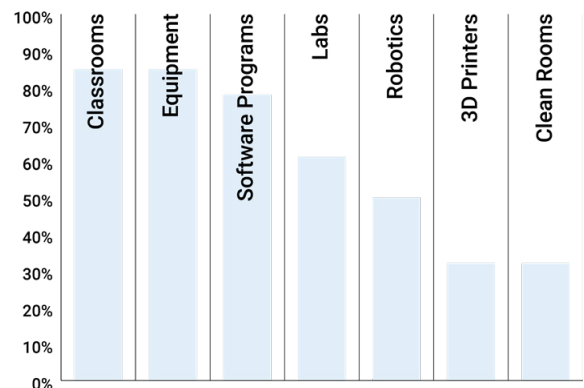
Source: MB DART Workforce Development Survey – Industry and Employers, July 2023

Chart 9 provides CBO perceived needs for Workforce Training Facilities and Required Equipment. In contrast to the Industry and Employer respondents, Classrooms, Equipment (including farming implements, tractors, commercial kitchen, computer

labs, etc.), Software Programs, and Labs received highest priority, followed by Robotics, 3D printers and Clean Rooms with less priority.

COMMUNITY-BASED ORGANIZATIONS AND LEADERS (SPANISH LANGUAGE) SURVEY

Responses were also sought from CBO's, NGO's, and other regional organizations through a Spanish language Survey with the same questions as the CBO Survey noted above. Twenty-three individuals responded to the Spanish language CBO Survey with the following results.

Chart 10: Community-based Organizations and Other Entities (Spanish language) (N=23)
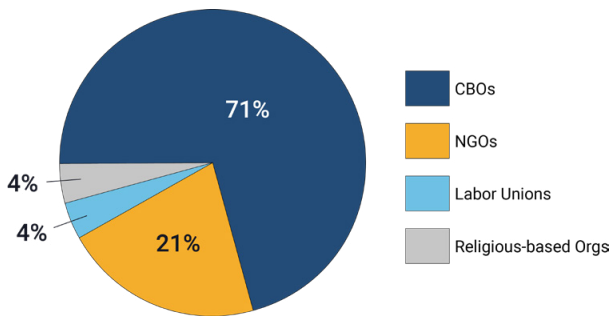
Source: MB DART Workforce Development Survey – Community-based Organizations, July 2023

Chart 10 highlights the breakdown of the CBO's and others responding to the Survey in Spanish. Responses were heavily skewed toward CBO's and NGO's across the Region, with Religious-based Organizations entering the mix.

Chart 11: Basic Workforce Training Needs (N=23)
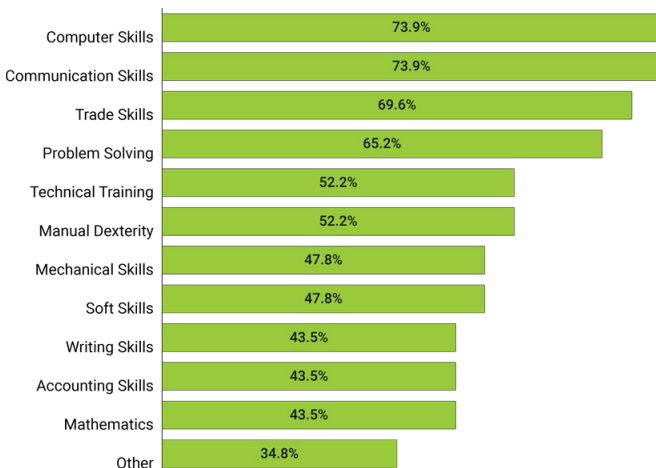
Source: MB DART Workforce Development Survey – Community-based Organizations, July 2023

Chart 11 reflects the perceived basic workforce training needs within the Region. Once again, Computer Skills and Communication Skills are the most basic need. However, Trade Skills and Problem Solving have higher priority, followed closely by Technical Skills, Manual Dexterity, and Mechanical Skills.

Chart 12: Who Needs to be Trained within the Community (N=23)
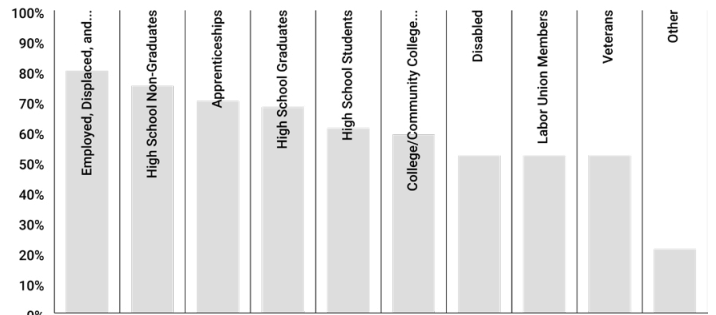
Source: MB DART Workforce Development Survey – Community-based Organizations, July 2023

Chart 12 above reflects a much different perception of who needs training in the Spanish speaking community. Employed, Displaced and Re-Employed workers have the highest perceived need, followed closely by High School "Non-Graduates," Apprenticeships, High School Graduates, and High School Students.

Chart 13: Workforce Training Skills Needed but not Available (N=23)
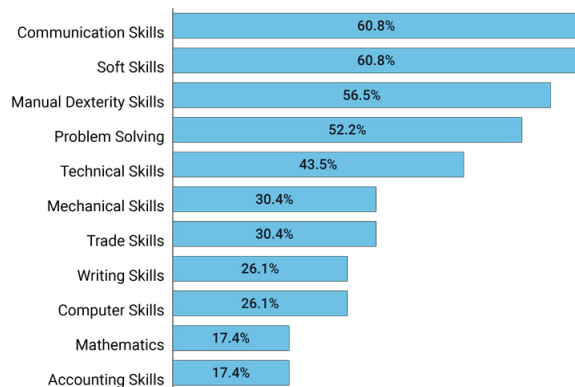
Source: MB DART Workforce Development Survey – Community-based Organizations, July 2023

Chart 13 above again reflects a key component within the Region – Workforce Training Needed But Not Available. Communication Skills are similarly the top skill needed but not available, followed by Soft Skills, Manual Dexterity, Problem Solving, and Technical Skills. These are all excellent benchmarks for the workforce training needs within the Region.

Chart 14: Workforce Training Facilities and Equipment Needed (N=23)

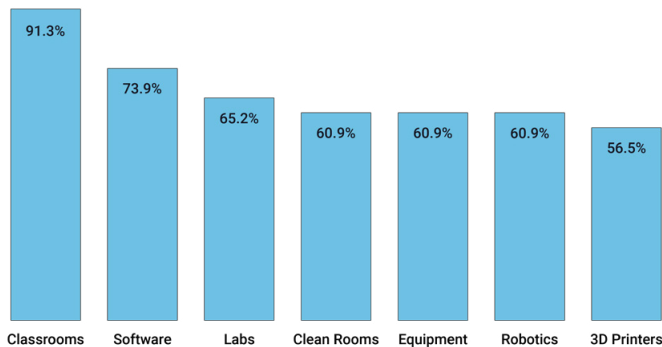*Source: MB DART Workforce Development Survey – Community-based Organizations, July 2023*

Chart 14 provides CBO, NGO, and Other Organization workforce training facility and equipment need, highlighted by Classrooms, Software Programs, and Labs. Clean Rooms, Other Equipment (including farm implements, etc.), Robotics, and 3D Printers are also needed within the Region.

ACADEMIC AND LABOR UNIONS SURVEY AND INTERVIEWS

Survey responses were also sought from local and regional universities, colleges, community colleges, county school districts, and a mix of labor unions. Since most of the responses were the result of personal interviews (and only a handful of SurveyMonkey responses), the brief summary of results are as follows:

- SurveyMonkey or direct phone (Zoom) call interview responses were received from representatives of UC Santa Cruz, CSU Monterey Bay, Cabrillo College, Hartnell College, Monterey Peninsula College (MPC), and the Monterey County Office of Education.
- Writing Skills, Computer Skills, Communication Skills, Mathematics, Soft Skills, and Accounting Skills were the top workforce training programs/curriculum that already exist at these institutions of higher learning. To a lesser extent, Technical Training, Mechanical Skills, and Problem-Solving courses are also provided.
- All of these institutions provide Classrooms, with a large majority providing Labs, Software Programs, and assorted Equipment. Not all provide Robotics and 3D Printing.
- On average, facilities of 25,000 square feet or larger are provided, with a few at less than 10,000 square feet of space.

- CSUMB plans to build out a mechatronics program, including a robotics lab with ag tech and marine applications. MPC developed a mechatronics curriculum that stands on hiatus but could be revitalized with greater demand.
- Monterey County Office of Education (MCOE) has developed a public-private partnership with the creation of the Bob Hoover Academy at the Salinas Airport for pilot training. MCOE is looking to hire a CTE instructor for Aviation Mechanics. They have also developed a CTE program partnership with Gavilan College. MCOE has also received a joint $50 million state grant for STEM training with San Joaquin and Santa Barbara Counties, with Monterey County taking the lead in Computer Science. Additionally, MCOE has received funding from Chevron to create a Mobile FabLab on a trailer with fabrication equipment to be used in the Tri-County area.

All in all, the Survey results provide a wealth of information regarding the current and future workforce training needs of the Monterey Bay Region. Moreover, the Surveys stimulated a regional discussion that this Feasibility Analysis intends to address regarding the opportunities for a regional advanced manufacturing workforce training center.

WORKFORCE TRAINING CENTER RESEARCH

COMMON UNDERSTANDING OF A WORKFORCE TRAINING CENTER

A Workforce Training Center is a facility or collection of facilities that offers skills training and educational courses, training referrals, career counseling, job listings, and similar employment-related services. It is designed to help people develop the skills they need to enter the workforce in a high-growth, high-demand occupation as quickly as possible. Workforce training programs are designed to improve the skills of current employees and prospective job applicants in any industry. Workforce development trains individuals to be more productive and prosperous in the workplace, which benefits both the employer and the worker.

Essentially, workforce training programs are all about providing people in the workforce with the skills they need to succeed there. After completing a training program, individuals will have new and improved skills that help them to be productive and effective in the workplace. As a result, when they are done right, these programs provide economic opportunities not only to individuals but also to businesses and entire communities. Workforce training centers are an important component in a commu-

nity's economic development strategy. A trained and educated workforce supports existing industry, including a wider range of regional and local employers but it also facilitates the creation and growth of innovation-based companies through incubation and spin-off processes, and provides other value-added services and programs, together with high quality space and facilities. If done well, a workforce training center can become the catalyst for the development of a cluster of high and new tech regional competitiveness and job creation.

Additional benefits from the development of an appropriate advanced manufacturing workforce training center within the Monterey Bay Region include the creation of potentially thousands of new higher-wage jobs through innovation in aerospace and aviation manufacturing, including drones and robotics; composite manufacturing; agricultural technology; energy efficiency technology, including electrical vehicles and charging stations; other advanced manufacturing technology; mechatronics; and many other emerging sectors. Moreover, additional local revenues through taxes and fees will be generated through the development of these new types of jobs.

Studies focused on California have shown that these types of technology and innovation jobs are also an important source of secondary jobs and local economic development – resulting in a local jobs multiplier. One job created in these technology sectors is associated with the creation of 4 to 6 additional jobs in the local goods and services economy.[7] [8]

The cooperation and synergy that surrounds workforce training centers can nurture greater knowledge and attract intellectual talent that further supports an environment of collaborative partnerships and creativity, especially in California Central Coast communities with diverse and underrepresented populations.

This feasibility analysis examines the viability of the creation of a Monterey Bay Advanced Manufacturing Regional Workforce Training Center ("Center") based in the region encompassing Monterey, San Benito, and Santa Cruz counties. The following highlights strategies and facilitates the development of a regional workforce training center that targets among other areas of need:

- Aerospace manufacturing
- Aircraft maintenance and repair
- Composite manufacturing
- Automation / Systems / IT
- Construction

- Transportation
- Natural resources (agriculture/wildfire)
- Utilities/infrastructure inspection, etc.

COMPARATIVE ANALYSIS OF WORKFORCE TRAINING CENTERS ACROSS THE UNITED STATES

As an important step in determining the need, scope and vision of a regional workforce training center, the following comparative analysis of workforce training centers across the United States was performed to examine the attributes, features, and programs of successful facilities.

PROCESS DESCRIPTION

The summary review of Model Workforce Training Centers (see Appendix 4) was accomplished by reviewing a list of fifteen different workforce training facilities that presently exist across California and the United States. These centers were selected since they have relevance to the Monterey Bay Regional Workforce Training Center and may provide some guidance on the viability of specific aspects of the proposed center. The summary of these attributes is listed below with descriptions related to their purpose and role they play in this assessment. The best data for each attribute was determined from the publicly available information from the existing centers themselves (e.g., websites, Google Maps, etc.). Where information for a specific category was not able to be found an educated 'guess' was made or the category was listed as 'unknown,' 'unlikely,' or simply identified by '???' in the review.

SUMMARY DESCRIPTION OF THE CATEGORIES FOR THE ASSESSMENT

Name: Provides the name of the facility/group.

Affiliation: Indicates University or other organization affiliation.

Location: Indicates where the facility is located.

Established: Provides the year when the facility was started. This is useful as it can show in some sense the viability of their model as the longer the facility/group has been around, the more likely their business model is to sustain success.

Model: Provides a basic overview of the facility and its purpose

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[7] *https://www.bayareacouncil.org/community_engagement/new-study-for-every-new-high-tech-job-four-more-created/*

[8] *"Updated Employment Multipliers for the U.S. Economy," Josh Bivens, Economic Policy Institute, January 23, 2019.*

and function. Provides a glimpse into their stakeholder purpose and business strategy and the market they serve.

Facility Size: This is approximated or taken from the group's website. The size of the facility helps to inform us on the viability of different size facilities and the services that can be provided in a space of a give square footage.

Weblink: Links to the main website for the facility.

Of the fifteen (15) facilities assessed in the Summary of Workforce Training Centers (please see Appendix 4), it was determined that ten (10) have most relevance to the proposed Monterey Bay Advanced Manufacturing Workforce Training Center and may provide some guidance to the viability of specific aspects of the Center. These included (in no particular order):

- National Center for Aviation Training ("NCAT") at Wichita State University, Wichita, KS: Established in 2010, it provides a strong model for workforce training in skilled aviation manufacturing. In addition, it contains 220,000 square feet of state of the training labs and classrooms. The facility consolidates and optimizes two of the area's most unique resources: the research capabilities and expertise of Wichita State University's National Institute for Aviation Research ("NIAR") and the number one ranked aviation and advanced manufacturing programs of Wichita State University ("WSU") Tech. At NCAT, NIAR shares resources with WSU Tech in its Advanced Coatings; Additive Manufacturing; CAD/CAM; Composites and Advanced Materials; Emerging Technology; and Robotics and Automation laboratories. Operating budgets vary depending upon the scope of the program but are generally in the $8 to $10 million range.

- Carnegie Mellon Robotics Academy at Carnegie Mellon University, Pittsburgh, PA: Established in 2003, Carnegie Mellon Robotics Academy studies how educators can use robots to teach Computer Science, Science, Technology, Engineering, and Mathematics (CS-STEM). As a world leader in robotics education, the Carnegie Mellon Robotics Academy has trained thousands of teachers and coaches internationally. Their professional development courses equip educators with both the content and pedagogical knowledge needed to successfully implement robotics programs. All training and professional development courses allow educators to earn a Carnegie Mellon Robotics Academy Certification, simultaneously providing valuable continuing education credits and enabling them to offer our certifications to their students. The Academy provided approximately 65,000 square feet of classroom, lab space, and workshops.

- Motlow State Automation & Robotics Training Center

("ARTC") at Motlow State University, McMinnville, TN: Established in 2022, the ARTC provides a state-of-the-art training facility in McMinnville, TN. Motlow State is a national leader in credentialing for robotics training. Motlow's Automation and Robotics Training Center (ARTC) in McMinnville is the only facility in the nation prepared to credential workers for the top three robotics manufacturers in the world: ABB, FANUC, and Yaskawa Motoman. They train workers on ABB, FANUC, and Yaskawa Motoman industrial robots and robot software, focused on technician training and automation training.

- Center for Business and Workforce Development, Pennsylvania College of Technology, Williamsport, PA: The Center for Business and Workforce Development is a 31,800 square foot state-of-the art facility hosting a wide array of open enrollment and customized training classes. Topics such as leadership, industrial operations, computer, and safety, among many others, are available to companies and individuals. The Center features industrial labs, computer labs, spacious classrooms, and two conference rooms.

- ROC and CTEC Career Education, Kern High School District, Bakersfield, CA: Both the Regional Occupational Center (established in 1985) and The Career Technical Education Center (opened in 2021) are accredited public education career/technical training institutions. They offer a variety of programs to those interested in developing or improving job skills. All courses are designed to prepare students for entry-level employment. Classes at ROC CTEC are open to high school juniors, seniors, and adults. ROC and CTEC offers two campuses with a combined 125,000 square feet of premier, state-of-the art classrooms, workshops, computer labs, and applied health care training facilities. Their annual operating budget is approximately $15 million.

- INTECH (Industrial Technical Learning Center), Chaffey College, Fontana, CA: Established in 2012, INTECH is a regional training center designed to train and upskill a workforce pipeline for business and industry in the Inland Empire region and provides training at no cost to all individuals. INTECH is the first public-private partnership in the California Community College System - Chaffey College and California Steel Industries, Inc. (CSI) have had a long-standing, successful partnership for almost twenty years. In 2014, a grant opportunity allowed them to formalize the partnership and used Department of Labor TAACCCT funds to renovate CSI's old administration building and create a regional training center. The INTECH Center is located on CSI's property and is a 33,000 square foot facility with six classrooms, a computer lab, mechatronics lab, electrical lab, and mechanical lab. Chaffey College Economic Development operates the INTECH Center and is 100% self-funded. Their annual operating budget is approximately

$8 million.

- Embry-Riddle Research Park, Embry-Riddle Aeronautical University, Daytona Beach, FL: The Embry-Riddle Research Park provides approximately 46,000 square feet of classroom, computer labs, workshops, research hangar, wind tunnel, and engineering and aerospace innovation space, adjacent to the main campus in Daytona Beach, FL. It creates a technology-focused ecosystem bringing together university researchers and students with businesses, entrepreneurs, and start-ups, providing a foundation to start or grow their enterprise. It also provides training opportunities in aviation and aerospace advanced manufacturing with two licensed spaceports, 20 military installations and 100-plus public use airports nearby.

- Electronic Vehicle Infrastructure Training Program ("EVITP"), Royal Oak, MI: The EVITP program provides the most comprehensive online training for the installation of electrical vehicle supply equipment ("EVSE") in North America today. More than a technical installation course, EVITP offers a full overview of the Electric Vehicle industry including an extensive section on Customer Relations & Customer Satisfaction. Developed in collaboration with industry, EVITP offers the perspective of Automakers, Utilities, EVSE equipment manufacturers and other key stakeholder associations. To be eligible for EVITP, a participant must be a state licensed or certified electrician.

- Manufacturing Solutions Center, Catawba Valley Community College, Conover, NC: Established in 1990, the Manufacturing Solutions Center is part of Catawba Valley Community College. Over the past 25 years, Manufacturing Solutions Center has become an essential part of manufacturing in North Carolina. The Manufacturing Solutions Center is a facility where innovative concepts can be brought to life. It is where products and prototypes are tested; manufacturing processes are fine-tuned, and accurate cost and product studies are performed. All of these services are available to manufacturers to help them stay at the forefront of their industry. Housed in the Conover Station in approximately 30,000 square feet, training services provide include Testing for hosiery, textiles, furniture; Business Incubation Opportunities; assist Entrepreneurs and Inventors; Product Development; Training for hosiery knitting machines, M1 Stoll, AutoCad; 3D printing and Reverse Engineering; Hosiery 101/102; and Marketing.

- Energetics Technology Center, University of Maryland, Indian Head, MD: Founded in 2006, the Energetics Technology Center ("ETC") was launched in partnership with the Center for Energetics Concepts Development at the University of Maryland. As ETC grew, its work moved into adjacent fields, such as robotics, autonomous systems,

and literature-based discovery. These efforts were the precursor to its current initiatives in artificial intelligence and machine-discovery of next generation energetic materials. This has grown into our global awareness project and predictions of foreign military capabilities in the development of advanced weapon systems. In 20,000 square feet of labs, classrooms, workshops, and test facilities, ETC trains individuals in applied data science, artificial intelligence, and machine discovery.

SECTION 3

TARGETED WORKFORCE WITHIN THE MONTEREY BAY REGION – DEMOGRAPHICS, EMPLOYMENT TRENDS, AND EDUCATION

CURRENT AVAILABLE WORKFORCE

To better determine the requirements for an advanced manufacturing workforce training center for the Monterey Bay Region, the demographic make-up of the current workforce population across the three-county area must also be examined.

According to the American Community Survey data from the US Census, the population in the Monterey Bay Region is 774,420 for 2017-2021.[9] The Region has a civilian labor force of 379,974 with a participation rate of 62.7%, which is lower than both the participation rate for California (63.7%) and the entire United States (63.4%). The labor force participation rate is an estimate of an economy's active workforce. The formula is the number of people ages 16 and older who are employed or actively seeking employment, divided by the total non-institutionalized, civilian working-age population.

The labor force participation rate measures the percentage of adults who are either employed or actively looking for a job. It does not include those in the military, prisons, or otherwise outside of the ordinary labor market. It also accounts for the people who are not seeking work, making it a more reliable statistic than the regular unemployment rate.

Table 1: Population and Civilian Labor Force

AREA	POPULATION	CIVILIAN LABOR FORCE	PARTICIPATION RATE	PEOPLE LOOKING FOR WORK
Monterey Bay Region	774,420	379,974	62.7%	141,730
Monterey County	438,953	200,826	60.6%	79,125
San Benito County	63,329	33,330	68.3%	10,566
Santa Cruz County	272,138	145,818	64.4%	51,911

Source: American Community Survey, US Census, 2023

Table 1 above highlights the Total Population, Civilian Labor Force, and Participation Rate across the entire Monterey Bay Region as it compares to each of the separate three counties. It is important to note that Monterey County has the lowest participation rate of 60.6% and San Benito County with the highest at 68.3%. Based upon these numbers the last column in Table 1 reflects the total number of people in the civilian workforce without jobs looking for work – which totals nearly 142,000 across the entire Monterey Bay Region, including over 79,000 alone in Monterey County.

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[9] *American Community Survey, https://www.census.gov/programs-surveys/acs/about.html*

More specifically, as highlighted in Table 2 below, the population of the Monterey Bay Region is younger (36.2 years median age) than California (37.0 years median age) and the entire USA (38.4 years median age). The difference is even greater when you consider Monterey County (34.9 years median age), indicating a significantly younger population with over 26.3% under the age of 18 years; and San Benito County (35.7 years median age) with 26% of the population younger than 18.

Additionally, the Monterey Bay Region has a much higher Hispanic/Latino population (50.9%) compared to the state of California (39.5%) and the United States (18.4%). At a county level, the Hispanic/Latino population is even higher in Monterey County (59.7%) and San Benito County (60.9%).

Table 2: Population by Age and Race

DEMOGRAPHICS	MONTEREY BAY REGION	MONTEREY	SAN BENITO	SANTA CRUZ	CALIFORNIA	USA
Median Age	36.2	34.9	35.7	38.5	37.0	38.4
Under 18 years	23.7%	26.3%	26.0%	19.1%	22.8%	22.5%
18 to 24 years	11.5%	9.8%	9.0%	14.8%	9.3%	9.2%
25 to 34 years	13.3%	14.0%	13.8%	12.1%	15.1%	13.8%
45 to 54 years	12.8%	13.2%	13.6%	11.8%	13.5%	12.9%
55 to 64 years	12.0%	11.8%	12.1%	12.2%	12.8%	12.6%
65 to 74 years	9.1%	8.2%	7.8%	10.9%	8.5%	9.6%
White	53.8%	43.3%	62.7%	68.5%	52.1%	68.2%
Black or African American	1.9%	2.5%	1.0%	1.1%	5.7%	12.6%
Asian	5.3%	5.8%	3.1%	4.9%	14.9%	5.7%
Hispanic or Latino	50.8%	59.7%	60.9%	34.0%	39.5%	18.4%

Source: American Community Survey, US Census, 2023

Table 3: Educational Attainment

DEMOGRAPHICS	MONTEREY BAY REGION	MONTEREY	SAN BENITO	SANTA CRUZ	CALIFORNIA	USA
No High School Diploma	21.8%	28.5%	15.7%	12.2%	15.0%	10.3%
High School Graduate	20.1%	21.2%	28.0%	16.3%	20.5%	25.3%
Some College	20.0%	18.0%	25.8%	22.0%	20.5%	20.1%
Associate's Degree	8.4%	8.1%	10.9%	8.3%	7.9%	9.3%
Bachelor's Degree	18.6%	15.6%	14.8%	24.4%	22.8%	22.0%
Postgraduate Degree	11.1%	8.7%	4.7%	16.8%	13.2%	13.1%

Source: American Community Survey, US Census, 2023

Table 3 above examines educational attainment across the Monterey Bay Region. Of note, the Monterey Bay Region (21.8%) and Monterey County (28.5%) have a higher percentage of the population that are Non-High School Graduates compared to the state of California (15.0%) and across the US (10.3%). Additionally, the Monterey Bay Region (18.6%), Monterey County (15.6%), and San Benito County (14.8%) have a significantly lower percentage of College Graduates than across California (22.8%) and the entire US (22.0%).

POTENTIAL FOR EMPLOYMENT GROWTH WITHIN TARGETED WORKFORCE GROUPS ACROSS THE MONTEREY BAY REGION

When reviewing collectively the demographic, educational, and labor force data outlined above under Section II (A), a number of definitive conclusions can be ascertained about the Monterey Bay Region and included counties:

- The Monterey Bay Region maintains a vibrant Civilian Labor Force, including nearly 142,000 people without jobs actively looking for work. This would indicate a significant pool of trainable and interested workers to be served by a regional workforce training center.

- The population of the Monterey Bay Region (and more so in Monterey and San Benito counties) is younger - with more individuals (by percentage) below the age of 18 than the rest of California and the entire United States. This would indicate a greater number of potential individuals entering the workforce over the next decade with increasing workforce training needs.

- The Monterey Bay Region, including Monterey and San Benito Counties, has a higher concentration of Hispanic/Latino population than the rest of California and the entire United States. As the Survey results above also indicate (see Section I(B)(2)(c)), this is not only a growing segment of the population, but a willing and able workforce requiring training into the future.

- The Monterey Bay Region, including Monterey County has a higher rate of individuals without a high school diploma than the rest of California and the entire United States. Moreover, the Monterey Bay Region, including Monterey and San Benito Counties has a lower rate of college graduates than the rest of California and the entire United States. Again, this data would indicate a significant need for a regional workforce training center targeting a less educated workforce seeking jobs of the future.

In summary, the Monterey Bay Region retains the fundamental

attributes for the potential development of a regional workforce training center. The aforementioned conclusions highlight a younger, diverse, and less educated workforce actively seeking employment within the Region.

As workforce training can take many forms and develop a wide range of skill sets, a narrower focus on programs tailored for the region's population and developing industries is warranted. As the 4IR/Industry 4.0 evolution continues to materialize, a need for advanced manufacturing skills focused on regional growth industries of aerospace manufacturing, aircraft maintenance and repair, composite manufacturing, automation, construction, transportation, natural resources (agriculture/wildfire), and utilities and infrastructure inspection continues to emerge. A Monterey Bay regional advanced manufacturing workforce development center will not only need to address the needs of an evolving local labor force, but also look to build upon existing training opportunities and programs and fill skill development and training gaps where necessary, especially for 4IR jobs of the future.

As a result, the following Section III begins to examine the existing regional resources and gaps in workforce development programs locally, regionally, and beyond. The analysis focuses on existing relevant skills in robotics, drone technology, and electric vehicle related training as an example of the advanced manufacturing skill development possibilities within the Monterey Bay Region.

SECTION 4

# WORKFORCE TRAINING GAP ANALYSIS

OVERVIEW

Workforce training for advanced manufacturing requirements will span a wide range of skills, technologies, engineering techniques, mechatronics specialization, and other leading-edge expertise. For purposes of this analysis and due to the most available information of focused sectors for advanced manufacturing applicability, existing local and regional robotics, drone, and electric vehicle related training programs are considered. These sectors were examined to better determine the existing programs, but also more importantly, to determine the gaps in advanced manufacturing workforce training needs within the Monterey Bay Region.

SKILLS NEEDED FOR ROBOTICS, DRONE, AND ELECTRIC VEHICLE (EV) RELATED TRAINING

ROBOTICS OVERVIEW

Modern robotics is a diverse field that involves the use of robots in manufacturing, medicine, agriculture, and a host of other industries. Robots are used in manufacturing to perform tasks such as welding, painting, and assembly. In medicine, robots are used for telepresence, which allows physicians to examine and treat patients in remote locations.[10] They are also used for sterilizing rooms and delivering medical supplies and equipment.[11]

In agriculture, robots can perform various tasks such as planting, spraying, harvesting, sorting, and monitoring crops and soil. They can also use sensors, data analytics, and artificial intelligence to optimize production and reduce waste. Robotics in agriculture is a response to the challenges of labor shortages, consumer demand, and high production costs.[12] Some of the most common robots in agriculture are used for harvesting and picking, weed
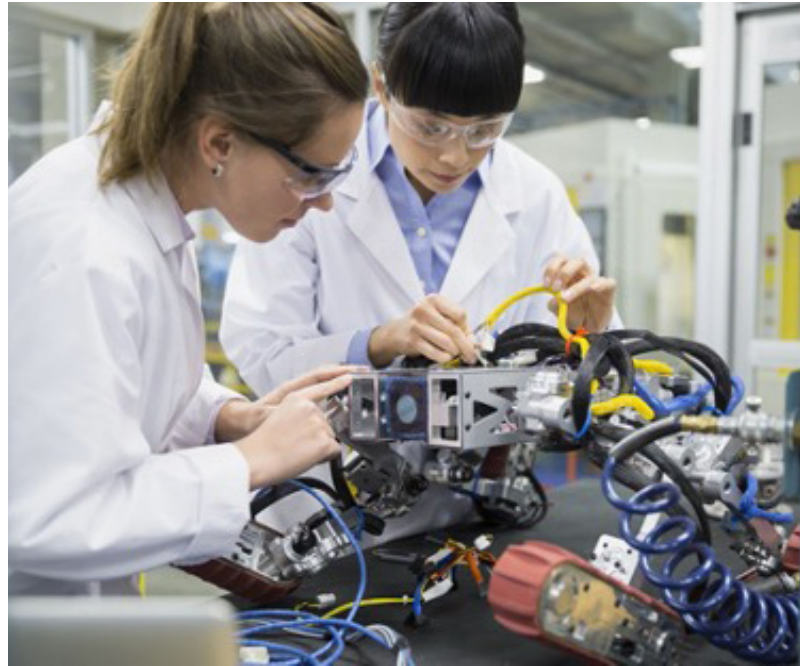
control, weed mapping, fertilizing and irrigation, thinning and pruning, crop monitoring, analysis, sorting, and packing.[13] [14]

To work with robotics, three main areas are generally considered from basic to highly skilled. These are divided into three general basic tier levels: 1) Technician, 2) Specialist, and 3) Integrator. In addition to these general characterizations there are certifications for beginners in robotics that are available, for example the FANUC Certified Robot Operator, FANUC Certified Robot Technician, and the Certified Vision Professional-Basic are each examples of trainings/certifications that can be done with little or no background prior knowledge in the field of robotics, and one can prepare for these by taking an exam prep course.[15] Similar courses can be considered for a proposed robotics curriculum for this workforce training center.

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[10] https://www.asme.org/topics-resources/content/top-6-robotic-applications-in-medicine

[11] Ibid.

[12] https://www.agritechtomorrow.com/story/2021/04/robotic-applications-in-agriculture/12822/

[13] https://roboticsbiz.com/7-major-use-cases-of-robotics-in-agriculture/

[14] https://www.automate.org/blogs/robotics-in-agriculture-types-and-applications

[15] https://careerkarma.com/blog/robotics-certifications/

Robotics Skills

For the three basic areas in robotics: 1) Technician, 2) Specialist, and 3) Integrator, the following general description and skill requirements are:

Robotics Technicians

Description of Robotics Technicians: "Robotics technicians are most often able to enter their careers with an associate's degree or trade school certification, since the majority of their skills come from hands-on experience…with the role of maintaining individual robots on the manufacturing floor…."[16] "The Robotics Technician[17] is an entry-level role that focuses on the day-to-day maintenance of robots on the manufacturing floor. Many current manufacturing workers can easily adapt to this role, provided adequate manufacturing workforce training[18]."

Technician Competencies: Electrical Systems, Electronics and Controls, Fluid Power, Maintenance and Troubleshooting, Mechanical Systems, Programmable Logic Controllers (PLC), Robot Programming, Safety (System and Procedures).[19]

Robotics Specialist:

Description of Robotics Specialist: "Robotics Specialists are the subject matter experts on robotic systems on the manufacturing floor and are responsible for proposing upgrades to the systems that can increase productivity. This position requires more robotics training than the Robotics Technician role."[20]

Specialist Competencies: Advanced Robot Programming, Application Emphasis, Inspection/QA, Installation Concepts, Project Management, Robot and System Troubleshooting, Safety-Risk Assessment, Sensors, Vision.[21]

3) Robotics Integrator:

Description of Robotics Integrator: "The Robotics Integrator is the subject matter expert on automation. The Integrator understands how applying robotics to the manufacturing floor benefits their operations and will evaluate, design, and implement plans for areas ripe for automation. Of the three positions, the Robotics Integrator requires the highest level of robotics training and experience."[22]

Integrator Competencies: Augmented Reality/Virtual Reality, Big Data, Computer Programming, Interoperability, Offline Programming, Simulation, System and Process Design, Systems Simulation/Modeling, Visualization.[23]

DRONE OVERVIEW

Drone(s) is a common term for what is generally considered to be unmanned aerial vehicle (UAV), or more generally as a vehicle that can be controlled remotely or autonomously without a human pilot on board. UAS stands for Unmanned Aerial System, which is the totality of everything that makes a UAV work, including the ground control, the transmission systems, the software, and the person controlling the UAV. Every UAV is a drone, but not all drones are UAVs as drone can also refer to any unmanned vehicle, not just aerial vehicles. UAS is a more specific term than drone or UAV and it is usually used for more advanced unmanned aircraft that are not for civilian use.[24] [25]

Aerial drones have become increasingly popular in recent years due to their versatility and ease of use. Drones are used in a variety of applications such as aerial photography and videography, surveying, mapping, search and rescue operations, agriculture, and delivery services.[26] Sophisticated drones could soon be doing everyday tasks like fertilizing crop fields on an automated basis, monitoring traffic incidents, surveying hard-to-reach places, or even delivering pizzas.[27] Drones with exceptional cameras and cutting-edge sensors can collect relevant information that aid in

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[16] *https://www.roboticscareer.org/news-and-events/news/23439*

[17] *https://arminstitute.org/projects/robotics-technician-apprenticeship-program*

[18] *https://arminstitute.org/our-work/workforce-development-services/*

[19] *https://www.roboticscareer.org/news-and-events/news/23439*

[20] *https://www.roboticscareer.org/news-and-events/news/23439*

[21] *Ibid.*

[22] *https://www.roboticscareer.org/careers*

[23] *Ibid.*

[24] *https://www.missiongo.io/unmanned-aerial-vehicles-uav-unmanned-aerial-systems-uas-and-autonomous-drones-whats-the-difference/*

[25] *https://inspiredflight.com/uas-vs-uav/*

[26] *https://www.businessinsider.com/drone-technology-uses-applications*

[27] *Ibid.*

weather forecasting. Additionally, these unmanned aerial vehicles are sent into hurricanes and tornadoes to capture videos that help experts analyze the storm system patterns.[28]

The future of drone technology is bright. Regulators across the globe are now looking at ways to support the expansion of drone technology, exploring carrying heavier loads and transporting people.[29]

The drone market has been experiencing healthy growth in the United States and around the world over the past few years. By 2023, the commercial drone market is expected to exceed previous levels and reach $6.15 billion, a compound annual growth rate (CAGR) of 19.09%. By 2030, the entire UAV market is set to be worth $92 billion.[30]

Two main options exist for Drone related jobs that may be options for a potential workforce training center, these are: drone pilots and drone maintenance/repair technicians.

The Federal Aviation Administration (FAA) requires drone pilots to obtain a Remote Pilot Certificate. To obtain this certificate, pilots must pass an FAA-approved knowledge test.[31] To become

a drone repair technician, one must first earn a certificate from an FAA-accredited school, or else meet a required number of hours of hands-on experience. Then it is necessary to pass a series of written, oral, and practical tests to become certified as a drone repair technician.[32] [33]

Drone Skills

As previously described two general pathways exist that can be adapted to a workforce training facility: 1) drone pilot training and 2) drone maintenance, repair, construction technical training.

Drone (UAS) Pilot:

Description of Drone (UAS) Pilot: A drone pilot, also known as a UAV or UAS operator, is responsible for remotely piloting and operating drones for various purposes such as aerial photography, surveillance, mapping, or reconnaissance. They are responsible for planning and monitoring drone flights, ensuring safe landing, capturing, and reviewing aerial data, and meeting with clients to discuss their needs. They also conduct drone systems testing and maintenance, assist in flight test events and demonstrations, and comply with laws and regulations related to drone operations.[34]

Drone Pilot Competencies: FAA certification (e.g., FAA Part 107 Remote Pilot Certificate[35]), pre-flight and flight planning, UAS operations, data collection, GIS, camera and sensor aptitude, associated software proficiency.

Drone (UAS) Aviation Mechanic:

Description of Drone (UAS) Mechanic: As a UAV drone technician typically would be responsible for conducting routine maintenance on UAV drones, troubleshooting malfunctioning or defective drones, and repairing issues discovered. They also inspect drones for maintenance issues or possible malfunctions before flights and assist with the development of simulation exercises designed to test drones for real-word scenarios.[36]

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[28] *https://droneswhiz.com/benefits-of-drone-technology/*

[29] *https://www.weforum.org/agenda/2021/07/the-bright-future-for-drones/*

[30] *https://consortiq.com/uas-resources/drone-industry-outlook-us-2020-2030*

[31] *https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot*

[32] *https://www.droneblog.com/drone-repair-technician/*

[33] *https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentid/99865*

[34] *https://www.indeed.com/career-advice/finding-a-job/becoming-a-drone-pilot*

[35] *https://www.faa.gov/uas/commercial_operators/part_107_airspace_authorizations*

[36] *https://www.onlinedegree.com/careers/trade/uav-drone-technician/*

Drone Aviation Mechanic Competencies: FAA Repairman's certificate (FAA Repairman's Certificate[37]), FAA Approved Aircraft Mechanic Certificate (FAA Aircraft Mechanic Certificate[38]), additional detailed proficiencies are indicated in Appendix 5.

ELECTRIC VEHICLE RELATED OVERVIEW

According to a report by the California Energy Commission (CEC), California needs 1.2 million electric vehicle chargers by 2030 to support an estimated 7.5 million passenger plug-in vehicles. The report also states that 157,000 chargers will be required by 2030 to support 180,000 medium- and heavy-duty electric trucks and buses also anticipated.[39]

The construction of electric vehicle charging stations worldwide slowed down due to labor unavailability and raw material procurement issues. All these factors collectively delayed the projected growth of electric vehicle charging stations as per the pre-COVID scenario. The market growth was considerably slowed down during 2020.[40]

However, several factors are expected to continue to drive consumer demand for EVs over the 2021–31 decade: environmental concerns, greater vehicle choice, improved battery capacity, and cost savings.[41]

Publicly accessible chargers worldwide approached 1.8 million charging points in 2021, of which a third were fast chargers. Nearly 500,000 chargers were installed in 2021, which is more than the total number of public chargers available in 2017.[42]

According to the California Energy Commission (CEC), there are 87,707 electric vehicle (EV) charging stations in California, of which 42.31% (total of 37,113) are public chargers.[43]

California has the green light to start using federal infrastructure funding to expand electric vehicle (EV) charging stations along the state's interstates and highways following the recent federal approval of a joint plan by Caltrans and California Energy

Commission.[44] The news release indicated that: "California expects to receive a total of $384 million [from federal funding] for the CA NEVI program[45] over the next five years. The federal funding will build on California's historic $10 billion, multiyear investment to accelerate the transition to zero-emission vehicles by improving affordability and expanding charging infrastructure.

Relative to Electronic vehicle repair and maintenance, it is generally considered that EVs require less maintenance than conventional vehicles because they have fewer moving parts and fluids to change. The battery, motor, and associated electronics require little to no regular maintenance and brake wear is significantly

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[37] https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/99865

[38] https://www.faa.gov/mechanics/become

[39] https://www.energy.ca.gov/news/2021-06/report-shows-california-needs-12-million-electric-vehicle-chargers-2030

[40] https://www.fortunebusinessinsights.com/electric-vehicle-ev-charging-stations-market-102058

[41] https://www.bls.gov/opub/btn/volume-12/charging-into-the-future-the-transition-to-electric-vehicles.htm

[42] https://www.iea.org/reports/global-ev-outlook-2022/trends-in-charging-infrastructure

[43] https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/electric-vehicle#:~:text=Electric%20Vehicle%20Chargers%20in%20California%20Charger%20counts%20are,the%20Alternative%20Fuels%20Data%20Center%20%28AFDC%29%20and%20PlugShare.

[44] https://www.energy.ca.gov/news/2022-09/federal-funding-help-california-expand-electric-vehicle-charging-network

[45] https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/nevi/2022-ca-nevi-deployment-plan-a11y.pdf

[46] https://afdc.energy.gov/vehicles/electric_maintenance.html

reduced due to regenerative braking. However, parts that are common to EV's and internal combustion vehicles, like tires, brakes, and windshield wipers, will need to be checked regularly.[46]

As with any vehicle, electric vehicles need to be occasionally maintained and repaired. Much of the routine maintenance and repair work can be done by normal repair mechanics, but the electrical systems and drivetrain will often need skilled workers familiar with electric vehicles.[47]

Electric Vehicle Mechanic and Charging Station Technician Related Skills

EV Vehicle Mechanical Technician:

Description of EV Mechanical Technician: Entry-level electric vehicle technicians may find employment with manufacturers, dealerships, or repair shops. New technicians may be assigned to more experienced mechanics to gain experience with complex tasks. EV vehicle technicians diagnose, service and repair high voltage EVs, build EV motors, install computers, EV control devices, assemble generators, use computer-controlled machines, etc.[48]

EV Mechanical Competencies: Previously described, California has specific requirements for training/certification on both gas and electric vehicles.[49]

EV Charging Station Technician:

Description of EV Charging Station Technician: An Electric Vehicle (EV) Charging Station Technician is responsible for diagnosing, servicing, and repairing high voltage commercial charging stations.

EV Charging Station Technician Competencies: Electrical Systems, Electronics and Controls, Maintenance and Troubleshooting, Mechanical Systems understanding, state certification, knowledge of the National Electrical Code for EV charging stations, Electric Vehicle Infrastructure Training Program Certification (EVITP), etc.[50] Please refer to Appendix 5 for further detailed information.

CURRENT OR POTENTIAL DRONE, ROBOTICS, AND EV TRAINING OR CERTIFICATION LOCATIONS AVAILABLE WITHIN 0-50, 51-100, 101-200, 201-300, AND 301+ MILE RADIUS OF MB DART

The following link (Tier 1-3 Drone, Robotics, EV Entities in CA - Interactive Map) directs the user to an Interactive Map (i.e., Google map) of entities found within the State of California that currently provide, potentially could provide, or do not provide but could have the capacity to add classes, training, or certifications for robotics, drone, and EV related technologies. The Interactive Map includes a center point of MB DART in Marina, CA with concentric circles of 50, 100, 200, and 300 miles radiating from MB DART. In addition, it provides reference to Monterey, Santa Cruz, and San Benito CA counties. Map 2 shows a static view of the Interactive Map.

Map designations include:

- "Tier 1 - Current" are entities that are represented by colorized markings that indicate entities that presently provide directly related classes, certifications, or specific training for drone (purple airplane), robotics (green robot), or EV (yellow plug).

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[47] *https://www.bls.gov/green/electric_vehicles/*

[48] *https://www.evtechnician.com/highlights/careers*

[49] *https://bar.ca.gov/*

[50] *https://wattlogic.com/blog/electric-vehicle-charging-training/*

Map 2: Overview static image of the Interactive Map linked above.
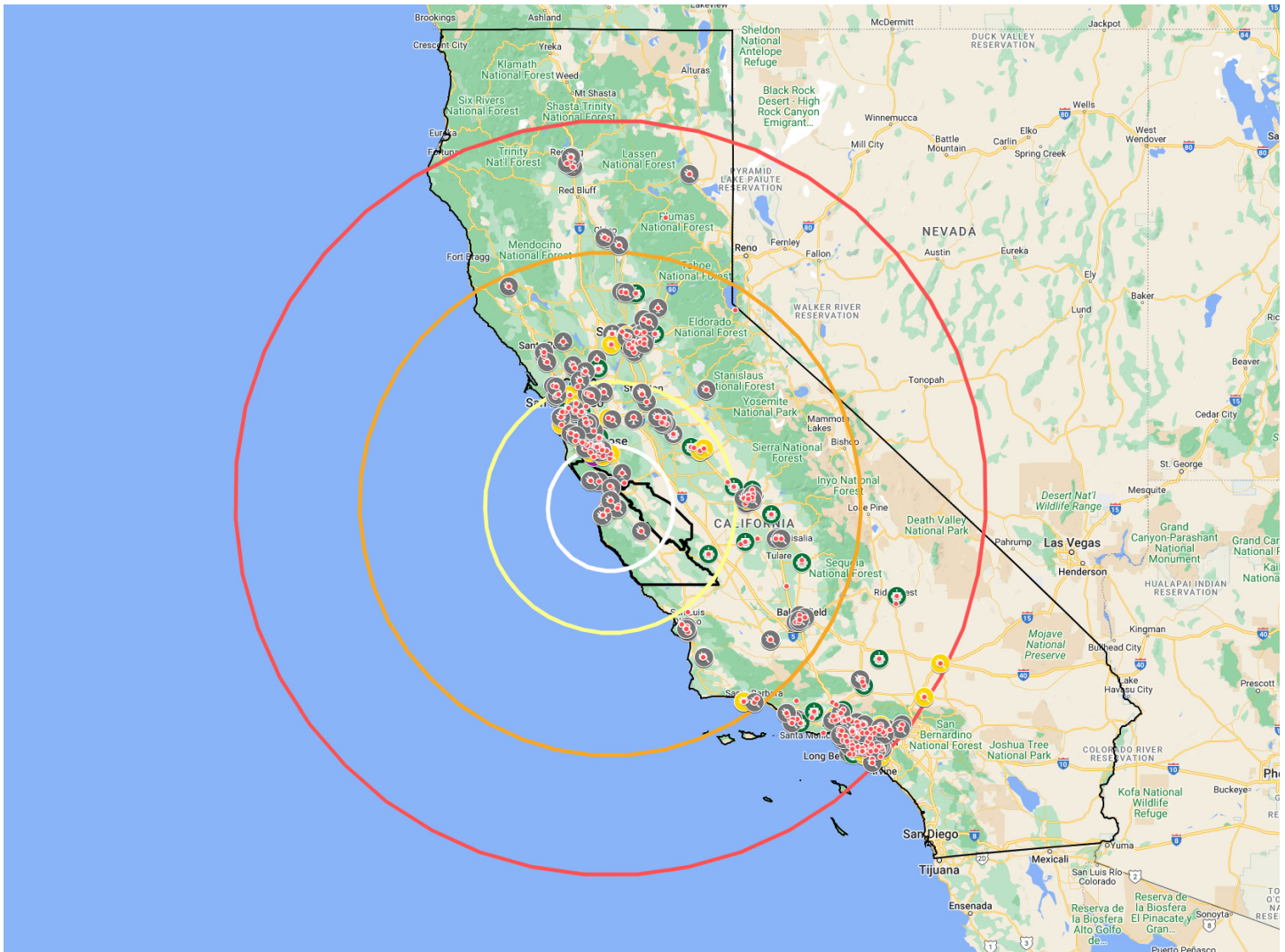
- "Tier 2 - Potential" are entities that are indicated by gray icons to mark entities that presently provide associated courses or training that could be adapted or support classes, certifications, or specific training for drone (gray airplane), robotics (gray robot), or EV (gray plug). These could be considered "shovel ready" entities that could be adapted to provide these services.

- "Tier 3 - Prospective" are entities that are marked by red dots that designate locations for entities with the likely ability to provide associated classes, certifications, or specific training for some of these three areas of interest (i.e., drone, robotics, and/or EV), but these entities presently do not have directly related offerings and would need to a put concerted effort to provide these training services

(i.e., these are not shovel ready, but could likely adapt to do so). They are noted in this study as they are likely capable of doing so should they choose to add it to their entity's mission/purpose/curriculum and could be potential entities to work with should the need present itself.

Summary data from the Interactive Map are indicated in Graph C1 which provides a breakdown of the locations within the concentric regions that currently (Tier 1), potentially (Tier 2), or may provide in the future specific training, certification, etc., for robotics, drone, and EV related technologies within 300 miles of MB DART (with the exclusion of entities in Nevada that may fall within the concentric boundaries).

Graph C1: The following graph provides a numerical summary of Tier 1-Current and Tier 2-Potential entities within the concentric circle regions from the Interactive Map for Robotics, Drone, and EV related technologies relative to the MB DART location.
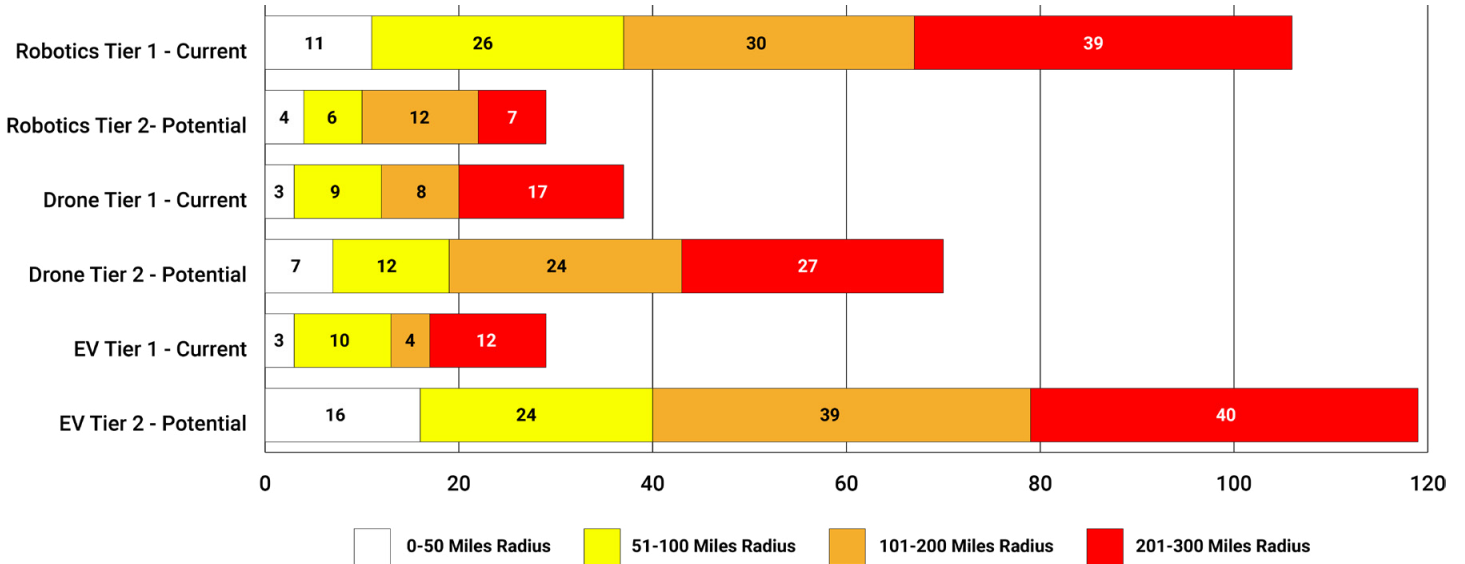
The colors on Graph C1 white, yellow, orange, and red indicate the numbers of current or potential entities within the 0-50 (white), 51-100 (yellow), 101-200 (orange), and 201-300 (red) miles from the MB DART site and correspond to the concentric colored circles on the map (see Interactive Map). A review of the overall map in combination with Graph C1 that the area within 50 miles of MB DART shows the generally reduced availability of current or potential sites for workforce training in these areas. The subsequent section provides a more concise view of the availability within the Monterey Bay Region which includes Monterey, Santa Cruz, and San Benito counties, for availability of current and potential training in robotics, drone, and EV technologies.

RELATED TRAINING CURRENTLY OR POTENTIALLY AVAILABLE WITHIN MONTEREY, SAN BENITO, AND SANTA CRUZ COUNTIES

The following map (Map 3) shows the Monterey Bay Region (including the whole of Monterey, Santa Cruz, and San Benito counties) and the 0 to 50-mile concentric circle from the central MB DART location. Included in the map are three panels that each indicate the Tier 1-Current and Tier 2-Potential drone (panel A), robotics (panel B), and EV sites (panel C) and with panel D indicating Tier 3-Prospective locations that could with concerted effort provide training.

Map 3: Monterey Bay Region (i.e., Monterey, Santa Cruz, and San Benito counties) overview of Tier 1-Current (colorized) and Tier 2-Potential (gray) sites for Drone (A), Robotics (B), EV (C) and Tier 3-Prospective (Red dot) entities (D) from Interactive Map.
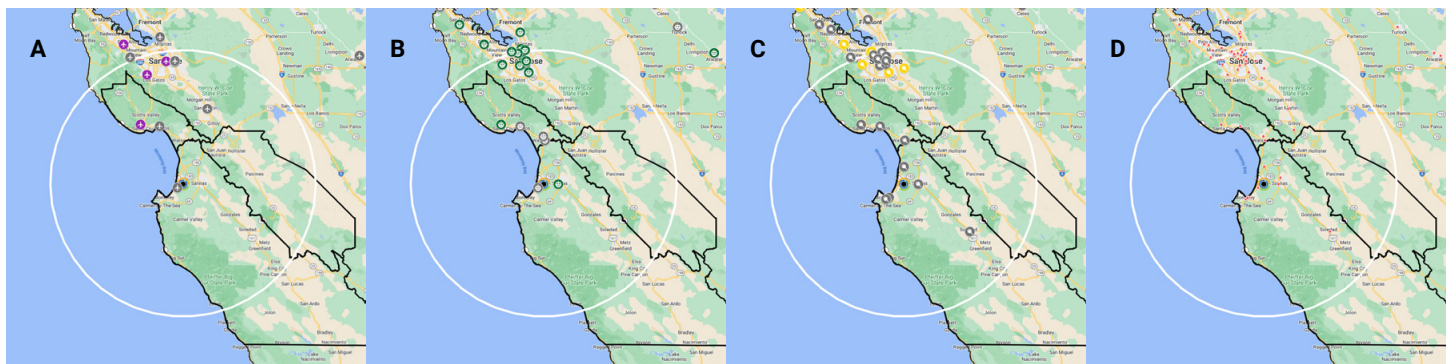
Map 3 Panel A: Monterey Bay Region including Monterey, San Benito, and Santa Cruz counties showing Tier 1-Current (purple airplane) and Tier 2-Potential (gray airplane) drone workforce entities.

Map 3 Panel B: Monterey Bay Region including Monterey, San Benito, and Santa Cruz counties showing Tier 1-Current (green robots) and Tier 2-Potential (gray robots) robotics workforce entities.
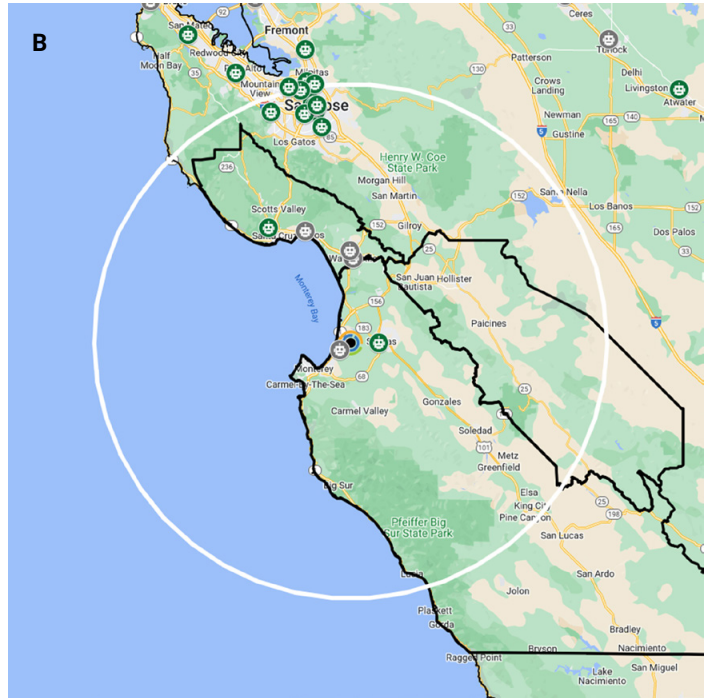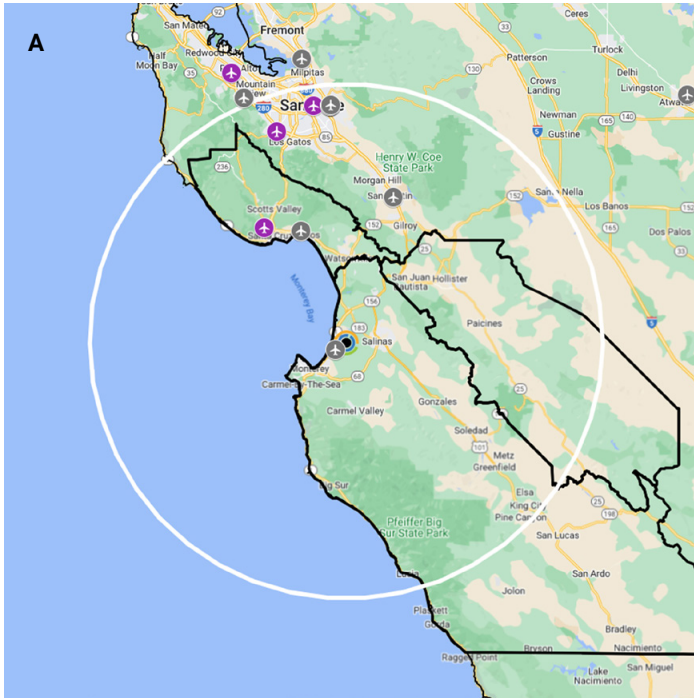
Map 3 Panel C: Monterey Bay Region including Monterey, San Benito, and Santa Cruz counties showing Tier 1-Current (yellow plugs) and Tier 2-Potential (gray plugs) EV workforce entities.

Map 3 Panel D: Monterey Bay Region including Monterey, San Benito, and Santa Cruz counties showing Tier 3-Prospective (red dots) workforce entities.
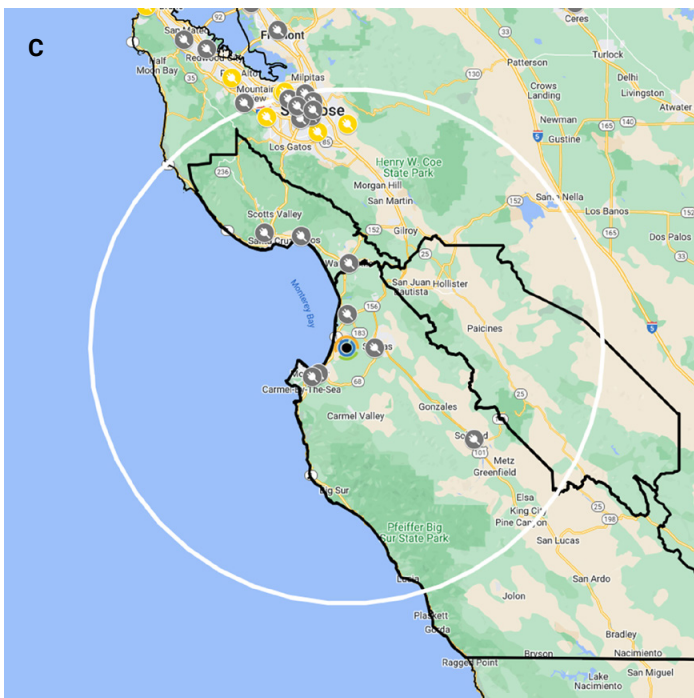
Map 4: Zoomed view of areas within the Monterey Bay three county region overview of Tier 1-Current (colorized) and Tier 2-Potential (gray) sites for drone (A), robotics (B), EV (C) and Tier 3-Prospective (red dot) entities (D); see Graph E1 for sum total values.
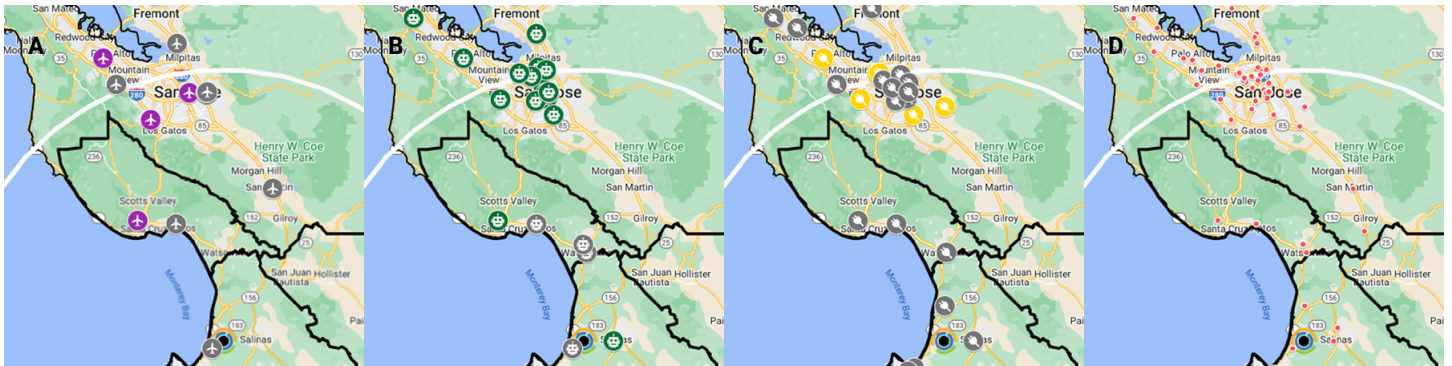
A review of Map 3 (Panels A-C) shows that most of the current, potential, and prospective locations for workforce training for robotics, drone, and EV reside within the concentric 50-mile circle (white circle) exist outside the three counties of interest (Monterey, Santa Cruz, and San Benito) with the majority residing in the greater San Jose/Santa Clara County area. Map 3 Panel D indicates multiple Tier 3-Prospective entities that reside within the greater Monterey Bay Region that may be strategic partners for workforce training should they chose to participate in aspects of a workforce training center.

Map 4 shows a zoomed in view of the general areas where entities reside that either Tier 1-Current, Tier 2-Potential, or Tier 3-Prospective entities that provide or could provide certain aspects of workforce training for robotics, drone, or EV related technologies. Of these sites, the majority reside within the immediate vicinity of Monterey Bay or immediately surrounding communities. However, it becomes evident in reviewing these maps that a gap is present within the greater Monterey Bay Region regarding the availability of workforce training for robotics, drone, and EV technologies when compared to the neighboring counties (see Interactive Map).

GAPS (TO MEET SKILLS NEEDS WITHIN REGION 100-MILE RADIUS OF MB DART)

For the Interactive Map we considered entities up to a 300 miles concentric circle from the MB DART location. As previously described, the map contains three levels of entities that are either Tier 1-Currently, Tier 2-Potentially, or Tier 3-Prospectively entities that provide robotics, drone, or EV related technological training. Here we have limited the gap analysis to a limit of 100-miles from the MB DART location. Although the entities within the 300-miles provide related information, we determined that the

entities within the 50-mile concentric circle from the MB DART location provide an area for a realistic prospective to assess the potential viability of a workforce training center located within the Monterey Bay Region. In large part, it is unlikely that an individual would travel greater than 0-50 miles one-way to attend a facility of this nature. Therefore, we have limited the scope of the gap analysis to include only those entities that currently (Tier 1) or potentially (Tier 2) that do or may provide related training for robotics, drone, or EV technologies. For 0-50-mile gap assessment, we are not specifically considering Tier 3 entities as these entities would require time and effort to create programs or training from scratch (although possible) rather than simply adapt current programs (i.e., Tier-2 entities) or those that already currently provide (i.e., Tier-1 entities) robotic, drone, or EV related training.

A review of the sites located within the 0-50 miles and 51-100 miles concentric circles from the MB DART facility indicate the results that show an overall lack of accessible workforce training location for robotics, drone, and EV technologies for someone living within the Monterey Bay Region. Graph E1 shows the stark contrast of the current availability of workforce related training in robotics, drone, and EV for both Tier 1-Current and in most cases Tier 2-Potential sites within 0-50 miles (excluding Monterey (M), San Benito (SB), and Santa Cruz (SC) counties) and 51-100 miles of the MB DART location. In addition to the Monterey Bay Region counties and the 0-50 miles radius, we also included the 51-100 miles values in Graph E1 to provide a perspective of general regional availability of similar workforce training. The vast majority of these within the 51-100 miles concentric region reside within the San Jose/Santa Clara County area (see Map 2 and the Interactive Map). The Monterey Bay Region county values (i.e., M, SB, and SC) have been excluded from the 0-50 miles values for the respective robotics, drone, and EV Tier-1 and Tier-2 entities for Graph E1.

Graph E1: Provides a summary of "Tier 1-current" and "Tier 2-potential" robotic, drone, and EV technological training entities that reside within the California counties of Monterey (M), San Benito (SB), and Santa Cruz (SC).
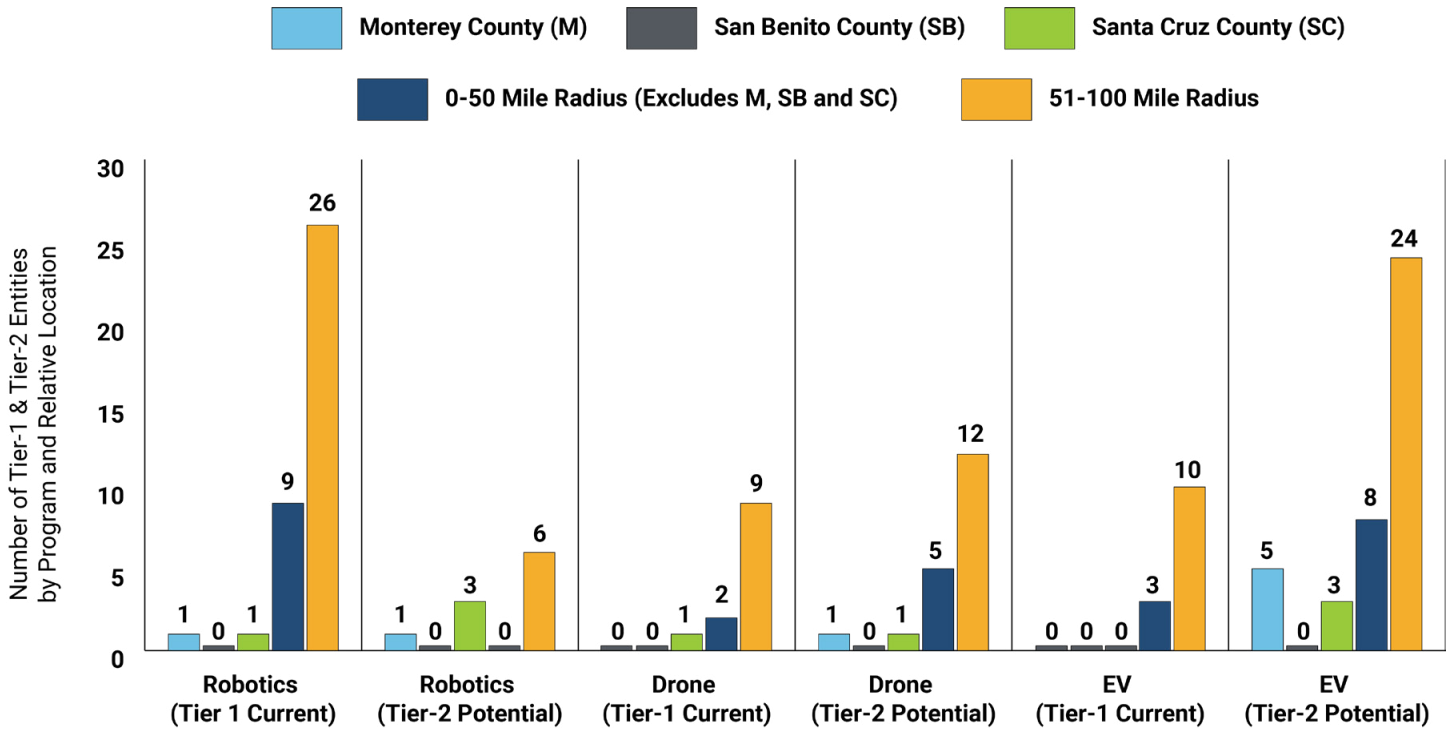
These data shown in Graph E1 indicate some encouraging findings that demonstrate the presence of a Tier-2 entities at present within the Monterey Bay Region that could potentially host a workforce training facility in the target areas of robotics, drone, and EV technologies; however, this is in stark contrast to the general lack of "Tier 1-current" training options in the three counties compared to those available outside the three counties but within the 0-50 miles concentric region.

A specific review of the Interactive Map shows that the values in Graph E1 for the orange bars (i.e., "0-50 Miles Radius (Excluding M, SB, and SC)") for "Tier-1 Current" entities for robotics, drone and EV all reside within the San Jose/Santa Clara County region. This is also apparent as noted in Maps 3 and 4 and observable within the Interactive Map.

Evidence from the maps (Maps 2, 3A-D, and 4) and graphical data (Graphs C1 and E1) presented indicate a relative visible gap of current or potential available workforce training that exists within the Monterey Bay Region (i.e., Monterey, Santa Cruz, and San

Benito counties) for the areas of robotics, drone, and EV technologies when compared to those that reside outside the Monterey Bay region. Coupled with the relative population growth (anticipated growth by 2030-2040) and expressed need for training in this area (as indicated in section III above in this study) suggest that the addition of a workforce training center in the sectors of robotics, drone, and EV technologies would provide an invaluable and needed asset to the region. Additionally, with the development of more specific advanced manufacturing workforce training capability, a Monterey Bay Regional Workforce Training Center would fill an even greater need for the current and future jobs of the region.

RECOMMENDATIONS FOR THE CREATION OF A MONTEREY BAY REGIONAL ADVANCED MANUFACTURING WORKFORCE TRAINING CENTER

OVERVIEW

Based on the extensive data collected and analyzed (as described above), there is a definite need for a regional advanced manufacturing workforce training center to better serve Monterey, San Benito, and Santa Cruz Counties' current and future Drone, Robotics, and EV industry labor needs. Moreover, with the right combination of advanced training programs and technological skill development curricula, there may also be potential to serve a broader universe of unskilled, semi-skilled, and reemployed workers for advanced manufacturing jobs of the future from throughout California and across the United States with the creation of a uniquely positioned workforce development center in the Monterey Bay Region.

Workforce training can be delivered through various forms of distributed training at multiple locations, through distance learning, through a single workforce training center, or a combination of all the above to create the building blocks of the needed skilled talent within the Region. The following recommendations were developed for consideration.

SCOPE OF DISTRIBUTED WORKFORCE TRAINING

Distributed training/learning is an instructional model that allows instructors, students, and content to be in different, noncentralized locations so that instruction and learning can occur independent of time and place. The distributed learning model can be used in combination with traditional classroom-based courses and traditional distance education courses (in which it is also deferred to as blended or hybrid learning, or it can be used to create entirely virtual classrooms.)[51]

Most applicable to the Monterey Bay Region, the development of a distributed workforce training program utilizing existing classroom curriculum along with distance education courses to provide the basic and fundamental skills development in close collaboration with regional community college and university partners may be the ideal solution for an initial phase of training as discussed below.

POTENTIAL COLLABORATIVE DISTRIBUTED WORKFORCE TRAINING PARTNERS

The following analysis focuses on examples (not exhaustive) of relevant existing and potential distributed training opportunities offered by Monterey Bay Region community colleges and universities. Local community colleges and universities provide or potentially provide related certification, training, or coursework, etc., that have relevance to robotics, drone, and/or EV related technological workforce training.

NOTE: related example courses or training are labeled as Tier 1-Current (C), or Tier 2-potential (P) followed by robotics (R), drone (D) or electronic vehicles (EV). For instance, a Tier 1-Current robotics would be (CR) and Tier 2-Potential drone would be (PD), or Tier 1-Current EV (CEV), etc. For a detailed description of the Tier levels (1-3), please refer to Section IV Subsection C.

- Hartnell Community College (main campus – Salinas, CA) current directly relevant or semi-relevant coursework include:

  o PD: Courses in Statics, Circuit Analysis, Material Science and Engineering, Computer science, Metal Fabrication, etc. (i.e., EGN – 4, 5 – 8, CSS – 1, 2A, and 3; MFGT – 130 – 132)

  o CR: Courses in Statics, Circuit Analysis, Material Science and Engineering, Computer science, etc. (i.e., EGN – 4, 5 – 8, CSS – 1, 2A, and 3)

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[51] *https://web.archive.org/web/20150222012236/http://www.bced.gov.bc.ca/dist_learning/*

- o PEV: Courses in Automotive repair, Electrical systems, Statics, Circuit Analysis, Material Science and Engineering, Computer science, Welding, Agricultural Mechatronics, Metal Fabrication, etc. (i.e., AAT – 100, 120, 121; EGN – 4, 5 – 8; CSS – 1, 2A, and 3; WLD – 150 – 158, MFGT-111A, 111B, 112A, 112B, 130 – 132)

- California State University Monterey Bay (CSUMB) (main campus Seaside/Marina, CA) current directly relevant or semi-relevant coursework include:

  - o PD: Courses in Computer science, photography, etc. (i.e., CST – 236, 237, 337, 338, 438; CST – 226, SICP – 503, VPA – 310)

  - o PR: Course in Marine Robotics (i.e., MSCI 337)

  - o NOTE: CSUMB Mechatronics program is coming on-line in Fall 2024[52]

- Cabrillo College (main campus Aptos, CA) current directly relevant or semi-relevant coursework include:

  - o PD: Courses in video art, post-production, digital video (i.e., AP – 14)

  - o PR: Courses in machine processes, welding, etc. (i.e., ENGR – 12 and W158)

  - o PEV: Courses in electrical construction, energy/electrical code, green building, etc. (i.e., CEM – 151EL, 162, 162LD, 165E, and 175C)

- Monterey Peninsula College (main campus Monterey, CA) current directly relevant or semi-relevant coursework include:

  - o PD: Courses in photographing processes and digital photography (i.e., ARTP – 55 and 12B)

  - o PR: Courses in principles in robotic, mechanics, circuits, theory, machine intelligence, prototyping (i.e., ENGR – 1B and 9)

  - o PEV: Courses in automotive technology (i.e., AUTO – 90, 100-108, 111, 161, 162, and 170)

  - o MPC also maintains a Mechatronics curriculum that is currently on hold pending additional resources and staffing.

- UC Santa Cruz (main campus Santa Cruz, CA) currently has Tier 1-Current programs in both Robotics and Drone and has Tier 2-Potential EV programs throughout their vast applicable course offerings. Descriptions are provided for the programs and if informative some specific courses are

indicated (i.e., CR - Mechatronics):

- o CR: Robotics Engineering
  UCSC robotics engineering program prepares graduates for rewarding careers at the interfaces between electrical, computer, and mechanical engineering. UCSC robotics engineering graduates will have a thorough grounding in the principles and practices of robotics and control, and the scientific and mathematical principles upon which they are built; they will be prepared for further education (both formal and informal) and for productive employment in industry.

  - · Mechatronics courses ECE – 118, 218

  - · Technologies involved in mechatronics (intelligent electro-mechanical systems) and techniques necessary to integrate these technologies into mechatronic systems. Topics include electronics (A/D, D/A converters, op amps, filters, power devices), software program design (event-driven programming, state machine-based design), DC and stepper motors, basic sensing, and basic mechanical design (machine elements and mechanical CAD). Combines lab component of structured assignments with a large and open-ended team project.

- o CR, CD, PEV: Electrical Engineering
  The electrical engineering curriculum provides a balance of engineering science and design and allows students to specialize in both the traditional topics and the latest subjects in electrical engineering. Students may concentrate their electives in the areas of electronics and optics or communications, signals, systems, and controls. The major is designed to attract motivated students who, upon graduation, will be sought by employers in the high-tech industry. The electrical engineering program is accredited by the Engineering Accreditation Commission of ABET.

- o CR, CD, PEV: Technology and Information Management
  Technology and Information Management (TIM) is a multi-disciplinary program that focuses on the integration of engineering, computer science, information technology, and business management for two purposes: the technology of management, which includes the design of information technology to solve business problems, and the management of technology, which includes the management of new-product development and entrepreneurship.

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[52] *https://csumb.edu/news/news-listing/title-v-grant-helps-boost-engineering-program-launch-at-csumb/*

o CD: Unmanned Aircraft Systems Collegiate Training

· UCSC joins FAA/ UAS Collegiate Training Initiative - February 07, 2023

· UC Santa Cruz is now the first UC- or CSU-member of the Federal Aviation Administration (FAA)/ Unmanned Aircraft Systems' (UAS) Collegiate Training Initiative program, which was designed to recognize and support institutions that prepare their students for careers in drones.

Additionally, in response to the basic training needs identified in the various Surveys as well as fundamental distributed workforce training possibilities, all of the above institutions of higher learning provide some, if not all, relevant courses and curriculum that address:

- Communication Skills
- Computer Skills
- Trade Skills
- Writing Skills
- Technical Training
- Mechanical Skills
- Other (including Accounting Skills, Soft Skills, Problem Solving, etc.)

Moreover, the relevant curricula at these academic institutions could be enhanced with input from local employers, emerging industry leaders, and community-based organizations focused at addressing their respective needs and requirements.

SINGLE WORKFORCE TRAINING CENTER (INCLUDING EQUIPMENT, CLASSROOMS, LAB SPACE, WORKSHOPS, AND INSTRUCTORS)

In addition to the distributed workforce training skills that can be provided by the regional community college and university partners, a second phase of training would be required to fill in the more specialized gaps required for advanced manufacturing. This phase of workforce training could be provided by an advanced manufacturing workforce training center established at a centrally located and accessible location within the three-county region.

This site would include a combination of classrooms, labs, workshops, and common areas with the flexibility to meet current demands as well as future needs of an emerging workforce. Additionally, many of the primary instructors for this center could come from the local area community colleges, universities, high schools, and other related industries and employers. Not only will the Center provide needed curriculum and training for the region's potential trainable workforce, but it could also provide additional employment for part-time faculty and skilled individuals within the local area.

Specific training programs, curricula, and relevant courses will need to be established through comprehensive and necessary input on the workforce needs from local employers and emerging companies as well as consultations with local community organizations and leaders. Furthermore, emergent Fourth Industrial Revolution advanced manufacturing and technology requirements, standards, and certifications will need to be consistently reviewed and updated to ensure that training specifications and curriculum development continually meet international standards and benchmarks such as the IBSTPI.[53]

For more than four decades, The International Board of Standards for Training, Performance, and Instruction (IBSTPI) has been developing and validating the standards for professionals in the learning, development, and performance improvement fields. Each IBSTPI competency model represents a hierarchy of competence, including:

Domain—Broad areas of competence required for a position
Competencies—Specific areas of competence within a domain
Performance statements—Underlying skills needed for each competency

The most current version of IBSTI Competencies reflects the changing way that instructional designers work, including the influence of advanced technologies, team-base design, and business management skills.[54] Local collaboration measured against international training standards will allow for the most productive development of relevant and flexible workforce training curriculum into the future.

This single advanced manufacturing workforce training center concept is discussed more fully under Section VII below.

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[53] *https://ibstpi.org/ , International Board of Standards for Training, Performance, and Instruction*

[54] *https://ibstpi.org/competency-sets-services/*

RECOMMENDATIONS FOR THE CREATION OF A MONTEREY BAY REGION ADVANCED MANUFACTURING WORKFORCE DEVELOPMENT CENTER

Based upon the aforementioned analysis and consideration, the following recommendations are set forth in a simple tri-level strategy:

1. Develop a collaborative partnership with Monterey Bay Region community colleges and universities to provide distributed workforce training courses based upon their existing and available curriculum.

2. Develop a specific advanced manufacturing training curriculum working in partnership with Monterey Bay Region community colleges and universities, with input from an advisory board of local employers, industry leaders, and community-based organizations that meet their respective workforce needs now and into the future.

3. Plan, Design, and Implement an advanced manufacturing workforce training center that is centrally located and accessible to those in need of training and will be the site to deliver the specific advanced curriculum.

PRELIMINARY SITE SELECTION/RECOMMENDATION

Identifying and selecting the most appropriate location for a Monterey Bay Regional Advanced Manufacturing Workforce Training Center will be an important factor in its initial creation, attraction to potential users, and long-term viability and sustainability into the future.

Commonly, site selection criteria can rely upon many different factors and characteristics depending upon the nature of development and final use. However, to best determine the ideal location for the Center, we considered the following specific requirements and attributes.

LOCATION REQUIREMENTS AND ATTRIBUTES

i.   Regional Proximity

    a. Close to major cities and communities

    b. Convenient access, off major highways and roads, ease of ingress and egress

    c. Close to housing for students, workers, and instructors

    d. Close to related industries: e.g., advanced air mobility, ag technology, etc.

ii. Readiness for development

    a. General and Specific plan approval

    b. Environmental approvals (e.g., CEQA, NEPA), including endangered species and other fish and wildlife challenges

    c. Required infrastructure in place or planned, e.g., water, sewer, power, broadband connectivity

    d. Shovel ready for immediate construction

    e. Proximity to highways, roads, and public transportation

    f. Available existing buildings and/or facilities

iii. Available land

    a. Sufficient Acreage for start-up and future expansion

    b. Potential for neighboring development of compli-

mentary industry, corporate partners, research and development and manufacturing facilities

iv. Supportive landowner and developer

    a. Willingness to propose creative solutions

    b. Donation of land

    c. Potential for "build to suit" and/or long-term lease with option to buy

v.   Cooperative and supportive local government

    a. Willingness to propose creative solutions

    a. Willingness to cut or streamline red tape/regulations

    a. Willingness to invest in necessary infrastructure

SITES CONSIDERED

1. UC MBEST (Monterey Bay Education, Science and Technology Center)

    a. Located in the City of Marina, adjacent to Marina Airport; owned by UC Santa Cruz.

    ii. Two potential sites – North Central Campus: 67.9 acres, and West Campus: 34.3 acres.

    iii. North Central Campus maintains roads, sewer, and power infrastructure

    iv. Both parcels are constrained by Fish and Wildlife mitigation requirements, which could delay development

2. CSUMB

    a. Located in the City of Seaside on the former site of Fort Ord

    i.   Exact acreage and location TBD

    ii. CSUMB plans to build a 30,000 to 40,000 square foot facility to house engineering and mechatronics programs in the future

3. Monterey Peninsula College Education Center at Marina

Campus

   a. Located in the City of Marina, approximately 4 miles
       from Marina Airport; owned by MPC with several
       existing college facilities.

   i. Approximately 16.7 acres adjacent to existing facilities
       with roads, sewer, and power infrastructure

4. City of Salinas

   a. Salinas Business Park at Salinas Airport (adjacent)

   i. Owned and operated by several entities, including
       Cushman and Wakefield, Swenson, and Borelli Invest-
       ment Company

   ii. Approximately 15.7 acres, with plans to build a 229,000
       square foot warehouse building, with appropriate
       infrastructure

   b. Hartnell College – Alisal Campus

   i. Hartnell College satellite campus focused on agri-tech-
       nology, next door to UCANR and USDA facilities

   ii. Approximately 18.5 acres with potential for additional
       buildings, in close proximity to Salinas Airport

Table 4: Comparative Analysis Of Potential Regional Sites

SITE	PROXIMITY	READINESS	AVAILABLE LAND	OWNER AND DEVELOPER TEAM	LOCAL GOVERNMENT
UC MBEST	Located next to Marina Airport; 8 miles to Salinas; 11 miles to Monterey; 35 miles to Hollister; and 38 miles to Santa Cruz via Hwy 1.	North Central Campus parcel maintains road, sewer, and power infrastructure, including 39k sq. ft. UC MBEST HQ building. California Dept. of Fish and Wildlife requires mitigation of habitat restoration before any future development.	Two potential sites – North Central Campus (67.9 acres), or West Campus (34.3 acres), next to Marina Airport	UCSC	City of Marina
CSUMB	Located in Seaside, CA off Hwy 1 approximately 3 miles to Marina Airport; 10 miles to Salinas; 8 miles to Monterey; 36 miles to Hollister; and 39 miles to Santa Cruz	CSUMB has long-term plans to build a 30k to 40k sq ft space for their engineering and mechatronics program	TBD	CSUMB	City of Seaside
Monterey Peninsula College Marina Education Center	Located in Marina, CA at the corner of Imjin Road and 3rd Avenue, approximately 4 miles from Marina Airport; 10 miles to Salinas; 9 miles to Monterey; 33 miles to Hollister; and 36 miles to Santa Cruz	Existing college facilities, including 12k sq ft classroom and workshop space. Location maintains road, sewer, and electrical power infrastructure.	~16.7 acres along Imjin Road	MPC	City of Marina
City of Salinas – Salinas Business Park	Located next to the Salinas Airport and adjacent to Hwy 101; near Hwy 183 for connection to Castroville and Santa Cruz, and Hwy 68 for connection to Monterey Peninsula.	Warehouse distribution center, with direct access to the airport ramp. 229k sq. ft. building will include 36 ft clear height, 480V 3 phase power availability, and column spacing of 50' x 50' providing flexible unit sizes. Occupancy in 2024.	~15.7 acres	Cushman Wakefield, Swenson, and Borelli Investment Company	City of Salinas
City of Salinas – Hartnell College Alisal Campus	Located a mile from the Salinas Airport, less than 2 miles from Hwy 101 and Hwy 68. Adjacent to the campus are both the UC Davis Cooperative Extension and an USDA-ARS Laboratory.	Existing college facilities, including 25k sq ft of smart classrooms, conference rooms, clean/dirty classroom laboratories, computer laboratories, and numerous hands-on technical shops dedicated to agriculture related trades.	~18.5 acres	Hartnell College	City of Salinas

Positives*   Negatives^

Map 5 (Panels A and B): Provide approximate locations identified as potential sites for a workforce training center within the Monterey Bay Region as discussed in "Comparative Analysis of Potential Regional Sites" Table 4 above.

Map 5 Panel A: Provides a prospective reference for the general region with a designation of the location of Map 5 Panel B.

Map 5 Panel B: Provides approximate locations for the proposed regional sites for an Advanced Manufacturing Workforce Training Center
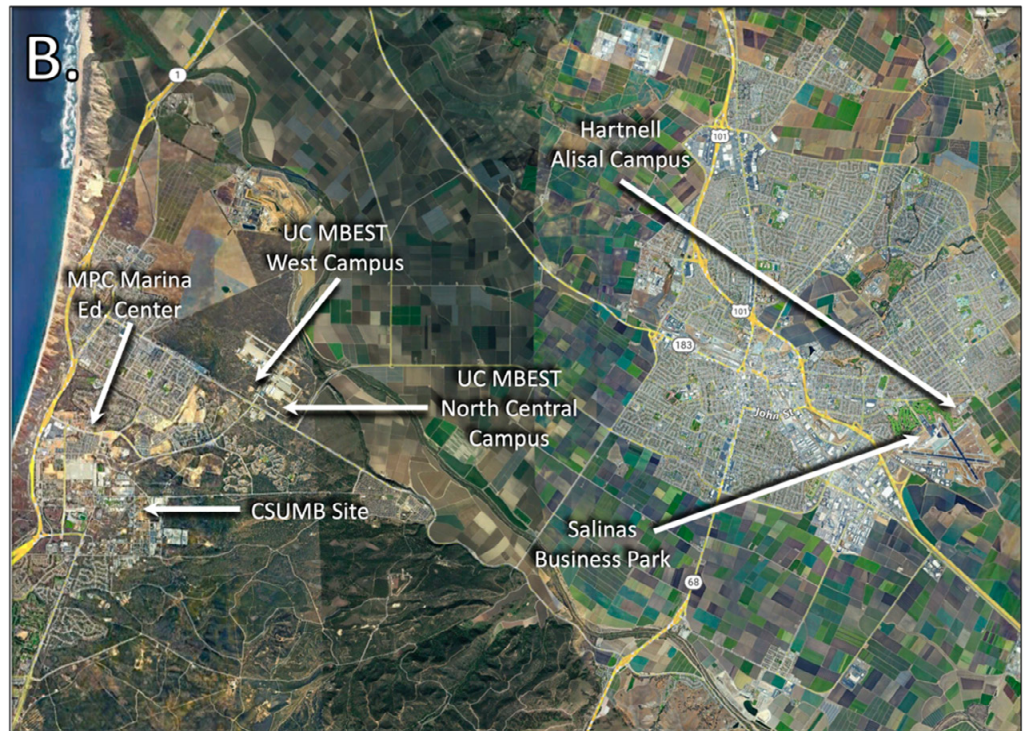
CONCEPT OF MONTEREY BAY REGION ADVANCED MANUFACTURING WORKFORCE TRAINING CENTER

PRIMARY CONCEPT

The Monterey Bay Region Advanced Manufacturing Workforce Training Center will be a purpose build state-of-the-art multiuse facility that could be designed to provide multiple stakeholders access to facilities and equipment to allow for current and future workforce training needs and requirements.

The Center is proposed to house a combination of 1.) Classrooms; 2.) Labs, including but not limited to computers, engineering design, and CAD software; 3.) Workshops, including but not limited to laser 3D Printers, composite manufacturing equipment, robots, EV automotive and aviation equipment, electronic and mechatronics-related equipment e.g., appropriate engineering, electronics, repair, and maintenance equipment, machine fabrication equipment, and any other assembly and service equipment; 4.) Common use areas, affording collaborative space for student and instructor interaction and flexibility for multiple uses; and 5.) Meeting spaces and conference rooms.

RECOMMENDED STRUCTURE

The recommended size of the Center is a result of regional industry input but also a review of the optimal size of other workforce training centers across California and the United States. Workforce training centers vary in size depending upon the scope and range of skills development offered. For example, Joby Aviation has expressed a need for a training facility approximately 60,000 square feet in size. As a comparison, the Chaffey College INTECH Center in Fontana, CA is 33,000 square feet, and the ROC and CTEC Career Education, Kern High School District in Bakersfield, CA is a combined 125,000 square feet over two sites.

Therefore, based upon the foregoing analysis and review, it is recommended that the Monterey Bay Regional Advanced Manufacturing Workforce Training Center include:

1. Size: 50,000 to 60,000 square foot free-standing building equipped to meet the needs of the advanced manufacturing jobs of the future.

2. Structure and Components: The Center should include a mix of flexible but practical uses, including:

   a. Classrooms – approximately 5,000 to 8,000 sq. ft of individual classrooms (4-8 classrooms)

   b. Conference Rooms and Meeting Rooms – approximately 1,500 to 3,000 sq. ft. (2-3 conference rooms and 4-5 meeting rooms)

   c. Common Areas – approximately 4,000 sq. ft. for collaborative interaction of students and faculty, large group meetings, events for the facility, community meetings, as well as a breakroom, lounge, kitchen, etc.

   d. Workshops and Labs – approximately 25,000 to 35,000 sq ft. of open area with high ceilings, work benches, workstations, and equipment bays for flexible use.

3. Assumptions:

   a. Site Location – building sizing considerations could fit into any of the sites listed under Section VI.

   b. Truck Loading/Equipment Docks: Workshop and Lab areas will need truck loading/unloading areas with roll-up doors or the equivalent for moving large scale equipment and projects.

   c. Floors/Building Heights: Workshop area is envisioned to be a two-story overall height for easy access and accommodation for larger advanced manufacturing projects. Classrooms, Labs, Meeting Space, and Conference rooms could be either one-story with multiple levels or larger open common open areas.

   d. Capital Cost:

   i. Building cost – based upon commonly accepted costs per square foot, a 50,000 to 60,000 square foot building including all the components listed above would be approximately $14 to $16 million. (See Appendix 6 for more detailed calculation of costs)

   ii. Equipment cost – based upon a preliminary estimate for required training equipment provided by Joby - $8.4 million.
   TOTAL = $22.4 to $24.4 million

   e. Operating Budget: this will need to be examined and analyzed further based upon the final scope of work-

force training involved, required staffing, utilities, maintenance, etc. However, similar size workforce training facilities range from $8 million annual operating budget (INTECH, Chaffey College) to $15 Million annual operating budget (ROC and CTEC Career Education, Kern High School District), and are supported with fee for service revenue, government subsidy/grants, and/or philanthropic support.

Motlow State Automation and Robotics

Kern High School CTEC

Kern High School CTEC Internal

Embry Riddle Research Park

CONCLUSIONS

The continued growth of Joby Aviation's advanced manufacturing operations at the Marina Airport, along with the presence of a growing cluster of advanced air mobility, AgTech, and national security-oriented firms throughout the California Central Coast are driving increased needs and requirements in current and future career technical education, and demand for workers with future-relevant skills. This is further borne out in the increasing numbers of manufacturing jobs across the Monterey Bay Region.

As the foregoing extensive data collection and thorough analysis of the Monterey Bay Region's demographic and socio-economic makeup concludes, the Region retains the fundamental attributes for the potential development of a regional workforce training center. The aforementioned conclusions highlight a younger, diverse, and less educated workforce actively seeking employment within the region. This conclusion is further supported by the various survey responses and stakeholder outreach highlighting the need for current and future workforce training opportunities across Monterey, San Benito, and Santa Cruz counties.

Moreover, the Gap Assessment of available workforce training in the areas of robotics, drone, and EV technologies in the Monterey Bay region, as compared to immediate areas outside the three-county area, indicates a general lack of available workforce training in the target technologies – suggesting a strong need for such advanced manufacturing training within the Monterey Bay Region. This need could be filled with the development of a distributed training model along with more specialized training relevant to advanced manufacturing. The development of a distributed workforce training program utilizing existing classroom curriculum along with distance education courses to provide the basic and fundamental skills development in close collaboration with regional community college and university partners may be the ideal solution for an initial phase of training.

Lastly, the feasibility analysis concludes that a single regional advanced manufacturing workforce training center should be established to meet the needs outlined above. The Monterey Bay Region Advanced Manufacturing Workforce Training Center will be a purpose build state-of-the-art multiuse facility that could be designed to provide multiple stakeholders access to facilities and equipment to allow for current and future workforce training needs and requirements.

Appendix

BIOGRAPHIES

THE HATAMIYA GROUP

Lon Hatamiya

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Lon Hatamiya is the President and Chief Executive Officer of the Hatamiya Group, an economics consulting firm in Davis, California. Lon specializes in international, national, and regional economic analysis, with an emphasis on technology, food, and agriculture. He has extensive government management experience serving at both the state and federal levels. He was the first Asian American cabinet member in the history of the state of California, serving as Secretary of the California Technology, Trade and Commerce Agency, when he was appointed by Governor Gray Davis in 1999. He was also the first Asian American Administrator at the United States Department of Agriculture, where he headed up the Agricultural Marketing Service and then the Foreign Agricultural Service under President Bill Clinton. Mr. Hatamiya practiced law with the international firm of Orrick, Herrington and Sutcliffe, and worked for The Procter and Gamble Company in Cincinnati, Ohio, The Sony Corporation in Tokyo, Japan, and H.B. Orchards, Inc. in Marysville, California. He also served as a Director for the international consulting firms of LECG, LLC. and Navigant Consulting.

Mr. Hatamiya graduated from Harvard College with an A.B. in Economics. He also obtained his JD and MBA degrees from UCLA. In addition, he is native of Marysville, California, where he grew up on his three-generation family farm.

Kent Morgan

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J. Kent Morgan, Ph.D. is the Owner and President of J. Kent Morgan Consulting, LLC, a scientific and regulatory consulting company based in Port Saint Lucie, Florida. He also serves as an affiliate to The Hatamiya Group in California. Kent specializes in consulting with national and international clientele for scientific product research and development from proof of concept through IP/licensing, federal registration, and the marketing/sales of the final product. He has written multiple reports for US federal regulatory agencies including both the US EPA and FDA and has secured funding from granting agencies for his clients. He has authored multiple peer reviewed scientific journal articles and holds both US and international patents. He has worked as Chief Science Officer and Acting Chief Science Officer for multiple start-up companies and provided guidance to assess the value of scientific IP and has negotiated exclusive licensing agreements of multiple technologies. He has contracted and advised clients in varying scientific fields including (but not limited to), molecular biology, microbiology, cell biology, immunology, genetics, proteomics, bioinformatics, plant pathology, vector entomology, and agricultural chemicals for plant disease management.

Dr. Morgan graduated from Brigham Young University in Provo, UT with a B.S. in Microbiology. He obtained his Ph.D. in Microbiology/Cell and Molecular Biology from Oklahoma State University, and he performed his Postdoctoral training at the United State Department of Agriculture with the Agricultural Research Services in Fort Pierce, FL. Kent grew up in Utah and California and has lived both nationally and internationally.

APPENDIX 1

MONTEREY BAY DART WORKFORCE DEVELOPMENT - INDUSTRY AND EMPLOYER SURVEY

EXECUTIVE SUMMARY - JULY 2023

This Monterey DART Workforce Development Survey for Industry and Employers ("Industry and Employer Survey") was conducted to gather specific information for the optimal creation of an effective and efficient advanced manufacturing regional workforce training facility The Survey was made up of a series of multiple choice and short answer questions directed to solicit industry and local employers input within Monterey, San Benito, and Santa Cruz counties.

An array of industry and local employers across Monterey, San Benito, and Santa Cruz counties were asked to participate in a confidential on-line Survey to help measure their interest in the development of a regional advanced manufacturing workforce training facility. The Survey included questions about industry and employer experience on a wide variety of relevant topics related to workforce training. A total of 22 responses were received from over 100 Surveys emailed to potential respondents across the region.

Items on the Survey were worded as positive statements or direct questions, and included the following measured topics, including several sub-topics:

- Industry Represented

  - o Aerospace manufacturing, aircraft maintenance and repair, composite manufacturing, etc.
  - o Automation/Systems/IT, Construction, Transportation, etc.
  - o Natural resources (agriculture/wildfire/water, etc.)
  - o Utilities/Infrastructure inspection and repair
  - o Basic Workforce Training Needs
  - o Writing skills, computer skills, communication skills

- o Accounting skills, technical training
- o Manual dexterity skills, mechanical skills
- o Problem solving, mathematics
- o Soft skills
- o Trade skills
- Emergent Workforce Training Needs over the next 10 years

  - o 3D printing, Artificial Intelligence
  - o Quantum computing, Complex CAD Software
  - o Virtual Reality
- Types of Facilities and Equipment Needed for Workforce Training

  - o Labs, Classrooms
  - o Equipment, Software programs
  - o Robotics, 3D printers
  - o Clean rooms
- Requirement of Specific Credentials (i.e., licenses, certifications, etc.)
- Gaps in Knowledge of Current Workers
- Anticipated New Technologies for Workers to be trained

METHODOLOGY

The Survey forms and questions were developed with input from the Monterey Bay DART staff and consulting team.

The final Survey form asked respondents/industry/employers a series of quantifiable questions (14) related to their workforce training needs and perceptions. Respondents were requested through email invitations to complete the on-line questionnaire via Survey Monkey and to submit their answers electronically. Several follow-up emails were sent, and phone calls made to remind respondents to complete the Survey.

The Survey administrator checked returned Surveys for missing information and responses that would cause scanning errors. After scanning, the Survey responses were imported into Micro-soft® Excel and errors were checked against the individual Survey forms. Data analysis was completed using Excel.

SUMMARY OF RESULTS

Survey responses are broken out by specific categories, as follows (respondents could answer more than one choice so percentages could total more than 100%):

- Industry Represented

  o 31.8% of respondents were Natural Resources and related industries/employers.

  o 18.2% of respondents were Automation/Systems/IT related industries/employers.

  o 13.6% of respondents were Transportation-related industries/employers.

  o 13.6% of respondents were Aerospace Manufacturing.

  o 4.6% of respondents were Aircraft Maintenance and Repair.

  o 4.6% of respondents were Composite Manufacturing.

  o 54.5% of respondents were Other (including agriculture, ag tech, light manufacturing, etc.)

- Current Basic Workforce Training Needs

  o 68.2% of respondents require Computer Skills.

  o 50.0% of respondents require Communication Skills.

  o 50.0% of respondents require Technical Training.

  o 45.5% of respondents require Mechanical Skills.

o 40.9% of respondents require Problem Solving Skills.

o 36.4% of respondents require Trade Skills (e.g., welding, electrical installation, and repair, etc.)

o 31.8% of respondents require Writing Skills.

o 27.3% of respondents require Soft Skills (e.g., appro-priate attire, show up on time, communicate proactively, etc.)

o 18.2% of respondents require Mathematics.

o 4.5% of respondents require Manual Dexterity Skills.

- Emergent Workforce Training Needs over Next 10 Years

  o 66.7% of respondents believe that Artificial Intelligence will be needed.

  o 33.3% of respondents believe that Complex CAD Soft-ware skills will be needed.

  o 28.6% of respondents believe that 3D Printing will be needed.

  o 28.6% of respondents believe that Other will needed (including electrical engineering, food safety, ag science, data science, mechatronics, machining, and electrical testing, etc.)

  o 9.5% of respondents believe that Quantum Computing will be needed.

  o 9.5% of respondents believe that Virtual Reality will be needed.

- Required Workforce Training Facilities and Equipment

  o 63.6% of respondents require Robotics

  o 59.1% of respondents require Software Programs (including MS Office, CAD/CAM, etc.)

  o 50.0% of respondents require Classrooms.

  o 31.8% of respondents require 3D Printers.

  o 31.8% of respondents require Labs (wet/dry).

  o 22.7% of respondents require Other (including research farms and processing facilities; CNC Mills and Lathe; Welding, Machine Shop and Electrical troubleshooting; Python/Electrical circuits; etc.)

  o 9.1% of respondents require Clean Rooms.

- Required Credentials/Licenses/Certifications

  o 63.6% of respondents do not require any type of creden-

tial/license/certification for their employees.

o 36.4% of respondents require credentials/licenses/ certifications such as Certified Crop Advisor; Part 107 FAA(drone pilot license); and Production Planning Certification from APPIC ("Association of Psychology Post-doctoral and Internship Centers").

- Gaps in Knowledge of Current Employees

  o 57.1% of respondents lack employees with Computer Skills.

  o 57.1% of respondents lack employees with Mechanical Skills.

  o 52.4% of respondents lack employees with Communication Skills.

  o 42.9% of respondents lack employees with adequate Technical Training.

  o 38.1% of respondents lack employees with Problem Solving Skills.

  o 33.3% of respondents lack employees with necessary Soft Skills.

  o 23.8% of respondents lack employees with Writing Skills.

  o 23.8% of respondents lack employees with Trade Skills.

  o 19.0% of respondents lack employees with adequate Mathematics.

  o 4.8% of respondents lack employees with Accounting Skills.

  o 4.8% of respondents lack employees with Manual Dexterity Skills.

- Immediate Proficiency of New Hires

  o 45.5% of respondents wish that new hires were proficient in Computer Skills.

  o 45.5% of respondents wish that new hires were proficient in Problem Solving.

  o 40.9% of respondents wish that new hires were proficient in Mechanical Skills.

  o 36.4% of respondents wish that new hires were proficient in Soft Skills.

  o 31.8 of respondents wish that new hires were proficient in Communication Skills.

  o 22.7% of respondents wish that new hires were profi-

cient in Trade Skills.

  o 18.2% of respondents wish that new hires were proficient in Writing Skills.

  o 18.2% of respondents wish that new hires were proficient in Mathematics.

  o 9.0% of respondents wish that new hires were proficient in Accounting Skills.

  o 4.5% of respondents wish that new hires were proficient in Manual Dexterity Skills.

- Can a Workforce Training Facility/Program be Developed to Address These Issues?

  o 90% of respondents believe that a workforce training program can be developed!

  o 10% of respondents do not believe a workforce training program can be developed.

- Workforce Training In-Person or Online

  o 81.8% of respondents believe that workforce training should be in person.

  o 40.9% of respondents believe that workforce training could also be online.

  o 13.6% of respondents believe that workforce training could be provided both in-person and online.

- New Technology Training Needs into the Future

  o 80.9% of respondents believe that Artificial Intelligence training will be needed

  o 33.3% of respondents believe that Virtual Reality training will be needed.

  o 28.6% of respondents believe that 3D Printing training will be needed.

  o 28.6% of respondents believe that Complex CAD Software training will be needed.

  o 14.3% of respondents believe that Quantum Computing training will be needed.

  o 14.3% of respondents believe that Robotics training will be needed.

CONCLUSIONS

The Industry and Employer Buyer Survey produced some informative results. The Survey received twenty-two responses, which was a highly positive response rate of 22.0% (out of 100 invitations to respond). This compares favorably to the commonly accepted average response rate to external email surveys of between 10% to 30%.[1] This high response rate is an indication of the interest and need for the Monterey Bay Advanced Manufacturing Workforce Training Center.

Respondents to the Industry and Employer Survey came from a wide range of industries and employers across the region. These include 54.5% from agriculture, ag technology, and light manufacturing; 31.8% from Natural Resource and related industries; 18.2% from Automation and Information Technology; 13.6% from Transportation; 13.6% from Aerospace Manufacturing; 4.6% from Aircraft Maintenance and Repair; and finally, 4.6 from Composite Manufacturing .

Currently, a large majority of respondents (68.2%) require Computer Skills Training for their employees; with 50.0% of employers requiring Communication Skills and Technical Training for current and prospective employees. Also, a large number of respondents (45.9%) require Mechanical Skills, and (40.9%) require Problem Solving Skills for their workers. To a smaller degree, Employers require Trade Skills (36.4%) and Writing Skills (31.8%) as well.

Looking into the future, Employers anticipate a need for Artificial Intelligence training (66.7%); a further need for Complex CAD Software training (33.3%), and also 3D Printing training (28.6%). In addition, a majority of Employers (63.6%) will require Robotics facilities and equipment; and 59.1% will require additional Software Programs. Classrooms are required by 50.0% of Employers for training, with 31.8% requiring 3D Printing, and 31.8% requiring some form of Lab space.

Additionally, Respondents/Employers recognize current gaps in their workforce training needs. The large number of Employers (57.1%) lack employees with Computer Skills; 57.1% lack employees with Mechanical Skills; 53.4% lack employees with Communication Skills; and 42.9% lack employees with the necessary Technical Skills.

However, the vast majority of Employers (90.0%) believe that workforce training programs can be developed to address these needs and skills.

In sum, the Industry and Employer Buyer Survey provides invaluable input to gauge Industry/Employer interest in workforce training and to identify programs to be potentially provided. This information will be utilized to develop an appropriate workforce training program plan.

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[1] *https://www.genroe.com/blog/acceptable-survey-response-rate-2/11504*

MONTEREY BAY DART WORKFORCE DEVELOPMENT SURVEY - COMMUNITY-BASED ORGANIZATIONS AND LOCAL GOVERNMENT

EXECUTIVE SUMMARY - JULY 2023

This Monterey DART Workforce Development Survey for Community-based Organizations and Local Government ("CBO/LG Survey") was conducted to gather specific information for the optimal creation of an effective and efficient advanced manufacturing regional workforce training facility. The Survey was made up of a series of multiple choice and short answer questions directed to solicit community-based organizations and local government input within Monterey, San Benito, and Santa Cruz counties.

A number of community-based organizations ("CBO") and local governments across Monterey, San Benito, and Santa Cruz counties were asked to participate in a confidential on-line Survey to help measure their interest in the development of a regional advanced manufacturing workforce training facility. The Survey included questions about CBO and local government experience on a variety of relevant topics related to workforce development programs. A total of 12 responses were received from over 50 Surveys emailed to potential respondents across the region. Items on the Survey were worded as positive statements or direct questions, and included the following measured topics, including several sub-topics:

- Community Organization or Local Government Represented

    o Community-based organizations; Religious-based organizations

    o Government

    o Labor Unions

    o Other

- Basic Workforce Training Needs Within Community

    o Writing skills, computer skills, communication skills

    o Accounting skills, technical training

    o Manual dexterity skills, mechanical skills

    o Problem solving, mathematics

    o Soft skills

    o Trade skills

- Who has Limited Access to Workforce Training in the Community?

    o High School students or graduates

    o High School non-graduates

    o College/Community College students

    o Labor Union members

    o Apprenticeships

    o Employed/Displaced/Veterans

    o Individuals with disabilities

    o Other

- Who is being trained in the Community?

  o High School students or graduates

  o High School non-graduates

  o College/Community College students

  o Labor Union members

  o Apprenticeships

  o Employed/Displaced/Veterans

  o Individuals with disabilities

  o Other

- Who needs to be trained within the Community?

  o High School students or graduates

  o High School non-graduates

  o College/Community College students

  o Labor Union members

  o Apprenticeships

  o Employed/Displaced/Veterans

  o Individuals with disabilities

  o Other

- What workforce training is needed within the Community?

  o Writing skills, computer skills, communication skills

  o Accounting skills, technical training

  o Manual dexterity skills, mechanical skills

  o Problem solving, mathematics

  o Soft skills

  o Trade skills

  o Other

- What type of workforce training facilities and/or equipment is needed in the Community?

  o Labs, Classrooms

  o Equipment, Software programs

  o Robotics, 3D printers

  o Clean rooms

METHODOLOGY

The Survey forms and questions were developed with input from the Monterey Bay DART staff and consulting team.
The final Survey form asked respondents/community-based organizations/local government a series of quantifiable questions (11) related to their workforce training needs and perceptions. Respondents were requested through email invitations to complete the on-line questionnaire via Survey Monkey and to submit their answers electronically. Several follow-up emails were sent, and phone calls made to remind respondents to complete the Survey.

The Survey administrator checked returned Surveys for missing information and responses that would cause scanning errors. After scanning, the Survey responses were imported into Microsoft® Excel and errors were checked against the individual Survey forms. Data analysis was completed using Excel.

SUMMARY OF RESULTS

Survey responses are broken out by specific categories, as follows (respondents could answer more than one choice so percentages could total more than 100%):

- Community Organization or Local Government Represented

  o 50.0% of respondents were Community-based Organizations.

  o 41.7% of respondents were Non-Governmental Organizations ("NGO's").

  o 8.3% of respondents were Government entities.

  o 8.3% of respondents were Religious-based Organizations.

  o 8.3% of respondents were Labor Unions.

  o 33.3% of respondents were Non-Profits, Community Services, or Agricultural Organizations.

- Basic Workforce Training Needs Within Community

  o 83.3% of respondents believe that Computer Skills are needed.

  o 83.3% of respondents believe that Communication Skills are needed.

  o 66.7% of respondents believe that Writing Skills are needed.

  o 66.7% of respondents believe that Technical Training is needed.

- o 50.0% of respondents believe that Accounting Skills are needed.

- o 41.7% of respondents believe that Soft Skills are needed.

- o 41.7% of respondents believe that Trade Skills are needed.

- o 33.3% of respondents believe that Problem Solving is needed.

- o 33.3% of respondents believe that Mathematics are needed.

- o 16.7% of respondents believe that Mechanical Skills are needed.

- o 8.8% of respondents believe that Manual Dexterity is needed.

- o 16.7% of respondents believe that Other Skills are needed (including leadership, strategic planning, project management, etc.)

- • Need for Workforce Training in the Community

- o 90.9% of respondents believe the need for Workforce Training in the community is Large, with the remaining 9.1% of respondents believe the need is Moderate.

- • Who has Limited Access to Workforce Training in the Community?

- o 91.7% of respondents believe that High School "Non-Graduates" have limited access to workforce training.

- o 66.6% of respondents believe that Employed, Displaced or Re-Employed Individuals have limited access.

- o 50.0% of respondents believe that High School Students have limited access.

- o 50.0% of respondents believe that High School Graduates have limited access.

- o 41.7% of respondents believe that Apprenticeships are lacking and have limited access.

- o 41.7% of respondents believe that College/Community College Students have limited access.

- o 25.0% of respondents believe that Labor Union Members have limited access.

- o 25.0% of respondents believe that Veterans have limited access.

- o 25.0% of respondents believe that Individuals with

Disabilities have limited access.

- o 41.7% of respondents believe that Other have limited access (including Farm Workers, Women, Minorities, Undocumented, etc.)

- • Who is being trained in the Community?

- o 44.4% of respondents believe that College/Community College Students are being trained.

- o 44.4% of respondents believe that Apprenticeships are being trained.

- o 33.3% of respondents believe that High School Students are being trained.

- o 33.3% of respondents believe that Employed, Displaced, and Re-Employed Individuals are being trained.

- o 22.2% of respondents believe that Labor Union Members are being trained.

- o 22.2% of respondents believe that High School Graduates are being trained.

- o 22.2% of respondents believe that High School Non-Graduates are being trained.

- o 22.2% of respondents believe that Other are being trained (including Farm Workers and Those Paying for Training)

- • Who needs to be trained within the Community?

- o 83.3% of respondents believe that High School Graduates need to be trained.

- o 75.0% of respondents believe that High School Students need to be trained.

- o 75.0% of respondents believe that Employed, Displaced, and Re-Employed Individuals need to be trained.

- o 66.7% of respondents believe that High School "Non-Graduates" need to be trained.

- o 66.7% of respondents believe that College/Community College Students need to be trained.

- o 66.7% of respondents believe that Individuals with Disabilities need to be trained.

- o 50.0% of respondents believe that Labor Union Members need to be trained.

- o 50.0% of respondents believe that Apprenticeships need to be trained.

- o 50.0% of respondents believe that Veterans need to be

trained.

- o 25.0% of respondents believe that Other need to be trained (including Farm Workers, Women, Minorities, Undocumented, etc.)

- What workforce training is needed within the Community and not available?

   - o 72.7% of respondents believe that Communications Skills are needed.

   - o 72.7% of respondents believe that Technical Skills training is needed.

   - o 63.6% of respondents believe that Problem Solving is needed.

   - o 63.6% of respondents believe that Mathematics is needed.

   - o 63.6% of respondents believe that Soft Skills are needed.

   - o 54.5% of respondents believe that Writing Skills are needed.

   - o 54.5% of respondents believe that Computer Skills are needed.

   - o 45.4% of respondents believe that Accounting Skills are needed.

   - o 45.4% of respondents believe that Trade Skills are needed.

   - o 27.3% of respondents believe that Other Skills are needed (including English, Leadership, Strategic Planning, Food Safety, etc.)

- What type of workforce training facilities and/or equipment is needed in the Community?

   - o 83.3% of respondents believe that Classrooms are needed.

   - o 83.3% of respondents believe that Equipment is needed (such as farming implements, tractors, ag equipment, commercial kitchen, computer labs, robotics, etc.)

   - o 75.0% of respondents believe that Software Programs are needed.

   - o 58.3% of respondents believe that Labs are needed.

   - o 50.0% of respondents believe that Robotics are needed.

- o 33.3% of respondents believe that 3D printers are needed.

- o 33.3% of respondents believe that Clean Rooms are needed.

CONCLUSIONS

The CBO/LG Survey produced some informative results. The Survey received twelve responses, which was a highly positive response rate of 24.0% (out of 50 invitations to respond). This compares favorably to the commonly accepted average response rate to external email surveys of between 10% to 30%.[1]

Although respondents skewed heavily towards Community-based Organizations (50.0%) and Non-Governmental Organizations (41.7%), there was also a number of interested respondents from Local Government, Religious-based Organizations, Agricultural Organizations, and Labor Unions.

CBO/LG Survey respondents strongly believe that Computer Skills (83.3%) are needed among the workforce, with Communications Skills (83.3%) an equally important need. Writing Skills (66.7%) and Technical Skills (66.7%) are also important workforce training needs within the community. Half of respondents (50.0%) believe that Accounting Skills are needed, with Soft Skills (41.7%) and Technical Skills (41.7%) following closely behind. Additionally, a vast majority of respondents (90.9%) believe that the need for workforce training is Large across the Community.

Respondents also believe that there are large segments of the population that lack access to adequate workforce training, including High School Non-Graduates (91.7%); Employed, Displaced, or Re-employed Individuals (66.6%); High School Students (50.0%); and High School Graduates (50.0%).

There is also an interesting range of groups that are perceived to be currently receiving workforce training, including College/Community College Students (44.4%); Apprenticeships (44.4%); High School Students (33.3%); and Employed, Displaced, or Re-employed Individuals (33.3%).

Concurrently, Respondents believe that there is a need for more workforce training among High School Graduates (83.3%); High School Students (75.0%); Employed, Displaced, or Re-employed Individuals (75.0%); High School Non-Graduates (66.7%); College/Community College Students (66.7%); Individuals with Disabilities (66.7%); Labor Union Members (50.0%); Apprenticeships (50.0%);

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[1] *https://www.genroe.com/blog/acceptable-survey-response-rate-2/11504*

and Veterans (50.0%).

Additionally, Respondents recognize current gaps in community workforce training needs, including Communication Skills (72.7%); Technical Skills (72.7%); Problem Solving (63.6%); Mathematics (63.6%); Soft Skills (63.6%); Writing Skills (54.5%); Computer Skills (54.5%); and Accounting Skills and Trade Skills (45.4%)

Lastly, Respondents believe that Workforce Training Facilities and Equipment are needed in the Community, including Classrooms (83.3%); Equipment such as farming implements, tractors, commercial kitchen, computer lab, robotics (83.3%); Software Programs (75.0%); Labs (58.3%); and Robotics (50.0%).

The CBO/LG Survey provides invaluable input to gauge Community interest and identify programs to be potentially provided through a regional workforce training center. This information will be utilized to develop an appropriate plan and range of workforce development programs to serve the regional communities in Monterey, San Benito, and Santa Cruz counties.

MONTEREY BAY DART WORKFORCE DEVELOPMENT SURVEY - COMMUNITY-BASED ORGANIZATIONS AND LOCAL GOVERNMENT (SPANISH LANGUAGE)

EXECUTIVE SUMMARY - JULY 2023

This Monterey DART Workforce Development Survey for Community-based Organizations and Local Government in Spanish ("Spanish CBO/LG Survey") was conducted to gather specific information for the optimal creation of an effective and efficient advanced manufacturing regional workforce training facility. The Survey was made up of a series of multiple choice and short answer questions directed to solicit community-based organizations and local government input within Monterey, San Benito, and Santa Cruz counties.

A number of community-based organizations ("CBO") and local governments across Monterey, San Benito, and Santa Cruz counties were asked to participate in a confidential on-line Survey in Spanish to help measure their interest in the development of a regional advanced manufacturing workforce training facility. The Survey included questions about CBO and local government experience on a variety of relevant topics related to workforce development programs. A total of 23 responses were received from across the region.

Items on the Survey were worded as positive statements or direct questions, and included the following measured topics, including several sub-topics:

- Community Organization or Local Government Represented

  o Community-based organizations; Religious-based organizations

  o Government

  o Labor Unions

  o Other

- Basic Workforce Training Needs Within Community

  o Writing skills, computer skills, communication skills

  o Accounting skills, technical training

  o Manual dexterity skills, mechanical skills

  o Problem solving, mathematics

  o Soft skills

  o Trade skills

- Who has Limited Access to Workforce Training in the Community?

  o High School students or graduates

  o High School non-graduates

  o College/Community College students

  o Labor Union members

  o Apprenticeships

  o Employed/Displaced/Veterans

  o Individuals with disabilities

  o Other

METHODOLOGY

The Survey forms and questions were developed with input from the Monterey Bay DART staff and consulting team.

The final Survey form asked respondents/community-based organizations/local government a series of quantifiable questions (11) related to their workforce training needs and perceptions. Respondents were requested through email invitations to complete the on-line questionnaire via Survey Monkey and to submit their answers electronically. Several follow-up emails were sent, and phone calls made to remind respondents to complete the Survey.

The Survey administrator checked returned Surveys for missing information and responses that would cause scanning errors. After scanning, the Survey responses were imported into Microsoft® Excel and errors were checked against the individual Survey forms. Data analysis was completed using Excel.

SUMMARY OF RESULTS

Survey responses are broken out by specific categories, as follows (respondents could answer more than one choice so percentages could total more than 100%):

- Who is being trained in the Community?
  - o High School students or graduates
  - o High School non-graduates
  - o College/Community College students
  - o Labor Union members
  - o Apprenticeships
  - o Employed/Displaced/Veterans
  - o Individuals with disabilities
  - o Other

- Who needs to be trained within the Community?
  - o High School students or graduates
  - o High School non-graduates
  - o College/Community College students
  - o Labor Union members
  - o Apprenticeships
  - o Employed/Displaced/Veterans
  - o Individuals with disabilities
  - o Other

- What workforce training is needed within the Community?
  - o Writing skills, computer skills, communication skills
  - o Accounting skills, technical training
  - o Manual dexterity skills, mechanical skills
  - o Problem solving, mathematics
  - o Soft skills
  - o Trade skills
  - o Other

- What type of workforce training facilities and/or equipment is needed in the Community?
  - o Labs, Classrooms
  - o Equipment, Software programs
  - o Robotics, 3D printers
  - o Clean rooms

- Community Organization or Local Government Represented
  - o 73.9% of respondents were Community-based Organizations.
  - o 21.7% of respondents were Non-Governmental Organizations ("NGO's").
  - o 8.7% of respondents were Labor Unions.
  - o 4.3% of respondents were Religious-based Organizations.
  - o 56.6% of respondents were Non-Profits (including ALBA, BHC, etc.)

- Basic Workforce Training Needs Within Community
  - o 73.9% of respondents believe that Computer Skills are needed.
  - o 73.9% of respondents believe that Communication Skills are needed.
  - o 69.6% of respondents believe that Trade Skills are needed.
  - o 65.2% of respondents believe that Problem Solving is needed.

o 52.2% of respondents believe that Technical Training is needed.

o 52.2% of respondents believe that Manual Dexterity is needed.

o 47.8% of respondents believe that Mechanical Skills are needed.

o 47.8% of respondents believe that Soft Skills are needed.

o 43.5% of respondents believe that Writing Skills are needed.

o 43.5% of respondents believe that Accounting Skills are needed.

o 43.5% of respondents believe that Mathematics are needed.

o 34.8% of respondents believe that Other Skills are needed (including leadership, strategic planning, project management, etc.)

- Need for Workforce Training in the Community

o 73.9% of respondents believe the need for Workforce Training in the community is Large, 17.4% believe the need in Moderate, with the remaining 4.5% of respondents believe the need is Small.

- Who has Limited Access to Workforce Training in the Community?

o 82.6% of respondents believe that Employed, Displaced or Re-Employed Individuals have limited access.

o 73.9% of respondents believe that High School "Non-Graduates" have limited access to workforce training.

o 60.9% of respondents believe that High School Graduates have limited access.

o 56.5% of respondents believe that Apprenticeships are lacking and have limited access.

o 52.2% of respondents believe that Individuals with Disabilities have limited access.

o 52.2% of respondents believe that High School Students have limited access.

o 39.1% of respondents believe that College/Community College Students have limited access.

o 39.1% of respondents believe that Labor Union Members have limited access.

o 39.1% of respondents believe that Veterans have limited access.

o 8.7% of respondents believe that Other have limited access (including other students and the rest of the community)

- Who is being trained in the Community?

o 25.0% of respondents believe that College/Community College Students are being trained.

o 15.0% of respondents believe that Apprenticeships are being trained.

o 15.0% of respondents believe that High School Students are being trained.

o 15.0% of respondents believe that Employed, Displaced, and Re-Employed Individuals are being trained.

o 15.0% of respondents believe that Labor Union Members are being trained.

o 10.0% of respondents believe that High School Graduates are being trained.

o 10.0% of respondents believe that High School Non-Graduates are being trained.

o 10.0% of respondents believe that Individuals with Disabilities are being trained.

o 40.0% of respondents believe that Other are being trained (including No one)

- Who needs to be trained within the Community?

o 82.6% of respondents believe that Employed, Displaced, and Re-Employed Individuals need to be trained.

o 78.3% of respondents believe that High School "Non-Graduates" need to be trained.

o 73.9% of respondents believe that Apprenticeships need to be trained.

o 69.6% of respondents believe that High School Graduates need to be trained.

o 65.2% of respondents believe that High School Students need to be trained.

o 60.9% of respondents believe that College/Community College Students need to be trained.

o 56.5% of respondents believe that Individuals with Disabilities need to be trained.

o 56.5% of respondents believe that Labor Union

Members need to be trained.

- o 56.5% of respondents believe that Veterans need to be trained.

- o 26.0% of respondents believe that Other need to be trained (including Everyone)

- What workforce training is needed within the Community and not available?

  - o 60.8% of respondents believe that Communications Skills are needed.

  - o 60.8% of respondents believe that Soft Skills are needed.

  - o 56.5% of respondents believe that Manual Dexterity Skills are needed.

  - o 52.2% of respondents believe that Problem Solving is needed.

  - o 43.5% of respondents believe that Technical Skills training is needed.

  - o 30.4% of respondents believe that Mechanical Skills are needed.

  - o 30.4% of respondents believe that Trade Skills are needed.

  - o 26.1% of respondents believe that Writing Skills are needed.

  - o 26.1% of respondents believe that Computer Skills are needed.

  - o 17.4% of respondents believe that Mathematics is needed.

  - o 17.4% of respondents believe that Accounting Skills are needed.

  - o 17.4% of respondents believe that Other Skills are needed (including Computer Support, Mental Health, etc.)

- What type of workforce training facilities and/or equipment is needed in the Community?

  - o 91.3% of respondents believe that Classrooms are needed.

  - o 73.9% of respondents believe that Software Programs are needed.

  - o 65.2% of respondents believe that Labs are needed.

  - o 60.9% of respondents believe that Clean Rooms are

needed.

- o 60.9% of respondents believe that Equipment is needed (such as farming implements, tractors, ag equipment, commercial kitchen, computer labs, robotics, etc.)

- o 60.9% of respondents believe that Robotics are needed.

- o 56.5% of respondents believe that 3D printers are needed.

CONCLUSIONS

The Spanish-language CBO/LG Survey produced some instructional results. The Survey received 22 responses from various CBO's across the region. This indicates a strong community interest in the development of a regional advanced manufacturing workforce training center and the need for additional worker training for the future.

Respondents to the Survey skewed heavily towards Community-based Organization (73.9%) and Non-Governmental Organizations (21.7%). There was also an array of interested Respondents from Labor Unions, Religious-Based Organizations, and assorted Non-Profits.

Spanish-language Respondents believe that Computer Skills (73.9%) and Communication Skills (73.9%) are primarily needed in the Community. This is followed by perceived needs in Trade Skills (69.6%), Problem Solving (65.2%), Technical Training (52.2%), Manual Dexterity (52.2%), Mechanical Skills (47.8%), Soft Skills (47.8%), Accounting Skills (43.5%), and Mathematics (43.5%).

Community members also believe that there is Large need for additional Workforce Training (73.9%).

Additionally, Respondents believe that there are segments of the population that lack access to adequate workforce training opportunities within the Community, including Employed, Displaced or Re-Employed Individuals (82.6%); High School "Non-Graduates" (73.9%); High School Graduates (60.9%); Apprenticeships (56.5%); Individuals with Disabilities (52.2%); and High School Students (52.2%).

Interestingly, Respondents believe that many segments of the population are not currently receiving adequate workforce training, as indicated by the small percentages, including College/Community College Students (25.0%); Apprenticeships (15.0%); High School Students (15.0%); Employed, Displaced, and Re-Employed Individuals (15.0%); Labor Union Members (15.0%); High School Graduates (10.0%); High School "non-Graduates" (10.0%); Individuals with Disabilities (10%); and many believing that No

One is receiving workforce training (40.0%).

At the same time, Respondents believe that there is a strong need for workforce training among Employed, Displaced, and Re-Employed Individuals (82.6%); High School "Non-Graduates" (78.3%); Apprenticeships (73.9%); High School Graduates (69.6%); High School Students (65.2%); College/Community College Students (60.9%); Individuals with Disabilities (56.5%); Labor Union Members (56.5%); and Veterans (56.5%).

Respondents also recognized large gaps in workforce training needs, including Communications Skills (60.8%); Soft Skills (60.8%); Manual Dexterity Skills (56.5%); Problem Solving (52.2%; and Technical Skills (43.5%) as the main areas for improvement. Lastly, Respondents believe that Workforce Training Facilities and Equipment are needed in the Community, including Classrooms (91.3%);Software Programs (73.9%); Labs (65.2%); Clean Rooms (60.9%) Equipment such as farming implements, tractors, commercial kitchen, computer lab, robotics (60.9%); Robotics (60.9%); and 3D Printing(56.5%).

The Spanish CBO/LG Survey provides invaluable input to gauge Community interest and identify programs to be potentially provided through a regional workforce training center. This information will be utilized to develop an appropriate plan and range of workforce development programs to serve the regional communities in Monterey, San Benito, and Santa Cruz counties.

WORKFORCE TRAINING CENTERS

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
National Center for Aviation Training (NCAT)	Wichita State University	4004 N. Webb Rd.	Wichita	KS
FACILITY SIZE		**WEBLINK**		
220,000 sq. ft.		[National Center for Aviation Training (NCAT) (wichita.edu)](#)		
TYPES OF TRAININGS OFFERED				
Additive Coating, Additive Manufacturing, CAD/CAM, Composites and Advanced Materials, Robotics and Automation				

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Carnegie Mellon Robotics Academy	Carnegie Mellon University	10 40th Street Pittsburgh	Pittsburgh	PA
FACILITY SIZE		**WEBLINK**		
~65,000 sq. ft. minimum (the footprint is approximately~65,000 but the facility is multi-level and may be up to ~130,000 under-roof or more)		[Carnegie Mellon Robotics Academy - Carnegie Mellon Robotics Academy - Carnegie Mellon University (cmu.edu)](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Motlow State Automation & Robotics Training Center (ARTC)	Motlow State Community College	225 Vo-Tech Drive	McMinnville	TN
FACILITY SIZE		**WEBLINK**		
Unknown (recently built)		[Automation and Robotic Training Center](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Center for Business and Workforce Development	Pennsylvania College of Technology	One College Avenue	Williamsport	PA
FACILITY SIZE		**WEBLINK**		
31,800 sq. ft.		[Center for Business and Workforce Development	Pennsylvania College of Technology (pct.edu)](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
ROC & CTEC Career Education	Kern High School District	"501 SO MT. Vernon Avenue (ROC Campus) 7301 Old River Road (CTEC Campus)"	Bakersfield	CA
FACILITY SIZE		**WEBLINK**		
125,000 sq. ft. (combined 2 locations)		[ROC CTEC Career Education](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Intech (Industrial Technical Learning Center)	Chaffey College	9400 Cherry Avenue	Fontana	CA
FACILITY SIZE		**WEBLINK**		
~31,800 sq. ft.		[Intechcenter.org](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Embry-Riddle Research Park	Embry-Riddle Aeronautical University	1511 Aviation Center Pkwy	Daytona Beach	FL
FACILITY SIZE		**WEBLINK**		
~46,000 sq. ft. + ~18,000 sq. ft. (wind tunnel)		[Embry-Riddle Research Park](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Electronic Vehicle Infrastructure Training Program (EVITP)	EVITP Online Certification	811 N. Main Street, Suite 202,	Royal Oak	MI
FACILITY SIZE		**WEBLINK**		
Office only (online certification program)		[Electric Vehicle Infrastructure Training Program](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Ecology Action	Ecology Action - Helping people act now	877 Cedar Street, Suite 240	Santa Cruz	CA
FACILITY SIZE		**WEBLINK**		
Unknown (Suite in office building)		[Ecology Action](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Modesto Job Center Turlock Job Center Patterson Job Center Oakdale Job Center	Stanislaus County Workforce Development	251 E. Hackett Rd. C-2 (Main Facility) 629 12th Street (Modesto Center) 1310 W. Main Street (Turlock Center) 101 W. Las Palmas Ave. (Patterson Center) 1405 West F Street Str. I (Oakdale Center)	Modesto Modesto Turlock Patterson Oakdale	CA
FACILITY SIZE		**WEBLINK**		
Unknown, multiple locations		[Stanislaus County Workforce Development](#)		

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Center for Coastal Climate Resilience	UC Santa Cruz	"Office of Research Kerr Hall (Office Location) 115 McAllister Way (Likely lab sites)"	Santa Cruz	CA

FACILITY SIZE	WEBLINK
Unknown	[Office of Research Center for Coastal Climate Resilience](#)

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Aviation Education Outreach	North Central Texas Council of Governments	616 Six Flags Drive	Arlington	TX

FACILITY SIZE	WEBLINK
Unknown, multiple locations	[North Central Texas Aviation Education Outreach](#)

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Manufacturing Solutions Center	Catawba Valley Community Collge	301 Conover Station SE	Conover	NC

FACILITY SIZE	WEBLINK
Multiple (Building 1 = ~30,000 sq/ft; Building 2 = 75,000 [opening 2023])	[Manufacturing Solutions Center](#)

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Meridian Technology Centers	State Department of Career and Technology Education (CareerTech)	1312 S. Sangre Road	Stillwater	OK

FACILITY SIZE	WEBLINK
"Stillwater OK Campus (Main): >200,000 sq/ft Guthrie OK Campus: ~47,000 sq/ft"	[Meridian Technology](#)

WORKFORCE TRAINING CENTERS OR EDUCATION CENTER	LOCATION OR AFFILIATION	ADDRESS	CITY	STATE
Energetics Technology Center (ETC)	Center for Energetics Concepts Development at the University of Maryland	4445 Indian Head Highway	Indian Head	MD

FACILITY SIZE	WEBLINK
~20,000 sq/ft	Energetics Technology Center

ASSESSMENT OF THE GREATER MONTEREY BAY CALIFORNIA AREA FOR ELECTRIC VEHICLE (EV), DRONE, AND ROBOTICS ASSOCIATED TRAINING OR RELATED PROGRAMS

PURPOSE OF THIS DOCUMENT

This document provides a collated summary of Electric Vehicle (EV), Drone and Robotics workforce related fields and necessary associated training(s), certifications, topic specific requirements, anticipated job type(s) by category, and anticipated salary for trainees, respectively. Attempts were made to include both US and California specific requirements for credentials, certifications, and/or education requirements where applicable for the respective EV, Drone, and Robotics focus areas.

This information is helpful to informing the overall GAP analysis when used in combination with other sources (i.e., interviews, survey data, etc.) to assess where a GAP in workforce training services may exist in the region and to aid an informed decision to establish a novel workforce training facility in the greater Monterey Bay, California area to provide these services.

In-lieu-of a works cited, hyperlinks have been included throughout the document to allow the reader to directly link to the location where the information cited (or referenced) can be found that is referred to in the text.

Maps of 50 miles, 100 miles, and 200 miles (and in some cases beyond) are provided to indicate locations within these boundaries that identify either institutions or facilities that may already directly provide topic relevant services or training(s) or may provide associated services that can be applied towards further workforce training(s) for these specific areas of interest. Conversely, in some cases, locations have been indicated on maps that do not directly or indirectly provide relevant training opportunities relative to EV, Drone, or Robotics, but these have been indicated to show where they reside as these could potentially provide strategic opportunities for partnership for a workforce training facility in the region (as they may seek to host a faculty of this type to add to their services/portfolio).

ELECTRIC VEHICLE (EV)

EV Overview – Charging stations and EV Vehicle repair and Maintenance

According to a report by the California Energy Commission (CEC), California needs 1.2 million electric vehicle chargers by 2030. The report also states that 157,000 chargers will be required by 2030 to support 180,000 medium- and heavy-duty electric trucks and buses also anticipated (California Energy Commission Report - June 9, 2021).

The construction of electric vehicle charging stations worldwide slowed down due to labor unavailability and raw material procurement issues. All these factors collectively delayed the projected growth of electric vehicle charging stations as per the pre-COVID scenario. The market growth was considerably slowed down during 2020 (Fortune Business Insights).

However, several factors are expected to continue to drive consumer demand for EVs over the 2021–31 decade: environmental concerns, greater vehicle choice, improved battery capacity, and cost savings (US Bureau of Labor Statistics – Feb. 2023).

Publicly accessible chargers worldwide approached 1.8 million charging points in 2021, of which a third were fast chargers. Nearly 500,000 chargers were installed in 2021, which is more than the total number of public chargers available in 2017 (IEA. org Trends in Charging Infrastructure).

According to the California Energy Commission (CEC), there are 87,707 electric vehicle (EV) charging stations in California, of which 42.31% (total of 37,113) are public chargers (see current map here).

California has the green light to start using federal infrastructure funding to expand electric vehicle (EV) charging stations along the state's interstates and highways following the recent federal approval of a joint plan by Caltrans and California Energy Commission (September 19, 2022 News Release). The news

release indicated that: "California expects to receive a total of $384 million [from federal funding] for the [CA NEVI] program over the next five years. The federal funding will build on California's historic $10 billion, multiyear investment to accelerate the transition to zero-emission vehicles by improving affordability and expanding charging infrastructure."

Relative to Electronic vehicle repair and maintenance it is generally considered that EVs require less maintenance than conventional vehicles because they have fewer moving parts and fluids to change. The battery, motor, and associated electronics require little to no regular maintenance and brake wear is significantly reduced due to regenerative braking. However, parts that are common to EV's and internal combustion vehicles, like tires, brakes and windshield wipers, will need to be checked regularly (US Department of Energy).

As with any vehicle, electric vehicles need to be occasionally maintained and repaired. Much of the routine maintenance and repair work can be done by normal repair workers, but the electrical systems and drivetrain will often need skilled workers familiar with electric vehicles (US Bureau of Labor Statistics).

EV Options: Installation of Charging Stations and EV Repair and Maintenance

1. Installation of Charging Stations

NOTE: To install charging stations this requires training/certification as an electrician.

- All EV charging stations funded or authorized by the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), or the state board, must be installed by a licensed contractor. At least one electrician on each installation must hold an Electric Vehicle Infrastructure Training Program (EVITP) certification. (California Public Utilities Code Section 740.20)

- Requirements of the EVITP certification

  o Eligibility: Must be a California State Certified General Electrician.

    · EVITP will verify this information with the State.

- Company specific training – again a certain level of training (electrician) must already be acquired.

  o ChargePoint Partners (Residential-Installers)

  o WattLogic (Electric Vehicle Charging Training)

- EV Charging Station Technician:

  o Average Salary: $50,000 (ZipRecruiter) [up to $120,000]

  o Description of EV Charging Station Technician: An Electric Vehicle (EV) Charging Station Technician is responsible for diagnosing, servicing, and repairing high voltage commercial charging stations.

  o Competencies: Electrical Systems, Electronics and Controls, Maintenance and Troubleshooting, Mechanical Systems understanding, state certification, knowledge of the National Electrical Code for EV charging stations, etc. (WattLogic.com)

2. Performing repairs and maintenance on Hybrids/Electric Vehicles
(Requires training/certification in automotives – especially for hybrids)

- Hybrids - Alternative Fuels Data Center: Maintenance and Safety of Electric Vehicles (energy.gov)

  o Must have training/certification on both gas and electric vehicles. (Home page - Bureau of Automotive Repair (ca.gov))

- EV Vehicle Technician (EV Mechanic):

  o Average Salary: $59,058 (ZipRecruiter - National Ave), also see Table 1 for relative California anticipated salaries.

  o Description of EV Vehicle Technician: Entry-level electric vehicle technicians may find employment with manufacturers, dealerships, or repair shops. New technicians may be assigned to more experienced mechanics to gain experience with complex tasks. EV vehicle technicians diagnose, service and repair high voltage EVs, build EV motors, install computers, EV control devices, assemble generators, use computer-controlled machines, etc. (EVtechnician.com)

  o Competencies: Previously described, California has specific requirements for training/certification on both gas and electric vehicles. (Home page - Bureau of Automotive Repair (ca.gov))

Table 1: US Top-Ten Cities with Highest Annual Salary (Pay/Wage) for Electric Car Mechanic Jobs

CITY	ANNUAL SALARY	MONTHLY PAY	WEEKLY PAY	HOURLY WAGE
New York City, NY	$70,692	$5,891	$1,359	$33.99
Berkeley, CA	$70,187	$5,848	$1,349	$33.74
Bend, OR	$68,566	$5,713	$1,318	$32.96
Renton, WA	$68,502	$5,708	$1,317	$32.93
Merced, CA	$68,174	$5,681	$1,311	$32.78
Santa Monica, CA	$68,136	$5,678	$1,310	$32.76
Daly City, CA	$67,860	$5,655	$1,305	$32.63
San Mateo, CA	$67,700	$5,641	$1,301	$32.55
Boston, MA	$67,004	$5,583	$1,288	$32.21
Clovis, NM	$66,708	$5,559	$1,282	$32.07

Source: ZipRecruiterEV Car Mechanic "Top Ten Cities"

- Electric Vehicles Repair and Maintenance – Car Specific training

NOTE: Many companies provide their own "company in-house" training. One example is the Tesla START program that is an "intensive training program" that provides individuals across the US with the skills necessary for a successful career at Tesla and elsewhere. It is reported that during the program, individuals develop technical expertise and earn certifications through in-class theory, hands-on labs and self-paced learning. Tesla has partnered with colleges across the country to offer this program (Tesla START). The program is designed to provide students with the skills necessary to become advanced electric vehicle technicians at Tesla. The program is 12 weeks long and adds onto the automotive technology programs at the partnering schools with an expected hourly rate of $25/hour after completion of the training (Tradeschoolgrants.com).

- Tesla Start Program
  - Service Technician
  - Intensive EV and collision service training+

Tesla START Programs in California:

- Rio Hondo Community College - Los Angeles, California
- **Evergreen Valley College - San Jose, California (within 50 miles)**

NOTE: School(s) listed in "BOLD" are within 50, 100, or 200 miles of Marina, CA.

DRONES
([Unmanned Aircraft Systems (UAS)](#))

Drone Overview

Drone(s) is common term for what is generally considered to be unmanned aerial vehicle (UAV), or more generally as a vehicle that can be controlled remotely or autonomously without a human pilot on board. UAS stands for Unmanned Aerial System, which is the totality of everything that makes a UAV work, including the ground control, the transmission systems, the software, and the person controlling the UAV. Every UAV is a drone, but not all drones are UAVs as drone can also refer to any unmanned vehicle, not just aerial vehicles. UAS is a more specific term than drone or UAV and it is usually used for more advanced unmanned aircraft that are not for civilian use ([Mission Go - Difference between UAV](#) and [UAS and Inspired Flight - Difference between UAS and UAV](#)).

Aerial drones have become increasingly popular in recent years due to their versatility and ease of use. Drones are used in a variety of applications such as aerial photography and videography, surveying, mapping, search and rescue operations, agriculture, and delivery services ([Business Insider - Applications for drones](#)). Sophisticated drones could soon be doing everyday tasks like fertilizing crop fields on an automated basis, monitoring traffic incidents, surveying hard-to-reach places, or even delivering pizzas ([Business Insider - Applications for drones](#)). Drones with exceptional cameras and cutting-edge sensors can collect relevant information that aid in weather forecasting. Additionally, these unmanned aerial vehicles are sent into hurricanes and tornadoes to capture videos that help experts analyze the storm system patterns ([Droneswhiz.com - Benefits of Drone Tech](#)).

The future of drone technology is bright. Regulators across the globe are now looking at ways to support the expansion of drone technology, exploring carrying heavier loads and transporting people ([World Economic Forum - Future is bright for drone tech](#)).

The drone market has been experiencing healthy growth in the United States and around the world over the past few years. By 2023, the commercial drone market is expected to exceed previous levels and reach $6.15 billion, a compound annual growth rate (CAGR) of 19.09%. By 2030, the entire UAV market is set to be worth $92 billion ([US Drone Industry Outlook 2020-2030](#)).

To main options exist for Drone related jobs that may be options for a potential workforce training center, these are: drone pilots and drone maintenance/repair technicians.

Most drone engineers have a bachelor's degree in engineering, unmanned aircraft systems, or related fields. A growing number of schools offer degree programs in unmanned aircraft systems. In addition to formal education, the Federal Aviation Administration (FAA) requires drone pilots to obtain a Remote Pilot Certificate. To obtain this certificate, pilots must pass an FAA-approved knowledge test ([US FAA - Become a Drone Pilot](#)).

To become a drone repair technician, you first have to earn a certificate from an FAA-accredited school, or else meet a required number of hours of hands-on experience. Then you need to pass a series of written, oral and practical tests to become certified as a drone repair technician ([Droneblog.com - How to Become a Drone Repair Tech](#) and [US FAA AC65-24 Certification of a Repairman (General)](#)).

Drone Options: Pilots and Maintenance/Repairs Technicians

1. Drone Pilot ([US FAA UAS](#))

NOTE: Attempts to determine if California had additional requirements beyond US FAA regulations did not indicate any additional requirements apart from CA specific permitting required for drone usage.

Two Paths exist to obtain US FAA approval to pilot a drone:

1. New Drone Pilot ([US FAA "Become a Drone Pilot"](#)) Basic Requirements:

   • Be able to read, speak, write, and understand English

   • Be in a physical and mental condition to safely fly a drone

   • Pass the initial aeronautical knowledge exam: "Unmanned Aircraft General – Small (UAG)"

2. Current Pilot ([Existing Part 61 Certificate Holders](#)) Basic Requirements:

   • Must hold a pilot certificate issued under [14 CFR part 61](#)

   • Must have completed a flight review within the previous 24-months

   •

The US FAA has the [UAS Collegiate Training Initiative](#) (UAS-CTI) to establish a collegiate training initiative program for UAS drones. Per the US FAA the UAS-CTI is a: "…program designed for universities, colleges, and technical schools by the FAA to recognize institutions that prepare students for careers in drones. Post-secondary institutions with UAS curriculums that want to be recognized as UAS-CTI participants now have the opportunity to apply for this distinction. The results of this collaborative working

relationship will include a continuous dialogue with stakeholders to connect colleges and universities with general industry, local governments, law enforcement, and regional economic development entities to address labor force needs. (UAS-CTI)"

California schools approved with US FAA to administer the UAS-CTI, (California approved schools - no particular order)

1. California Baptist University, Riverside, California

2. Fullerton College, Fullerton, California

3. **Merced Community College, Merced, California (within 100 miles)**

4. MiraCosta College, Carlsbad, California

5. Mt. San Antonio College, Walnut, California

6. Orange Coast College, Costa Mesa, California

7. Palomar College, San Marcos, California

8. San Diego Miramar College, San Diego, California

9. **Santa Rosa Junior College, Santa Rosa, California (within 200 miles)**

10. Southwestern College, Chula Vista, California

11. **University of California, Santa Cruz, California (within 50 miles)**

12. **West Valley College, Saratoga, California (within 50 miles)**

NOTE: Schools listed in "BOLD" are within 50, 100, or 200 miles of Marina CA.
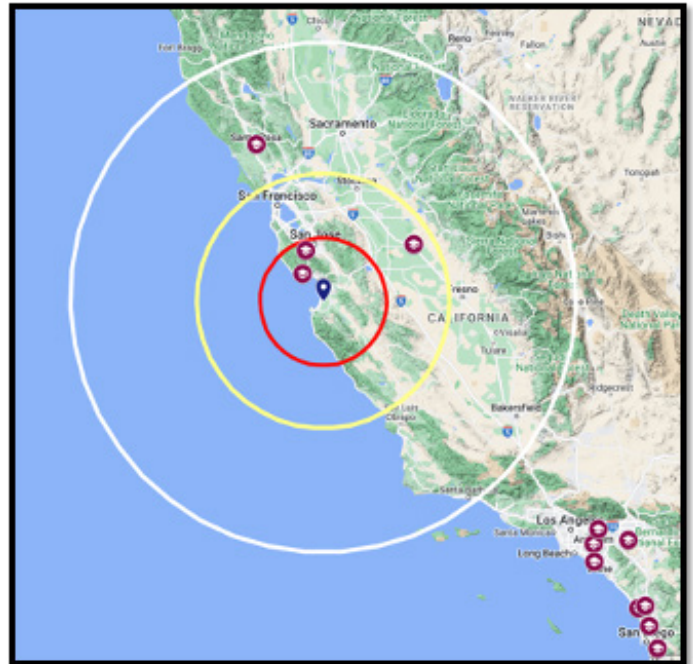
Figure 1: All California FAA registered institutions/schools for drone pilot training certification. Red, Yellow, and White circles are 50-, 100-, and 200-miles circumference from the municipal airport (OAR) in Marina, CA.

Link to Interactive Map: US FAA Registered California Drone Pilot Training (UAS-CTI Program)

Miscellaneous Considerations

- FAA require pilots to be rated to operate powered-lift unmanned vehicles (passenger) US FAA - Air Taxis

- 14 CFR Part 137 governs the use of aircraft, including drones, to dispense or spray substances

   o Certification Process for Agricultural Aircraft Operators

Drone (UAS) Pilot

- Average Salary: $82,976 (salary.com - National Median); $91,522 (salary.com - California Median), also see Table 2 for relative California anticipated salaries.

- Description of Drone (UAS) Pilot: A drone pilot, also known as a UAV or UAS operator, is responsible for remotely piloting and operating drones for various purposes such as aerial photography, surveillance, mapping, or recon-

naissance. They are responsible for planning and monitoring drone flights, ensuring safe landing, capturing, and reviewing aerial data, and meeting with clients to discuss their needs. They also conduct drone systems testing and maintenance, assist in flight test events and demonstrations, and comply with laws and regulations related to drone operations (indeed.com).

- Competencies: FAA certification (e.g., FAA Part 107 Remote Pilot Certificate), pre-flight and flight planning, UAS operations, data collection, camera and sensor aptitude, associated software proficiency.

Table 2: US Top-Ten Cities with Highest Annual Salary (Pay/Wage) for Drone Pilot Jobs

CITY	ANNUAL SALARY	MONTHLY PAY	WEEKLY PAY	HOURLY WAGE
San Mateo, CA	$126,933	$10,577	$2,441	$61.03
Richmond, CA	$122,206	$10,183	$2,350	$58.75
Bellevue, WA	$121,779	$10,148	$2,341	$58.55
Brooklyn, NY	$116,840	$9,736	$2,246	$56.17
San Diego, CA	$116,783	$9,731	$2,245	$56.15
Riverton, WY	$116,650	$9,720	$2,243	$56.08
Federal Way, WA	$116,041	$9,670	$2,231	$55.79
Stockton, CA	$115,554	$9,629	$2,222	$55.56
San Francisco, CA	$114,927	$9,577	$2,210	$55.25
Stamford, CT	$114,909	$9,575	$2,209	$55.24

Source: ZipRecruiter Drone Pilot "Top Ten Cities"

2. Drone Maintenance/Repairs

Certification - Repairperson: Per FAA Regulations and Policies for UAS BVLOS AS 2.8 (page 107) regulates the "Repairperson Certification for the UAS [for a person who is to] perform inspection, maintenance, and repair of UAS". The US FAA stated intent, rationale, and approach are as follows:

• INTENT: To ensure repairpersons are adequately trained and define the scope of their privileges.

• RATIONALE: UAS have architectures, systems, and performance and operating characteristics unique from those of traditional aircraft. Persons performing maintenance actions should possess the appropriate knowledge, skills, and abilities to accomplish the task in a safe and efficient manner. Maintenance training requirements should be aligned with the operating risk and system complexity of the environment and system.

• APPROACH: These requirements should be inspired by 14 CFR 65.107 - the Light-Sport Category, where certification for Repairmen is provided outside of a Part 145 or Part 121/135 CAMP. The FAA may develop an entirely new course for UAS, it could consider adding UAS specific training to the existing LSA course or consider offering a supplement to the LSA repairperson certification that would allow LSA qualified repairpersons to become qualified to work on UAS.

o US FAA "Become an Aviation Mechanic"

· An AMTS (also known as a "147 School") is an educational facility certificated by the FAA in accordance with 14 CFR part 147. These schools train prospective aircraft mechanics for careers in the airline industry, aviation maintenance facilities, and

commercial and general aviation (GA). An AMTS may offer Airframe and/or Powerplant courses, along with Avionics courses, which cover electronics and instrumentation

- Certification - Aircraft Mechanic: Oral, Practical, & Written Tests

  o The Aviation Mechanic certificate has two ratings – the Airframe (A) and the Powerplant (P). If you decide to seek both ratings, this is commonly referred to as an "A&P Certificate".

  o Must have (one of the following – both are not required):

    · Successful graduation from an FAA-approved Aviation Maintenance Technician School (AMTS) (US FAA AMTS and School list)

    · Completion of the Joint Service Aviation Maintenance Technician Certification Council (JSAMTCC) training course for military personnel.

Drone (UAS) Aviation Mechanic:

- Average Salary: $51,389 (ZipRecruiter.com - National Average); $63,021 California average (ZipRecruiter see Table 3).

- Description of Drone (UAS) Mechanic: As a UAV drone technician typically would be responsible for conducting routine maintenance on UAV drones, troubleshooting malfunctioning or defective drones, and repairing issues discovered. They also inspect drones for maintenance issues or possible malfunctions before flights and assist with the development of simulation exercises designed to test drones for real-word scenarios (onlinedegree.com).

- Competencies: FAA Repairman's certificate (FAA Repairman's Certificate), FAA Approved Aircraft Mechanic Certificate (FAA Aircraft Mechanic Certificate), other proficiencies are previously indicated.

Table 3: US Top-Ten Cities with Highest Annual Salary (Pay/Wage) for Drone Mechanic Jobs

| CITY	ANNUAL SALARY	MONTHLY PAY	WEEKLY PAY	HOURLY WAGE
San Jose, CA	$65,507	$5,458	$1,259	$31.49
Oakland, CA	$64,611	$5,384	$1,242	$31.06
Antioch, CA	$63,312	$5,276	$1,217	$30.44
Lebanon, NH	$62,963	$5,246	$1,210	$30.27
Hayward, CA	$62,567	$5,213	$1,203	$30.08
Vallejo, CA	$62,531	$5,210	$1,202	$30.06
Seattle, WA	$62,482	$5,206	$1,201	$30.04
Staten Island, NY	$62,205	$5,183	$1,196	$29.91
Santa Cruz, CA	$61,525	$5,127	$1,183	$29.58
Concord, CA	$61,093	$5,091	$1,174	$29.37

Source: ZipRecruiter Drone Mechanic "Top Ten Cities"

US FAA Registered Maintenance Schools in California (no order – also see Figure 1)

1. **Aviation Institute of Maintenance Oakland Campus, Freemont, CA (within 100 miles)**

2. **California Aeronautical University, Bakersfield, CA (within 200 miles)**

3. Victor Valley College School of Aviation Technology, Victorville, CA

4. Spartan College of Aeronautics and Technology, Riverside, CA

5. **Sacramento City College, McClellan Park, CA (within 200 miles)**

6. Chaffey Community College, Rancho Cucamonga, CA

7. Miramar College, San Diego, CA

8. **College of Alameda, Oakland, CA (within 100 miles)**

9. Mt. San Antonio College, Walnut, CA

10. **Reedley College, Reedley, CA (within 200 miles)**

11. North Valley Occupational Center, Van Nuys, CA

12. **Solano Community College School of Aeronautics, Vacaville, CA (within 200 miles)**

13. **Gavilan College, San Martin, CA (within 50 miles)**

14. Orange Coast College, Costa Mesa, CA

15. West Los Angeles College, Culver City, CA

16. San Bernadino Valley College, San Bernadino, CA

17. Spartan College of Aeronautics and Technology, Inglewood, CA

18. **Cuesta College, San Luis Obispo, CA (within 200 miles)**

19. Antelope Valley Community College, Lancaster, CA

20. **San Joaquin Valley College, Fresno, CA (within 200 miles)**

NOTE: Schools listed in "BOLD" are within 50, 100, or 200 miles of Marina CA.

Figure 2: All California FAA registered institutions/schools for drone repair and maintenance training certification. Red, Yellow, and White circles are 50-, 100-, and 200-miles circumference from the municipal airport (OAR) in Marina, CA.
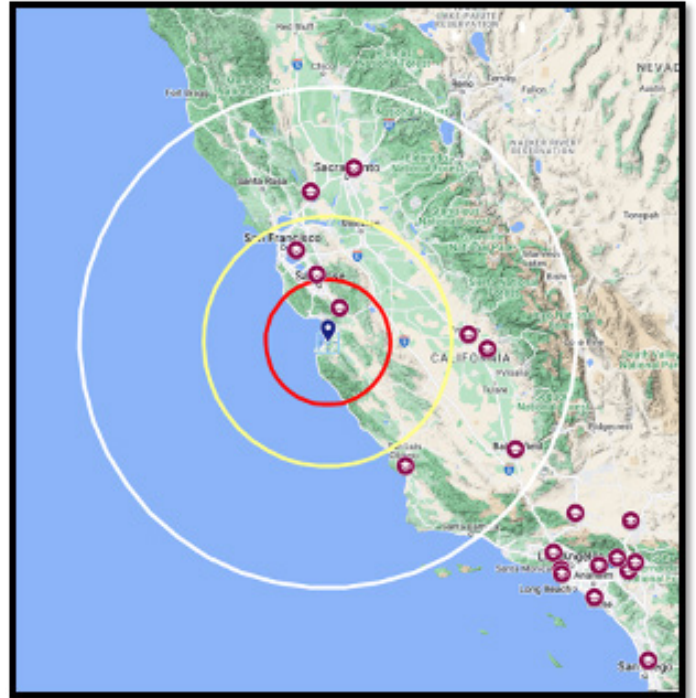
Link to Interactive Map: US FAA Registered California Drone Maintenance Training Facilities

ROBOTICS OVERVIEW

Modern robotics is a diverse field that involves the use of robots in manufacturing, medicine, agriculture and a host of other industries. Robots are used in manufacturing to perform tasks such as welding, painting, and assembly. In medicine, robots are used for telepresence, which allows physicians to examine and treat patients in remote locations (ASME 6 Applications for Robotics in Medicine). They are also used for sterilizing rooms and delivering medical supplies and equipment (ASME 6 Applications for Robotics in Medicine).

In agriculture, robots can perform various tasks such as planting, spraying, harvesting, sorting, and monitoring crops and soil. They can also use sensors, data analytics, and artificial intelligence to optimize production and reduce waste. Robotics in agriculture is a response to the challenges of labor shortages, consumer demand, and high production costs (AgriTech Tomorrow - Robotic Applications in Agriculture). Some of the most common robots in agriculture are used for harvesting and picking, weed control, weed mapping, fertilizing and irrigation, thinning and pruning, crop monitoring and analysis and sorting and packing (Roboticsbiz.com - 7 Major uses of Robotics in Agriculture and A3 - Robotics in Agriculture).

To work with robotics, individuals can take courses, certifications, training, classes, and tutorials available online. Some of the certifications that pay the most include Certified Vision Professional-Basic, Certified Motion Control Professional, Certified System Integrator, and Certified Robot Integrator. The best robotics certifications for beginners are the FANUC Certified Robot Operator, FANUC Certified Robot Technician, and the Certified Vision Professional-Basic. These certifications require little or no background knowledge, and you can easily prepare for them by taking an exam prep course (Careerkarma.com - Robotics Certifications).

The standard education requirement for most robotics engineering professions is a bachelor's degree. Individuals can major in mechanical engineering, robotics, artificial intelligence, or electrical engineering to qualify for robotics jobs (Careerkarma.com – How to get a job in robotics).

Relevant Robotics Standards and Organization Links

- Robotics Certifications (Careerkarma.com)
- A3 Association for Advancing Automation (Automate.org)
- Standards & Certifications (Automate.org)
- ARM Institute.org
- RoboticsCareer.org - Career Paths (ARM Institute)

- International Society of Automation
- FANUC
- FANUC Education
- ISO/TC 299 Robotics
- ISO/TC 299 Robotics (Committee)
- ISO/TC 299 Robotic Standards Catalogue

Robotics Options: Three Standard Levels for Robotics Careers

1. Robotics Technician (basic)
2. Robotics Specialist (mid-level)
3. Robotics Integrator (highly skilled)

1. Robotics Technicians:

- Average Salary: $54,080 (ZipRecruiter.com)
- Description of Robotics Technicians: "Robotics technicians are most often able to enter their careers with an associates degree or trade school certification, since the majority of their skills come from hands-on experience…with the role of maintaining individual robots on the manufacturing floor… (Roboticscareer.org)". "The Robotics Technician is an entry-level role that focuses on the day-to-day maintenance of robots on the manufacturing floor. Many current manufacturing workers can easily adapt to this role, provided adequate manufacturing workforce training. (ARM Institute Robotics Career Paths)."
- Competencies: Electrical Systems, Electronics and Controls, Fluid Power, Maintenance and Troubleshooting, Mechanical Systems, Programmable Logic Controllers (PLC), Robot Programming, Safety (System and Procedures). (Roboticscareer.org Competencies)

Table 4 indicates the top ten cities in the US with highest income for Robotics Technicians. Of note, 8 of the top ten are within California with 6 of the top 10 in Northern CA (majority in San Francisco Bay area). Merced CA may be representative to what one might expect to receive for a robotics technician salary within the proposed service area of the MB DART proposed workforce training facility.

Table 4: US Top-Ten Cities with Highest Annual Salary (Pay/Wage) for Robotics Technicians

CITY	ANNUAL SALARY	MONTHLY PAY	WEEKLY PAY	HOURLY WAGE
Berkeley, CA	$67,627	$5,635	$1,300	$32.51
Merced, CA	$66,515	$5,542	$1,279	$31.98
Daly City, CA	$65,388	$5,449	$1,257	$31.44
San Mateo, CA	$64,962	$5,413	$1,249	$31.23
Irvine, CA	$63,525	$5,293	$1,221	$30.54
Tacoma, WA	$63,452	$5,287	$1,220	$30.51
Richmond, CA	$62,837	$5,236	$1,208	$30.21
Bellevue, WA	$62,589	$5,215	$1,203	$30.09
San Francisco, CA	$60,588	$5,049	$1,165	$29.13
Orange, CA	$60,497	$5,041	$1,163	$29.09

Source: ZipRecruiter Robotic Technician "Top Ten Cities"

2. Robotics Specialist:

- Average Salary: $86,000 (ARM Institute)

- Description of Robotics Specialist: "Robotics Specialists are the subject matter experts on robotic systems on the manufacturing floor and are responsible for proposing upgrades to the systems that can increase productivity. This position requires more robotics training than the Robotics Technician role (Roboticscareer.org)."

- Competencies: Advanced Robot Programming, Application Emphasis, Inspection/QA, Installation Concepts, Project Management, Robot and System Troubleshooting, Safety-Risk Assessment, Sensors, Vision. (Roboticscareer.org Competencies)

3. Robotics Integrator:

- Average Salary: $130,000 (Comparably.com)

- Description of Robotics Specialist: "The Robotics Integrator is the subject matter expert on automation. The Integrator understands how applying robotics to the manufacturing floor benefits their operations and will evaluate, design, and implement plans for areas ripe for automation. Of the three positions, the Robotics Integrator requires the highest level of robotics training and experience (Roboticscareer.org)."

- Competencies: Augmented Reality/Virtual Reality, Big Data, Computer Programming, Interoperability, Offline Programming, Simulation, System and Process Design, Systems Simulation/Modeling, Visualization. (Roboticscareer.org Competencies)

REPRESENTATIVE CERTIFICATION RELATED TO ROBOTICS COMMON SPECIALTIES

Certified Vision Professional-Basic: A3 Program Link - Vision Professional-Basic

- Average Salary: $113,803 (PayScale.com)

- Description of Vision Systems:

  o "Vision systems identify, inspect, and communicate critical feedback data on your mechanical devices. They consist of one or more sensors or cameras, a processing element, and analysis software. The software provides parameters that you define based on your automation project's goal to collect information and apply feedback for your devices. (Vision Systems - A3)"

Certified Motion Control Professional: A3 Program Link – Motion Control Professional

- Average Salary: $92,124 (ZipRecruiter.com)

- Description of Motion Control Professional:

  o "Motion control is ubiquitous to automation…the fundamental knowledge…[for] everyone working with motion control, motors and automation technologies. The program is designed to ensure professionals have the knowledge they need to advance their careers and benefit their businesses.

Certified Motion Control Professional (CMCP) [are]…system integrators, machine builders, manufacturers, end-users and others recognized in the industry for their professional knowledge and expertise. (Motion Control Professional - A3)"

Certified System Integrator: A3 Program Link – System Integrator

- Average Salary: $99,230 (ZipRecruiter.com)

- Description of System Integrator:

  o "… Certified System Integrator…Certification provides vision users with a benchmark…to evaluate system integrator candidates during their search for the right integration partner.

Vision system integrators certified by A3 are acknowledged globally throughout the industry as an elite group of accomplished, highly skilled and trusted professionals. You'll be able to leverage your certification to enhance your competitiveness and expand your opportunities.

Once received, certification is valid for three years and will need to be renewed after expiration to keep a valid certification status. (Certified System Integrator Program Description - A3)"

Certified Robot Integrator: A3 Program Link – Robot Integrator

- Average Salary: $130,000 (Comparably.com)

- Description of Robot Integrator:

  o "The Certified Robot Integrator program was established in 2012 in response to an industry need for a benchmark for evaluating technical and robot safety acumen, as well as overall integrator business excellence.

Robot integrators must have already achieved a high level of proficiency, experience and success in order to be considered for the certification program. It's certainly not for everyone. Certification involves a rigorous process that includes an on-site audit, practical assessment of key personnel, safety training, and other important criteria.

Certification ensures that robot integrators who have successfully completed the program possess the capabilities at a very high level to deliver robotic products, systems and services that are safe, reliable, and of good quality.

Once received, certification is valid for two years and will need to be renewed after expiration to keep a valid certification status. (Certified Robot Integrator Program Description - A3)"

Certified Automation Professional: CAP Associate Certificate Program

- Average Salary: $87,000 (PayScale.com)

- Description of Automation Professional:

  o "The ISA Certified Automation Professional® (CAP®) certification is a mark of career excellence that affirms your commitment to quality and demonstrates your expertise and knowledge of automation and controls. ISA CAP certification provides you with a non-biased, third-party, objective assessment and confirmation of your skills and expertise as an automation professional.

CAPs are individuals who have proven they possess an extensive knowledge of automation and controls and that they have the expertise and qualifications to excel in their fields. As automation professionals who work in process automation and manufacturing automation industries around the globe, CAPs are responsible for direction, definition, design, development/application, deployment, documentation and support of software and equip-

ment systems used in control systems, manufacturing information systems, systems integration, and operational consulting.

To become an ISA CAP, [one] must meet certain education and work experience requirements, pass an exam, and commit to the ISA Code of Conduct. Learn more about CAP requirements. (ISA. org CAP Description)"

"You must meet at least one of the criteria below to be eligible to take the CAP Associate exam:

1. Complete a four-year academic degree in a related technology area (e.g., instrumentation, measurement and control, electrical, electronics, mechanical technologies, or computer programming courses related to practical engineering applications)

2. Complete a two-year technical degree in a related technology area and have one year of work experience in a related technology area

3. Five years of work experience in a related technology area

4. Successfully complete the ISA CAP Associate Certificate Exam Review course in any of the course formats available (EC01, EC01M). The exam fee is included with the course" (CAP Certificate Program)

CA Institutions within 200 miles of the MB DART location with robotics related certification programs (Programs are for 12-months or less [not degree seeking] – From RoboticsCareer. org):

- Silicon Valley Polytechnic, Institute, San Jose, California

- Woodland Community College, California

- University of California Berkeley, Berkeley

- Merced College, Merced, California

- Las Positas College, Livermore, California

- American River College, Sacramento, California

- West Hills Community College, Coalinga, Coalinga, California

- Folsom Lake College, Folsom, California

- Sonoma State University, Rohnert Park, California

- Twilio, San Francisco, California (company on the job training)

- Apple Inc., One Apple Park Way, Cupertino, California (company on the job training)

NOTE: Twilio and Apple Inc., are companies that are listed here to illustrate that they provide "on the job training" for certain certifications for their employees. These are shown as examples where the potential to make strategic partnerships could potentially be fostered with corporate stakeholders to either offload or to assist their specific training needs.

Types of certification courses offered at "local" institutions with robotics relevant training (12-month or less certifications):

- AutoCAD

- Semiconductor Technology

- SolidWorks Drafting

- Welding

- CMOS IC Design

- Applied Electricity and Electronics

- Artificial Intelligence Strategy

- C Programming Essentials

- C++ Programming Essentials

- CAD Draftsman

- CAD Operator

- Cisco Network Associate CC

- Cloud Computing CC

- Computer Applications Software CC

- Computer Desktop OS Security CC

- Computer Information Security Essentials

- Computer Information systems

- Computer Network Technician

- DFT/ATPG for Nanometer ASICs

- Digital VLSI IC Design with Verilog

- Electrical Engineering Minor

- Electronic Intelligent Systems

- Foundations of Data Science

- Heavy Equipment Operations

- IC Layout Design & Verification

- Machine Learning

- Manufacturing Minor

- Microsoft Systems Administrator CC

- Mobile Programming
- PCB Layout Design
- Pipe Welding Technology
- Python Programming
- Java Programming
- Welding Technology

Figure 3 indicates locations for institutions that provide robotics training that are registered with ARM Institute.org with 12-month or less certification programs within 200 miles of Marina, CA.

Figure 3: "Local" institutions with robotics relevant training (12 months or less certifications). Red, Yellow, and White circles are 50-, 100-, and 200-miles circumference from the municipal airport (OAR) in Marina, CA.
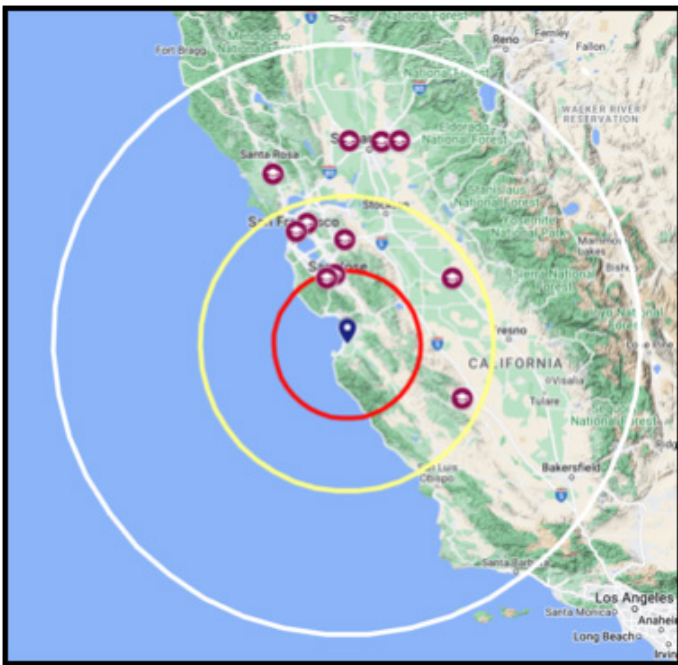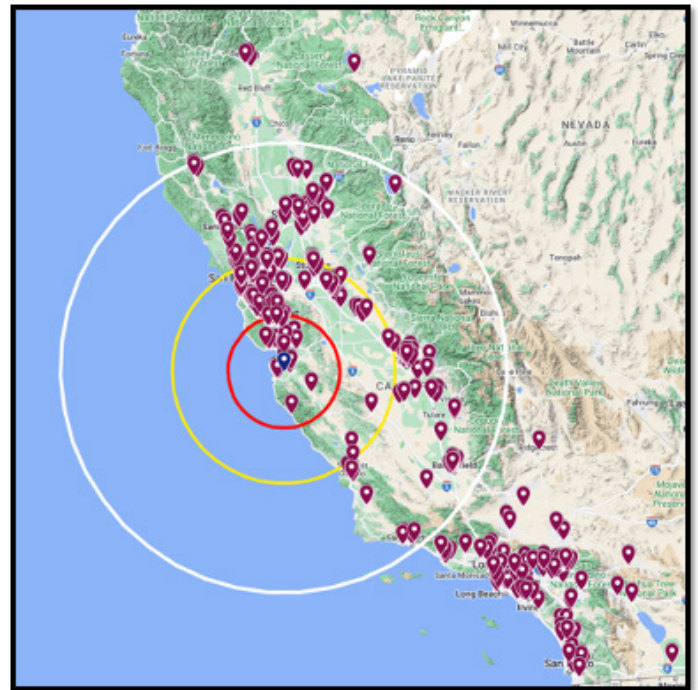

Link to Interactive Map: "Local" institutions with Robotics training (relative to OAR Airport)

ADDITIONAL

The following is a master map of California institutions that both do and do not have relative EV, Drone, or Robotics related programs. The inclusion of "no program" institutions as been included to show where they reside as these could potentially provide strategic opportunities for partnership for a workforce training facility in the region (as they may seek to host a faculty of this type to add to their services/portfolio).

Figure 4: Master list of California institutions investigated for this study to determine their program offerings related to EV, Drone, or Robotics. Red, Yellow, and White circles are 50-, 100-, and 200-miles circumference from the municipal airport (OAR) in Marina, CA.

NOTE: A near future iteration of this interactive map will delineate between program types and non-program institutions. This present "master list" map is still a work in progress.

Link to Interactive Map: Master list of CA institutions for EV, Drone, Robotics training, or potential locations for training

APPENDIX 6

ESTIMATED COST OF CONSTRUCTION OF WORKFORCE TRAINING CENTER

TYPE	SQ. FEET	COST PER SQ./FT*	TOTAL
Classrooms	5,000	$580	$2,900,000
	8,000	$580	$4,640,000
Conference Rooms	1,500	$400	$600,000
	3,000	$400	$1,200,000
Common Areas	4,000	$359	$1,436,000
Workshops and Labs	25,000	$250	$6,250,000
	35,000	$250	$8,750,000
TOTAL LARGE	**60,000**		**$16,026,000**
TOTAL SMALL	**35,500**		**$11,186,000**
Cost per square foot numbers were derived from commonly accepted industry standards			

Source: https://www.levelset.com/blog/cost-to-build-a-school/#Cost_to_build_a_high_school