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INFORMATIONAL HEARING

HIGHER EDUCATION'S ROLE IN PREPARING ENGINEERS FOR THE AEROSPACE INDUSTRY

February 9, 2018
9:00 a.m. – 11:30a.m.
Da Vinci Schools Board Room, El Segundo, CA

AGENDA

I. **Welcome**

- *LTC Tom Lasser, USA Retired*

II. **Introduction**

- *State Senator Ben Allen*

II. **Aerospace Industry Workforce Status and Needs**

- *Phil Mathews, Principal Director of Talent Acquisition at The Aerospace Corporation*
- *Marianne Koshar, Director of Human Resources at Boeing*

III. **The Engineering Pipeline from Southern California Higher Education**

- *Dr. Andrea Belz, Vice Dean of Technology, Innovation and Entrepreneurship, USC Viterbi School of Engineering*
- *Dr. Chris Lynch, Professor of Mechanical and Aerospace Engineering, UCLA*
- *Dr. Tim Fisher, Professor of Mechanical and Aerospace Engineering, UCLA*
- *Dr. Dena Maloney, Superintendent/President, El Camino Community College District*

- *David Gonzales, Dean of Industry and Technology, El Camino College*

IV. **Innovative Partnerships and Program Models in Education**

- *Dr. Ganesh Raman, Assistant Vice Chancellor for Research, California State University*
- *Steve Wallis, Da Vinci Science*

VI. **Public Comment**

HIGHER EDUCATION'S ROLE IN PREPARING ENGINEERS FOR THE AEROSPACE INDUSTRY

BACKGROUND MATERIALS

1. **Publications & Reports**

   a. ***The Changing Face of Aerospace in Southern California: The Future is Here (Executive Summary)***

   b. ***The Changing Face of Aerospace in Southern California: The Future is Here (Work, Work, Work)***

   c. ***The Changing Face of Aerospace in Southern California: The Future is Here (Regional Colleges and Universities Providing Aerospace Related Degrees or Certificates)***

   d. ***Fact Sheet on Socal Aerospace Industry Cluster (November 2017 Update)***

2. **Current Legislation**

   a. ***AB 427 (Muratsuchi)***

Publications & Reports

Executive Summary

SOUTHERN CALIFORNIA INDUSTRY CLUSTER SERIES

THE CHANGING FACE OF AEROSPACE *in* SOUTHERN CALIFORNIA

▲ THE FUTURE IS HERE

MARCH 2016

LAEDC INSTITUTE FOR APPLIED ECONOMICS

SAN DIEGO REGIONAL EDC

THE CHANGING FACE OF AEROSPACE IN SOUTHERN CALIFORNIA

▲ THE FUTURE IS HERE

AN INDUSTRY CLUSTER STUDY

PREFACE BY pwc

Christine Cooper, Ph.D.
Shannon Sedgwick
Wesley DeWitt

March 2016

INSTITUTE FOR APPLIED ECONOMICS
Los Angeles County Economic Development Corporation
444 S. Flower Street, 37th Floor ◆ Los Angeles, CA 90071

SAN DIEGO REGIONAL EDC
530 B Street, Suite 700 ◆ San Diego, CA 921011

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The LAEDC Institute for Applied Economics specializes in objective and unbiased economic and public policy research in order to foster informed decision-making and guide strategic planning. In addition to commissioned research and analysis, the Institute conducts foundational research to ensure LAEDC's many programs for economic development are on target. The Institute focuses on economic impact studies, regional industry and cluster analysis and issue studies, particularly in workforce development and labor market analysis.

Contents

Executive Summary

What we learned in this study.

The aerospace industry is facing exponential transformation from within the industry and from outside.

The aerospace industry was built on the vision and dreams of entrepreneurs and risk-takers who have continually pushed the limits of technological innovation. While the technologies that are shaping the future of aerospace continue to evolve, Southern California's rich, deep and strong ecosystem of large and small companies, research and educational partners, and an active defense sector amid a culture of risk-taking and future-thinking remains one of the world's most competitive regions for aerospace innovation.

This report examines the state of the industry today and how it will evolve in the future. Its findings are summarized as follows:

The Future Has Arrived

- In Southern California today, leading commercial technologies are moving into the aerospace market. The challenge for the region is to continue to support and enable its technological ecosystem, while the challenge for individual firms is to adopt emerging exponential technologies that are critical to future success in this industry.
- Companies operating in Southern California are blessed with a number of advantages, including a deep ecosystem of talent, expertise and engineering prowess, a synergistic environment for technological innovation, a culture of risk-taking and entrepreneurship, and a workforce with the needed skills for innovation across the most innovative technologies.

Recent Industry Activity

- The value of shipments of the aerospace industry nationwide reached $283 billion in 2014; new orders have climbed back towards pre-recession levels, reaching $346.6 billion in 2014.
- Commercial aircraft have been driving sales in recent years, now representing one-third of all US aerospace industry sales; the industry exports more than twice what it imports, producing a trade surplus of $61.6 billion in 2014.
- As the industry continues its transformation, leading California firms are well-positioned to compete in the modern day Space Race.

The industry employed 85,500 direct payroll workers in Southern California in 2014, accounting for 14 percent of the US industry employment.

Sizing Things Up

- Industry employment was 85,500 in 2014, not including aerospace-related defense personnel, accounting for 14 percent of industry employment nationwide.
- Guided missile and space vehicles (and related parts) manufacturing employment has grown by more than 64 percent since 2004, most of this occurring in Los Angeles County. Almost one quarter of the national employment in this industry segment is in Southern California.

The Future Has Arrived

A perspective from the PwC team.

The industry is facing exponential transformation from within the industry and from outside, offering exciting opportunities—and challenges.

The aerospace industry is in the midst of technological transformation. In Southern California today, leading commercial technologies are moving into the aerospace market. Engineers and innovators are pushing the boundaries of the industry, now no longer focused on avionics alone but introducing increasingly complex systems of communication, autonomy, advanced manufacturing processes, robotics and artificial intelligence. The challenge for the region is to continue to nurture the existing technological ecosystem and to build into this the environment to attract and retain the next generation of aerospace and technology firms. The challenge for aerospace firms themselves is to adopt emerging, exponential technologies that are critical to their future success.

Headwinds

Over the past few years, the aerospace industry has increasingly found itself in a challenging position as it seeks growth and innovation. Historically dependent on government-funded contracts, the industry is now facing headwinds from that direction that are not likely to recede. Among these are budget constraints, costs pressures and political challenges.

Across the defense industry, the U.S. government has not initiated as many significant new weapons programs as was once common for the industry. The recent award of the Long Range Strike Bomber contract to Northrop Grumman is a rarity in terms of scale. Although overall government budget constraints are not new, they continue to present the realities of current fiscal limits. The President's 2016 budget anticipates an increase of mandatory spending (which includes entitlements and healthcare) of 2.5 percent of GDP over ten years (through 2020), while national defense expenditures are expected to decline by 2.1 percent of GDP over the same period—suggesting a crowding out of defense spending by domestic needs.

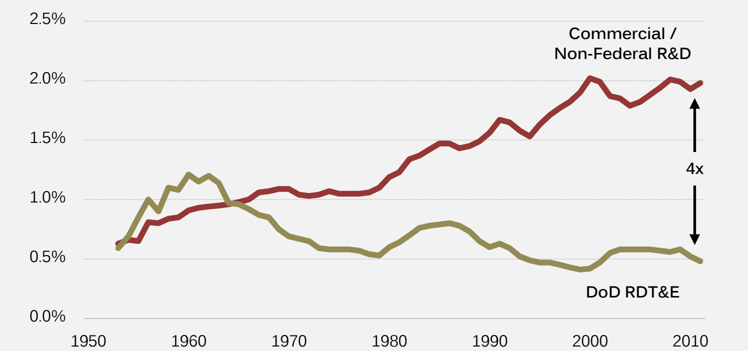
Additionally, persistent cost overruns in recent contract delivery has motivated the DoD to issue more fixed price contracts, which often squeezes margins at aerospace firms, inducing those with higher production costs to move to lower-cost locations when feasible, and forcing others to find other clients.

Overriding and amplifying these challenges, the existing political climate appears highly entrenched and will provide no relief. Budget sequestration continues to be in effect, which significantly impacts defense spending and hence aerospace suppliers, and annual budget negotiations themselves have become fractious, intractable and ultimately unpredictable.

The Old and the New: Growth of Commercial Investment

Certainly there will continue to be demand for the platforms and systems that have shaped the current industry, such as aircraft, missiles and satellites. But there is increasing demand for emerging technologies that are being driven by adjacent industries, such as autonomy, artificial intelligence, cloud computing, cybersecurity, robotics, connectivity and analytics.

US R&D Spending as % of GDP By Funding Source



Sources: National Science Foundation, Science and Engineering Indicators Report 2014; DoD Green Book; Analysis by PwC

Consequently, the aerospace industry is being split into a complex, exquisite system of past developments and information-based technologies of the future.

In many ways, this trend has been developing for a long time. Commercial research and development has been outpacing defense four-fold since the 1990s. But for some technologies, such as autonomy, this growth wedge has been much more dramatic. While less than twenty years ago, defense departments were the only funders of unmanned and autonomous systems, today commercial investment far outweighs defense, as virtually all industry interests, from global auto companies to technology giants to startups, are racing to develop a driverless vehicles, autonomous aircraft systems and increasingly capable robotics platforms. This trend is not isolated to autonomy but extends to several technologies central to the future of aerospace. In some key areas, the investment ratio of commercial investment to defense funding is 100 or even 1,000 to one.

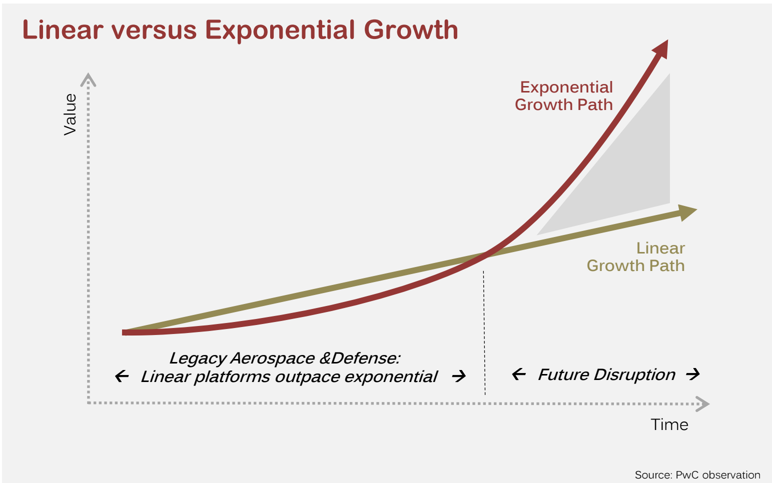
Moving from Linear to Exponential

The extent and reach of commercial investment is both capitalizing on and facilitating the increased speed of transformation in the digital world.

In the mid-1960s, Gordon Moore, then R&D Director at Fairchild Semiconductor and shortly thereafter a founder of what would become Intel Corporation, famously predicted exponential growth in digital technology, a prediction that was dubbed Moore's Law. The law predicted a doubling of computing power every year or so, and the following decades proved the law to be remarkably solid.

The doubling of a variable with each iteration is represented by what is known in mathematics as an *exponential* function. This stands in contrast to a constant multiple of a variable of with each iteration, which is represented as a *linear* function. Early in an exponential growth path, the level change is small, where, for example, a doubling of 2 units to 4 units is a change of merely 2 units. Further on the growth path, however, the level change is enormous, where, for example, a doubling of 4 giga-units to 8 giga-units is a change of 4 trillion units.

Digitization, although it seemed to grow slowly in its early years—not delivering, for example, personalized flying vehicles or the self-lacing sneakers of *Back to the Future*—it is now transforming virtually all industries, including those within the arena of the aerospace industry. Moreover, the transformations are now universally disruptive and



certainly seem to be occurring much faster today than ever in the past. The digital universe is now approaching the upper stages of its exponential growth curve.

Not all processes or industries are subject to exponential growth, of course. Many technologies experience linear growth trends, such as those related to physical infrastructure and assets. These technologies are characterized by capital intensity, high marginal costs and organizational structures that are large and sclerotic. Their growth is constrained by the physical limits of materials and people, and growth is therefore expensive to achieve and not very scalable.

By comparison, exponential technologies are those that are information-based, with digital rather than physical infrastructure, characterized by data and information intensity, minimal marginal costs and organizational structures that are lean and agile. Growth in these technologies is constrained only by information flows and computing power—both of which are themselves growing at exponential rate—which is therefore highly scalable and certainly disruptive.

How is this relevant to the aerospace industry? Emerging exponential technologies include artificial intelligence, machine learning, automation, biotech and bioinformatics, nanotechnology, robotics, unmanned and autonomous systems and 3D printing, many of which have high relevance to the aerospace industry, but are coming increasingly from outside the aerospace industry itself. Hence, much of the attention is shifting to companies that are not part of the core aerospace industry but are in the broader technology sector.

The integration of information technology and digitization into aerospace products and industries—often funded and developed by the commercial sector—is becoming a disruptive force.

Aerospace Companies at a Crossroads

How should this force be interpreted for future developments in the industry? Growth in information technologies is exponential and still has far to go. For example, in the realm of connectivity and the "Internet of Things," we expect a growth of connected devices from approximately 12 billion in 2015 to more than 25 billion in 2020, a five-year compound annual growth rate of 39 percent. At that anticipated rate, by 2030, more than one trillion devices will be connected. Such explosive connectivity will have major implications for every industry, including aerospace. As physical assets become connected, they become information-enabled and will also ride the exponential wave.

This creates a number of challenges for an industry such as aerospace where change and technology development occurs not exponentially, but in a linear fashion and with predictable outcomes. Many traditional aerospace firms are accustomed to linear innovation, which results in only marginal performance improvement, and incorporating emerging exponential technologies will necessarily involve organizational changes, from talent to investment to processes and structure.

As in any industry facing non-linear competition, the incumbents in the aerospace industry have several options. First, they can maintain their current market position as builders of platforms and hope that the cyclical nature of the aerospace industry or a resurgent international market will drive growth. Second, they can look to adjacent markets involving digital technologies that can become part of a new growth strategy. Third, they can move fully into the information value chain and try to shape and hence control it.

Currently, it would seem difficult for defense firms to pursue the third strategy as they do not have the necessary talent base. Aerospace companies in the U.S. employ less than one of every 150 engineers with expertise in areas such as autonomous systems, secure communications, artificial intelligence and machine learning. Further, these companies spend far less on research and development than do many U.S. technology companies—approximately 2 percent of revenues compared to approximately 8 percent, on average. Such a company will not be able to compete favorably with Amazon in cloud services or with Google, LinkedIn or Facebook in data analysis.

Nevertheless, aerospace companies need to accelerate their ability to use digital technology, which can help them develop products more quickly and economically, increase operational efficiency and improve the value proposition they present in the aftermarket. They cannot afford to wait for their customers to provide complete clarity.

Emerging technology markets are inherently uncertain and develop rapidly. Aerospace firms that do not find a way to innovate and anticipate customer needs will find themselves increasingly sidelined, and in a few years, those that will survive and provide industry leadership are likely to be those that demonstrate an ability to innovate and embrace future technologies despite uncertainty.

The future of the industry in Southern California will depend upon the ability of the region to build into the existing ecosystem the environment to attract the next generation of aerospace technology firms.

Capturing the Future: Opportunities for Aerospace in SoCal

With this background in mind, we believe that aerospace companies operating in Southern California enjoy advantages over the rest of the country:

Ecosystem

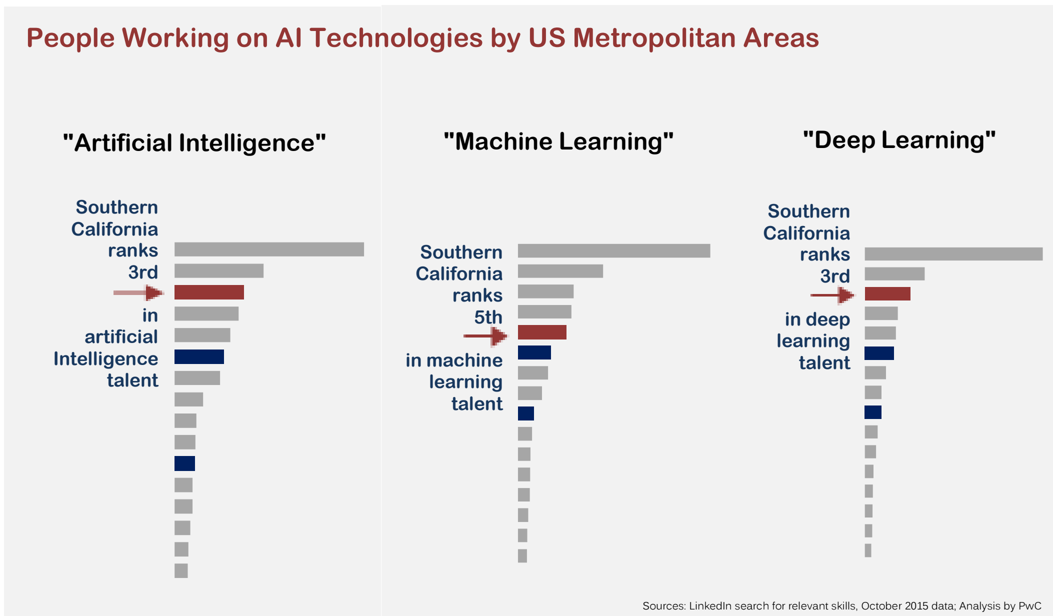
Southern California hosts a large number of organizations with technological talent and expertise and engineering prowess, including aerospace firms, NASA, Space and Naval Warfare Systems Command (SPAWAR), Los Angeles Air Force Base (LAFB), Jet Propulsion Laboratory (JPL), startups, universities and venture capital firms, all of whom together create a synergistic environment for technological innovation. Many of these institutions and ecosystem participants are highlighted throughout this document.

Culture

Culture is a critical element in the innovation sphere. The culture of risk-taking and entrepreneurship is often cited as one of the key reasons the United States has been the world's leader in innovation. This culture is amplified in Southern California, which has a rich and deep heritage of risk-taking, from the days of its early settlers to the growth of the region through the centuries, as pioneers forged new lives and ventures in these far western shores. This spirit is especially evident in aviation, from its early days following the 1910 air meet through the heyday of aircraft manufacturing during World War II and into today's pioneers now reaching beyond the stars.

Skills

Southern California is home to many people with the unique skills necessary for innovation across commercial and aerospace technologies, including those needed for artificial intelligence, facial recognition, product recommendations, machine learning and business intelligence and analytics. The region ranks between third and fifth among U.S metropolitan areas for the number of people working in these areas, as a search of such talent across the nation reveals. With the rich engineering and technology talent produced by regional educational institutions, Southern California has ample resources to lead the nation in the human capital necessary for the exponential growth of this industry.



As this report vividly outlines, the aerospace industry is thriving in Southern California, built on the pillars of these three key advantages, and launching into the converging technological ecosystem that will ultimately transform the human experience as it ventures into space. The challenge for aerospace firms is to adopt those emerging exponential technologies that are critical to their future success.

Introduction

An industry in transition.

The aerospace industry was built on the vision and dreams of entrepreneurs and risk-takers who have continually pushed the limits of technological innovation. Traditionally dependent on federal defense funding, the industry is now moving into the commercial market, integrating the exponential technologies that will be critical to its future success.

While the technologies that are shaping the future of aerospace continue to evolve, Southern California's rich, deep and strong ecosystem of large and small companies, research and educational partners, military installations and the culture of risk-taking and future-thinking remains one to the world's most competitive regions for aerospace innovation.

About This Report

This report is the second in our Industry Cluster Series, which examines industry clusters in the larger Southern California region in detail. Industry *clusters* are distinct from more commonly-recognized industry *sectors* as they are formed by firms that are in related industries, that sell related products, employ similar types of labor and have a common geographic concentration of activity.

This clustering of activity is believed to indicate regional specialization and competitiveness and offers the best opportunity for encouraging and sustaining economic development.

As important as they are in driving economic activity, industry clusters are even more significant when they are essentially export industries. By selling goods and services to the global audience, such clusters bring new dollars into the region, which recirculate through their supply chains to local firms and employees, supporting resident households and businesses and allowing them, in turn, to prosper and grow.

Because such industry clusters are not dependent on the local market for their business, these are the very industries that are most able to locate where they find conditions most hospitable – in terms of access to capital and land, cost-effective raw materials, and a qualified and available labor pool.

It is the distinction between traded clusters and local clusters that drives our analysis in this report. By understanding the current and historic trends of our leading most competitive industry clusters, we can come to understand the challenges and opportunities, and tailor our economic development programs and policies to strengthen our existing specialties and build them into flourishing, thriving and growing industries. We can ensure that we have a workforce ready and able to fill the jobs of the future in our strongest industry clusters, and remain competitive in a fast-changing global economy.

We can focus our public policy and programmatic efforts on those industries which are most likely to provide the highest wages, which, in turn, produce the highest impacts on the local economy and the best return for our investment, and those that are always at risk of moving elsewhere.

With the vision of the future of the industry as outlined by the analysts and professionals at PwC in our preface—an exciting picture of the evolution of the industry and how its future is being developed here—our discussion proceeds in five parts:

First, we step back and provide an overview of the aerospace industry in terms of its productive activity at the national and state level. We learn that while the industry is highly dependent on federal defense spending, there are significant areas of private sector investment that now contribute to the activity that supports and drives the industry. Our focus is on the Southern California region defined by the counties of Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura.

Following this, we focus on the metrics of the industry cluster – its size in terms of employment and wages and how these have performed over the past ten years.

Third, we examine the supply chain of the aerospace industry cluster – what goes into the making of the cluster? What recipe of goods and services is needed to provide the industry with its necessary inputs? With this quantified, we estimate the overall contribution of the cluster to the regional economy through its multiplier impacts.

Fourth, we consider the supply of workers into the industry. It employs a full spectrum of workers, from new job entrants to highly-specialized and experienced labor. The occupational makeup of the industry cluster is examined and regional workforce development programs outlined. An occupational forecast is provided to outline future workforce needs.

Finally, we share the results of a survey of industry participants and several in-depth interviews as we try to understand how the participants themselves see the evolution and future of their industry. Here we learn that in spite of several challenges, the Southern California region is still brimming with optimism and the spirit evocative of the industry's early pioneers, reaching for the moon, the stars and beyond.

This comprehensive picture of an industry cluster that draws a great deal of attention is meant to inform policymakers and local stakeholders as we together develop regional strategies to bring jobs and prosperity to the Southern California economy.

Complete discussion and description of methodologies and data sources are provided in the Appendix, along with more detailed data tables that expand on the exhibits shown throughout.

Work, Work, Work

Work, Work, Work

About the kinds of jobs that make this industry cluster successful.

More than 26 percent of jobs in the industry are in production occupations, and 22 percent are in engineering occupations.

The work that people do in their jobs is commonly classified using the Standard Occupational Classification (SOC) system, developed by the Bureau of Labor Statistics. Workers are classified into particular occupations with similar job duties, skills, education and training. In Southern California, there are approximately 650 detailed occupations represented in the workforce, which are not generally industry-specific but are common to many industries.

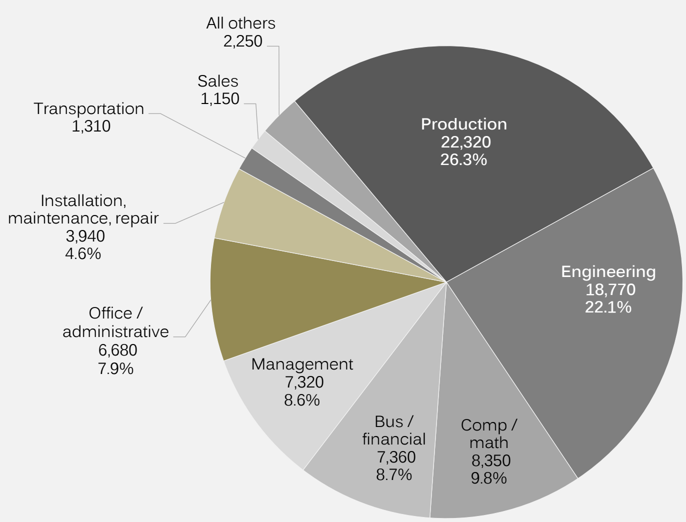
The aerospace industry cluster employs workers in occupations across the skills spectrum, but it is weighted towards workers engaged in production occupations and in engineering occupations. While some of these workers may be highly skilled, many others learn their occupational skills on-the-job and are less likely to need higher levels of education.

In total, there are almost 22,320 workers in production occupations, which include such roles as electrical assemblers, computer numerically-controlled (CNC) machine tool operators, machinists, inspectors and welders. Another 18,770 are engineers, mostly electrical engineers and industrial engineers, but also mechanical engineers, electronics engineers, electrical engineering technicians and aerospace engineers. Computer and math occupations for the most part include software developers, computer systems analysts, system administrators and support specialists, together accounting for almost 8,350 jobs. Business and financial occupations including accountants and auditors, market research analysts and business operations specialists accounted for more than 7,350 workers.

Exhibit A-7 in the Appendix lists the top 50 detailed occupations in the industry cluster by current employment.

Is the distribution of occupations in the aerospace industry in California similar to that across the nation? Is it typical for aerospace industries in other regions to hire more production workers than engineers, and more computer specialists than managers?

Major Occupational Groups in the Industry



Sources: Census Bureau, OES; Analysis by LAEDC

It might be reasonable to expect that California, reputedly a high-cost state, may specialize in work that requires higher compensation and would allow lower-cost regions to capture more of the manufacturing operations, at which California is less competitive.

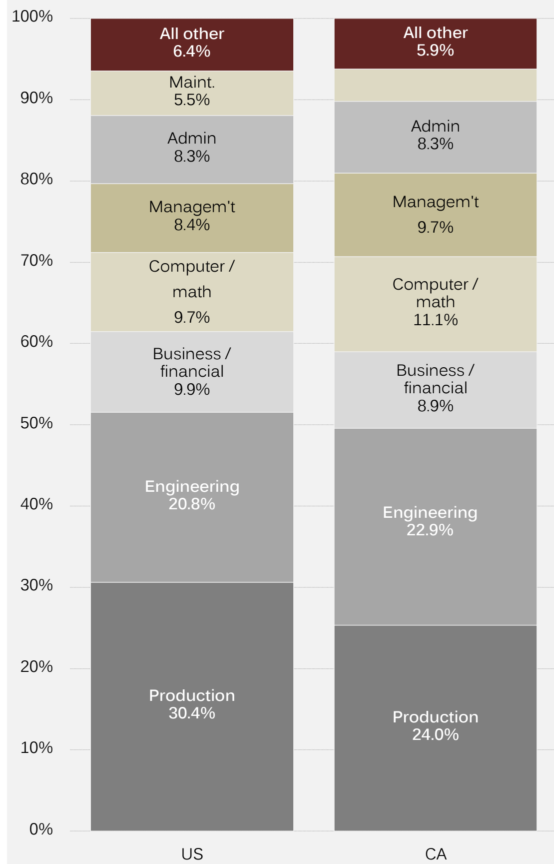
To see whether this is true, it is helpful to compare the occupational distribution by major occupational group of the industry in California compared to the national average in 2014. This is shown at right.

Several differences appear. California aerospace firms have a lower share of production workers and a higher share of engineers as a share of total employment. They also hire a higher percentage of computer and math workers, and more management than the national average. This would confirm that California's aerospace industry is more highly specialized in design and engineering than in production (and manufacturing). It can also suggest that manufacturing operations in California are more highly specialized.

Given the speed of technological progress in this industry and others, another area of inquiry would be to see how the occupational distribution of aerospace has changed over time. Consistent and comparable data is available at the national level for the past ten years and is shown below. (This data is not available at the state level.)

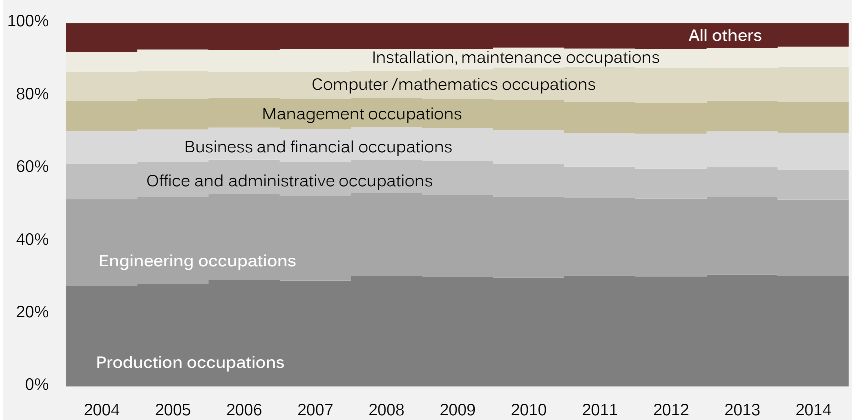
Interestingly, the occupational distribution within the industry has not significantly changed during the past ten years. There is a slightly larger share of workers in production occupations and a slightly smaller share of engineering workers. The nature of the skills and education required in these various occupations may certainly have changed over the time period, however, so the occupational groups, although identically labeled may reflect workers with quite different knowledge, skills and abilities.

Occupational Distribution of Aerospace Industry
US vs CA 2014



Sources: Census Bureau, OES; Analysis by LAEDC

National Occupational Distribution in Aerospace
2004 to 2014



Sources: Census Bureau, OES; Analysis by LAEDC

Future Workforce Needs

Given the expected growth of the industry over the next five years, and assuming a fairly consistent composition of occupations within the industry, the skills needed over the next five years can be reasonably projected.

At its current projected rate of employment growth, industry employment is expected to grow slowly. In some areas of Southern California, employment in the cluster may continue its decline in spite of the recent significant growth in space vehicles. That industry segment is still quite small in terms of employment, hence the projected occupational needs are small.

Many of the overall job openings expected over the next five years may be due to the retirement of existing workers rather than to new job openings being created. Replacement needs are estimated by the Census Bureau and depend on many factors, including the age profile of the existing workforce, and skills acquisition through on-the-job training (leading to promotion).

Overall, it is expected that 2,250 new job openings will be created in the industry in Southern California over the next five years. The industry will need an additional 3,380 replacement workers over the same period.

The highest number of openings will be found in occupations related to production, such as inspectors, assemblers, machinists and technicians. Engineering occupations will provide the second highest number of openings, with 520 new jobs created over the next five years and 910 jobs needing replacement workers. That the number of replacement workers is greater than the number of new jobs is an indication that the existing workforce is reaching retirement.

A full list of projected occupational openings is shown in Exhibit A-7 in the Appendix.

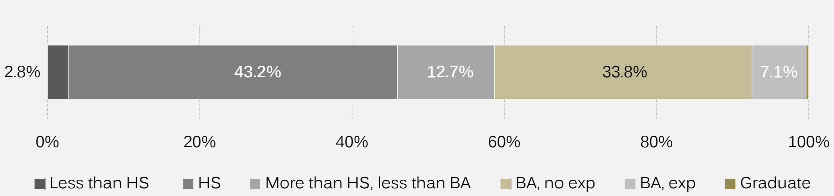
Of all openings over the next five years, more than 40 percent will require a bachelor's degree or higher. These workers are likely to be employed in engineering occupations. Approximately 53 percent of openings will be available to workers with a high school diploma or some college or post-secondary education. These workers are likely to be employed in production occupations.

5 Year Aerospace Occupational Needs in Southern California by Major Occupational Group

SOC	Occupational Group	New Jobs	Replacement Jobs	Total Job Openings
11-0000	Management occupations	170	190	360
13-0000	Business and financial	240	210	450
15-0000	Computer and mathematical	260	210	470
17-0000	Engineering	520	910	1,440
19-0000	Life, physical, social science	5	5	10
27-0000	Arts, entertainment, sports and media	10	20	30
33-0000	Protective services	20	20	40
37-0000	Building/grounds maintenance	10	10	20
41-0000	Sales and related occupations	20	30	50
43-0000	Office and administrative	180	230	410
47-0000	Construction and extraction	20	10	30
49-0000	Installation, maintenance / repair	110	130	240
51-0000	Production	630	1,330	1,960
53-0000	Transportation / material moving	40	50	90
	All Others	*10*	*20*	*30*
		2,250	3,380	5,630

Sources: CMP; Census Bureau, OES; Estimates by LAEDC

Educational Requirements for Entry Level Positions



Source: Estimates by LAEDC

Preparing the Workforce

To retain and expand the industry, a need for a continuous supply of workers, ranging from low skilled to very high skilled, exists. Educational and training programs are highly valuable as they provide paths to careers in aerospace for all skill levels. Universities and community colleges, as well as trade and technical schools, have formed targeted programs aimed at reducing the time spent by new entrants in on-the-job training to create an occupation-ready workforce.

Programs include: targeted aerospace STEM education programs for middle and high school students; certificates of achievement for individuals looking to improve their skill set and/or start a new career in the industry; associate of science degrees and non-degree transfer programs; and bachelor of science, master's and Ph.D. programs for those looking to enter the industry as highly-skilled employees.

Many programs, certificates, non-degree transfer programs and college degrees are broadly applicable to positions outside the aerospace industry, while others feed directly into a career in the industry.

Industry-specific curriculum has been developed to provide individuals interested in pursuing careers in the aerospace industry with the knowledge and skills required to successfully perform their job duties. Included in these are:

- Aerospace and Mechanical Engineering
- Aviation Safety and Security Program
- Aeronautics
- Aircraft Fabrication and Assembly
- Astronautics
- Unmanned Systems
- Licensing and Certification

Exhibit A-8 in the Appendix lists all aerospace-related degree and certificate programs currently offered at regional colleges and universities. These are briefly described below.

STEM Education

Unlike educational programs discussed below that target adults, STEM education programs exist to engage youth so as to increase their interest in studying fields that include science, technology, engineering and mathematics.

The Aerospace Corporation is affiliated with several STEM programs in the region. The company is a federally-funded research and development center (FFRDC) that works with the U.S. Air Force and the National Reconnaissance Office to support space programs that involve national security. Its STEM programs include:

- Greater Los Angeles Education-Aerospace Partnership (Great-LEAP) program, which brings industry members into the classroom;
- US FIRST Robotics competitions, which sponsor King Drew and Crenshaw High Schools;
- Mentors are provided as part of the national Math Counts organization;
- Participation in Change the Equation initiative, which aims to cultivate literacy within STEM programs; and
- The Mathematics, Engineering, and Science Achievement (MESA) program, which works with disadvantaged students.

The Aerospace Corporation, headquartered in El Segundo, is an example of industry involvement in STEM programs in the region.

Certificate Programs

Wide varieties of certificate programs exist in the region to provide individuals with the opportunity to learn skills applicable in the aerospace industry, although many programs are broadly applicable to positions outside the industry. Examples include mechanical design, computer-aided manufacturing (CAM), computer numerical control (CNC), pre-engineering and machine technology. Those that feed directly into a career in the industry include the Aircraft Fabrication and Assembly Certificate program at Antelope Valley College in Los Angeles County.

Associate Degrees

Associate degrees can act as a bridge to further education by combining general education, theoretical and applied coursework, or they may focus more heavily on applied knowledge in the same way that a certificate would, with additional background in general education and theory. Non-degree transfer programs also exist, which set students on a direct path to a bachelor's degree by helping them fulfill necessary transfer requirements for their school or program of choice.

Associate degree and non-degree transfer programs are also either broadly applicable or industry specific. The flexibility of associate degrees gives students wider options as they can choose to enter a career or pursue further education. For those who wish to enter the workforce after receiving an associate degree, programs such as Embry-Riddle Aeronautical University's aeronautics associate of science degree program exists, whereas those students with an interest in higher education can pursue an associate degree in pre-engineering followed by a bachelor's degree in mechanical or aerospace engineering.

Bachelor's Degrees

Due to the complex nature of the industry, completing tasks requires multi-disciplinary teams of engineers and therefore there is a wide range of possible positions for the highly-skilled. Workers at this level need an extensive knowledge of mathematics and physics, as well as a strong familiarity with computer-aided design (CAD) and materials science.

Aerospace-related bachelor's degrees include aerospace engineering, mechanical engineering, materials science, industrial engineering, and so on. The latter years of such engineering programs tend to couple education with career training in the forms of internships, fellowships and part-time or full-time employment within the industry. Having this experience expedites entry into the workforce upon graduation.

Graduate Degrees

Education for industry goes well beyond the bachelor's degree level. The Southern California region hosts many related graduate and doctoral degree programs. Students at this level focus more heavily on the research that pushes the boundaries of modern technology and practices by envisioning creative solutions to industry-wide problems. Many state schools in the area offer at least one relevant master's degree, while larger research institutions such as University of California San Diego (UCSD), University of California Los Angeles (UCLA) and the University of Southern California (USC) offer multiple relevant doctoral programs. Overall, students advancing their education beyond that of a bachelor's degree are sure to enter the workforce at the top tiers of the industry.

Aerospace & Mechanical Engineering

Many four-year universities in the Southern California region offer aerospace, mechanical, or combined aerospace & mechanical engineering degrees. These are highly technical and require practical laboratory experience alongside theoretical science and mathematics courses. Almost 60 percent of aerospace engineers in the US have bachelor's degrees and more than 30 percent have a master's degree, while more than 80 percent of mechanical engineers have bachelor's degrees and more than 10 percent have less than that. This is likely due to the amount of specialization required by the aerospace industry, as well as the larger number of mechanical engineers, yet the general foundation for each career is very similar. Undergraduate programs often prepare students for a career in the industry following graduation, with a heavier focus on applications over research, whereas graduate and Ph.D. programs concentrate more on advanced applications, theory and research.

The Aerospace & Mechanical Engineering bachelor's degree program at USC's Viterbi School of Engineering gives students a balance of theory and practical education. Undergraduates are given the opportunity to participate in any of three design-and-build challenges. Senior-level students undertake a yearlong laboratory course. In providing these opportunities to engineering students, USC's program ensures that they have the knowledge and skills they will need when entering the complex aerospace engineering workforce—while simultaneously promoting strong alumni networks.

Students in the Aerospace and Mechanical Engineering bachelor's degree program at USC's Viterbi School of Engineering participate in one of three design-and-build challenges which include faculty and graduate student mentoring.

Aviation Safety and Security Programs

There are two institutions in Los Angeles County with aviation safety and security programs. USC offers a five-course certificate program which has been in place since 1952, while Embry-Riddle Aeronautical University offers an online bachelor's of science degree in aviation security.

The USC program provides students with twenty courses, categorized into five groups, of which they must choose one course regarding safety management, one regarding accident investigation, one regarding human factors in aviation and two other courses from a variety of focuses.

The Embry-Riddle program is geared towards high school or 2-year college graduates, active or transitioning military and security professionals. It not only focuses on specific topics in aviation, such as airport, airline and corporate security, as well as aviation legislation, but also teaches broader topics such as national security and intelligence alongside general education courses. Upon completion of this program, students will be prepared to take the Airport Security Coordinator Exam, as well as the ASIS International Certified Protection Professional (CPP) Exam.

Aeronautics

Los Angeles is also home to two aeronautics programs, a Master of Science degree offered by the California Institute of Technology (CalTech) and an online Bachelor of Science degree offered by Embry-Riddle Aeronautical University.

The CalTech program is geared towards students continuing on to a master's degree in aerospace engineering or a Ph.D. in Aeronautics or Space Engineering. As such, the program does not require a final thesis or research project, and even grants students the option of forgoing the master's degree entirely as long as they choose to continue their education. The Embry-Riddle program aims to prepare students for a career in the aerospace industry upon graduation. It is multi-disciplinary, offering general education courses along with aviation science, management and safety courses. Students may also choose a concentration within the aviation industry as part of their studies.

Aircraft Fabrication and Assembly

Antelope Valley College in Los Angeles County provides a career technical education program in aircraft fabrication and technology. Suitable for both new students with no

Antelope Valley College has partnered with the National Science Foundation's Center for Aerospace Technical Education (SpaceTEC) to provide a career technical education program in Aircraft Fabrication and Technology.

relevant skills, as well as experienced students who would like to further advance their skills in the industry, students learn industry standards, how to operate the necessary tools, safety practices, aerodynamics, fabrication techniques and uses of composite materials, and upon completion earn a certificate.

Antelope Valley College also offers training in aerospace composites fabrication and repair through a partnership with SpaceTEC (the National Science Foundation's Center for Aerospace Technical Education). Students must complete four courses which will prepare them to enter entry-level manufacturing jobs within the aerospace industry, such as structural or composite technician positions. Through SpaceTEC, the college also provides aerospace manufacturing, aerospace composites and aerospace vehicle processing certifications.

Astronautics

Students educated in astronautics have a wide variety of space-related employment opportunities available to them. These could include careers in space craft design, remote sensing, orbital mechanics, space navigation and space instrumentation and sensing. Such topics form the foundation for operations of manned space flight, satellite communication, weather and ground monitoring and global positioning and navigation.

USC offers a bachelor's degree, master's degree, graduate certificate and Ph.D. in astronautics. Students begin by learning the fundamentals of aerospace engineering, followed by specialized work in astronautics and space technology, as well as technical electives. Practicing engineers and scientists wanting to enter space-related fields or undergo training in specific space-related areas can earn a graduate certificate in astronautics by completing four subject-specific courses provided by the school.

Unmanned Systems

Embry-Riddle Aeronautical University offers a bachelor's degree in unmanned systems applications and a master's degree in unmanned systems. Having a specialization in this nascent industry will give students an advantage in the job market and may better direct them towards a specific career. Undergraduates must choose between three paths: administration, operations and development. Those who focus on administration will learn management topics and administrative functions within the industry, while those who choose to focus on operations will learn the logistics of mission planning and execution, as well as how to make operations safe and efficient. Students who specialize in development will learn about the design, development and validation of unmanned systems applications with a foundation of engineering. Graduate studies are more analytical and research-based.

Licensing and Certification

At a point near or following the completion of an undergraduate degree program, engineers take either the Engineer in Training or Fundamentals of Engineering exam. Doing so prepares students for the Professional Engineers (PE) licensing exam, which they may take after four years of experience. A PE license is not required within the industry, but mechanical and electrical PE licenses may be desired by aerospace employers.

Throughout the Southern California region, the National Center for Aerospace and Transportation Technologies (NCATT) provides certification for aerospace/aircraft assembly, aircraft electronics technician, autonomous navigation systems, dependent navigation systems, onboard communications safety, radio communication systems and unmanned aircraft system maintenance.

Ongoing Pipeline of Workers

With such a broad array of educational institutions offering programs related to aerospace industries, Southern California appears well-equipped to continue supplying the needed workforce for the industry. In the most recent academic year, the region graduated more than 3,700 students with bachelor's degrees in engineering (from the selection of universities listed in the exhibit), of which more than 1,300 were mechanical engineering majors and 300 were aerospace engineers. More than 2,000 students were granted graduate degrees in engineering, 260 of which were in mechanical engineering and 115 in aerospace engineering.

The data is incomplete as several schools do not report their graduation rates by major.

Selected Engineering Degrees Conferred from Universities 2014-2015

University	Major & Degree Type: Aerospace			Mechanical			All Engineering		
	BS	MS	Ph.D	BS	MS	Ph.D	BS	MS	Ph.D
Caltech (2013-14)	*	*	12^	*	*	4^	*	*	38^
USC (2013-14)	*	*	6^	*	*	8^	*	*	93^
UC Irvine	52	54	13	190	"	"	636	310	90
UC Los Angeles	36	20	2	104	82	25	*	*	*
UC Riverside	-	-	-	106	13	8	454	87	77
UC San Diego (2013-14)	45	*	-	106	*	11^	1,063	433	132
							1		
CSU Fullerton	-	-	-	89	26	-	215	166	-
CSU Long Beach	44	19	-	163	20	-	585	168	-
CSU Los Angeles	-	-	-	70	28	-	183	106	-
CSU Northridge	-	-	-	127	30	-	327	201	-
Cal Poly Pomona	81	-	-	185	19	-	854	87	-
CSU San Diego	46	7	-	176	12	-	465	89	-
TOTAL	304	100	15	1,316	230	33	3,719	1,647	299

Sources: Data reported by individual universities
^ = Data reported by NSF
* = Data not published
- = Program not offered
" UC Irvine offers a joint Aerospace and Mechanical Engineering graduate program

Sources: NSF; CSU; UCI, UCLA; UCR; UCSD

Regional Related Degrees or Certificates

Exhibit A-8
Regional Colleges and Universities Providing Aerospace Related Degrees or Certificates

County	Institution	Type	Program	Degree
Los Angeles County	Antelope Valley College	2-Year	Aircraft Fabrication Assembly Technician	Cert.
			Engineering Technology	AS, Cert.
	Long Beach City College	2-Year	Mechanical Maintenance Technology	AS, Cert.
			Drafting -- Mechanical Design (Occupational Program) -- Engineering	AS, Cert.
			Mechanical Maintenance Technology -- Engineering and Industrial	AS, Cert.
			Machine Operator -- Manufacturing Technology -- Engineering and	AS, Cert.
			Numerical Control Technician -- Manufacturing Technology --	AS, Cert.
			Tool Designer, Manufacturing Technology -- Engineering and Industrial	AS, Cert.
			Engineering -- Engineering and Industrial Technologies	AS
			Industrial Systems Technology Maintenance	AS, Cert.
			Mechanical Drafting	AS, Cert.
			Metal Fabrication Technology	AS, Cert.
			Aeronautical and Aviation Technology	AS, Cert.
	California Institute of Technology	4-Year	Aeronautics	MS, Ph. D
			Aerospace Engineering	Minor, MS
			Space Engineer	Ph. D
			Mechanical Engineering	BS, MS, Ph. D
	Cal Poly Pomona	4-Yeas	Aerospace Engineering	BS, MS
			Engineering Technology	BS
			Mechanical Engineering	BS, MS
	CSU Long Beach	4-Year	Aerospace Engineering	BS, MS, Joint Ph. D
			Mechanical Engineering	BS, MS, Joint Ph. D
	CSU Los Angeles	4-Year	Mechanical Engineering	BS, MS
			Aviation Administration	BS
	Embry-Riddle Aeronautical	4-Year	Aeronautics	AS, BS, MS
			Aviation Business Administration	AS, BS
			Technical Management	AS
			Aviation Security	BS
			Unmanned Systems Applications	BS, MS
			Systems Engineering	MS
			Cybersecurity Management and Policy	MS
			Aviation Finance	MS
			Information Security and Assurance	MS
	UC Los Angeles	4-Year	Aerospace Engineering	BS, MS
			Materials Science	BS
			Mechanical Engineering	BS
	University of Southern California	4-Year	Aviation Safety and Security Program	Cert., Open Courses
			Aerospace and Mechanical Engineering	BS, MS, Ph. D
			Astronautical Engineering	BS, MS, Graduate
			Materials Science	MS, Ph. D
			Materials Engineering	MS
			Manufacturing Engineering	BS
Orange County	Fullerton College	2-Year	Industrial Drafting (CAD)	AS, Cert.
			Manufacturing Technology	AS
			Machine Technology (MACH)	Vocational Cert.
			CNC Operator	Vocational Cert.
			Computer Numerical Control (CNC)	Vocational Cert.
			Machine Technology Level I Skills	Vocational Cert.
			Machine Technology Level II Skills	Vocational Cert.
			Mastercam Skills	Vocational Cert.
			Surfcam Skills	Vocational Cert.
	Golden West College	2-Year	Computer Aided Design	Cert.
	Irvine Valley College	2-Year	Design, Modelling, and Rapid Prototyping	AS, Cert.
			Electronics Technology	AS
	Mt. San Jacinto College	2-Year	Engineering Technology	AS, Cert.
	Norco College	2-Year	Engineering/Drafting	AS, Cert.
			Machine Shop Technology	AS, Cert.

Exhibit A-8 (cont'd)

County	Institution	Type	Program	Degree
	Orange Coast College	2-Year	Manufacturing Technology	AA, Cert.
			Machinist	Cert.
			CNC Machine Operator	Cert.
			CNC Machine Programmer	Cert.
			CNC Programming	Cert.
			Tooling	Cert.
			Test & Troubleshooting	Cert.
	Saddleback College	2-Year	Electronic Technology	Cert.
	CSU Fullerton	4-Year	Mechanical Engineering	BS, MS
	UC Irvine	4-Year	Aerospace Engineering	BS
			Mechanical Engineering	BS
			Mechanical & Aerospace Engineering	MS
Riverside	UC Riverside	4-Year	Materials Science and Engineering	BS, MS, Ph. D
			Mechanical Engineering	BS
San Bernardino	San Bernardino Valley College	2-Years	Avionics Technology	AS, Cert.
	CSU San Bernardino	4-Year	Aerospace Studies	Air Force ROTC
San Diego County	San Diego City College	2-Year	CNC Operator	Cert.
			CNC Technology	Cert.
			Advanced Electromechanical Technology	Cert.
			Mechanical Design	Cert.
			Advanced Mechanical Design	Cert.
			Advanced Mechanical Design	Cert.
			Advanced Manufacturing	Cert.
			Computer Numerical Control (CNC) Technology	Cert.
			Computer Aided Manufacturing (CAM)	Cert.
			Electronics Manufacturing	Cert.
			Fabrication Manufacturing	Cert.
			Manufacturing Engineering Technology	AS
			Computer Aided Manufacturing (CAM)	AS
	San Diego Miramar College	2-Year	Aviation Business Administration	AS
			Professional Aeronautics	AS
	National University	4-Year	Manufacturing Design Engineering	BS
			Cyber Security & Information Assurance	MS
			Engineering Management	MS
	Point Loma Nazarene University	4-Year	Engineering Physics	BS
	San Diego State University	4-Year	Aerospace Engineering	BS, MS
			Aerospace Studies	Minor
			Mechanical Engineering	BS, MS
	UC San Diego	4-Year	Mechanical & Aerospace Engineering	BS, MS, Joint Doctoral
	University of San Diego	4-Year	Mechanical Engineering	BS

BA=Bachelor's degree program; BS=Bachelor's of Science program; MA=Master's degree program; MS=Master's of Science program; AA=Associate's degree; AS=Associates of Science program
C/D=Certificate or diploma; Cert=Certification; Voc Cert=-Vocational Certificate
Excludes 2-year Pre-Engineering programs and 4-year General Engineering, Computer Science and Computer Science Engineering programs
Sources: Various; Compilation by LAEDC

Fact Sheet

FACT SHEET ON

SOCAL AEROSPACE INDUSTRY CLUSTER

An updated snapshot of the report "The Changing Face of Aerospace in Southern CA" released March 2016. [1] *Updated November 2017*

The aerospace industry is being transformed by new technologies and new markets

SOCAL'S ADVANTAGES

- **Deep ecosystem of aerospace talent, suppliers and specialized service providers**
- **Active defense sector**
- **Engineering prowess**
- **A culture of embracing technological innovation, risk taking and entrepreneurship**
- **Highly-skilled and specialized workforce**

SoCal's aerospace sector is known for Mars landings, the Space Shuttle, the B-2 Stealth Bomber, development of GPS systems and entrepreneurs from Howard Hughes to Elon Musk.

SIZING THINGS UP

The aerospace industry represented **90,100 JOBS** in Southern CA in 2016, 14% of U.S. industry employment.
(Over 100,000 jobs when we include SoCal's public employees at JPL, NASA, etc.)

Southern CA aerospace generates **268,100 TOTAL JOBS** including jobs in its supply chain.

SoCal is becoming a **POWERHOUSE** for guided missiles, space vehicles and parts, with related employment up by **MORE THAN 62% SINCE 2004.**

NEARLY 1/4 OF JOBS nationally in guided missiles, space vehicles, and related parts are in Southern CA.

Southern CA's aerospace industry overall maintains **COMPETITIVE EDGE** with employment location quotient (LQ) of *2.1*, and an LQ of *3.4* for guided missiles and space vehicles.

THE INDUSTRY SPENDS MORE THAN $28 BILLION on goods and services for inputs into production.

Aerospace industry wages average **$106,200 PER YEAR.**

Workers are among the **HIGHEST-PAID** in the SoCal regional economy; almost twice the average paid for other industries.

Aerospace wages have **RISEN**

7% in Instrumentation and 24% in Guided Missiles, Space Vehicles and Parts since 2004.

[1] Report was created by Dr. Christine Cooper at the LAEDC's Institute for Applied Economics.

WORK. WORK. WORK.

TWO MAIN OCCUPATIONAL GROUPS:

Production Workers — **26%** OF JOBS

Engineering Occupations — **22%** OF JOBS

41% OF JOB OPENINGS *between 2014 and 2019 will require a bachelor's degree or higher.*

Southern CA excels at training the workforce for aerospace jobs, with **WORLD-CLASS EDUCATIONAL INSTITUTIONS** offering many targeted training programs.

What the industry says...

More than half of survey respondents indicate Southern CA is an "excellent" or "good" place to do business.

Located in Southern CA primarily for proximity to customers, suppliers and/or legacy of company.

Quality of life in SoCal attracts top talent.

Favorable climate enables testing and product development faster than elsewhere in U.S.

Current Legislation

AB 427 (Muratsuchi)

AMENDED IN ASSEMBLY JANUARY 11, 2018

AMENDED IN ASSEMBLY JANUARY 3, 2018

CALIFORNIA LEGISLATURE—2017–18 REGULAR SESSION

ASSEMBLY BILL No. 427

Introduced by Assembly Member Muratsuchi
(Principal coauthor: Senator Allen)
(Coauthors: Assembly Members ~~Bloom and Obernolte)~~ *Berman, Bloom, Fong, Lackey, Obernolte, Patterson, and Quirk-Silva)*

February 9, 2017

An act to add Part 6.8 (commencing with Section 15375) to Division 3 of Title 2 of the Government Code, relating to aerospace.

LEGISLATIVE COUNSEL'S DIGEST

AB 427, as amended, Muratsuchi. California Aerospace Commission.

Existing law establishes the Spaceport Office in the Department of Transportation to seek and obtain federal funding for the commercialization of private space activities in the state. Existing law, for the January 1, 2014, lien date to, and including, the January 1, 2024, lien date, exempts from taxation qualified property, as defined, for use in space flight. Existing law authorizes airport districts to provide and maintain spaceports and landing places for space reentry traffic.

Existing law establishes the Governor's Office of Business and Economic Development (office), which is administered by a director appointed by the Governor. The office serves the Governor as the lead entity for economic strategy and the marketing of California on issues relating to business development, private sector investment, and economic growth.

This bill would establish the California Aerospace and Aviation Commission consisting of ~~15~~ *17* members, as specified, to serve as a central point of contact for businesses engaged in the aerospace and aviation industries and to support the health and competitiveness of these industries in California. The bill would require the commission to make recommendations on legislative and administrative action that may be necessary or helpful to maintain or improve the state's aerospace and aviation industries and would require the commission to report and provide recommendations to the Governor and the Legislature, as specified. The bill would require *operations of the commission be supported through nonstate moneys and would require* that funds received by the commission be deposited in the Aerospace and Aviation Account, which the bill would create in the California Economic Development Fund, to be used by the commission upon appropriation by the Legislature. The bill would enact other related provisions.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. (a) The Legislature finds and declares that, in 2016, the aerospace and defense industry within the United States provided, produced, or generated the following:

(1) Support for 1.7 million jobs within both businesses that produce end-user goods and services and within the industry's supply chain.

(2) Approximately 2 percent of the nation's employment base and 13 percent of the nation's manufacturing employment base.

(3) Approximately $300 billion in economic value, representing 1.8 percent of total nominal gross domestic product in the United States, and 10 percent of total manufacturing output.

(4) Labor income of approximately 44 percent above the national average, at $93,000 average labor income per job, reflecting the highly skilled nature of the workforce.

(5) Tax receipts to federal, state, and local governments from companies and their employees of $63 billion, or about 1.7 percent of total tax revenues.

(b) The Legislature further finds and declares all of the following:

(1) Aerospace is one of California's largest industries, with a total economic impact in 2014 of more than $100 billion annually, including $38.8 billion in indirect revenues that support related industries.

(2) California is a global leader in space instrumentation, satellite services and manufacturing, and engineering services. The state provides more than 50 percent of all aerospace engineering services and 59 percent of aircraft search, detection, navigation, guidance, and nautical instrumentation.

(3) The California aerospace industry employs 230,000 workers directly and supports 511,000 jobs across related industry sectors, including finance, construction, and transportation.

(4) Key California strengths include having a capable and skilled workforce, with numerous technical universities to provide a pipeline for the industry, ideal climate conditions for flight-testing, large restricted airspace, high concentration of military operations, easy access to international manufacturing as an aerospace industry legacy, major international shipping ports, and an emerging startup scene, which has introduced new players such as SpaceX, Orbital ATK, and Virgin Galactic, among others, into the area.

(5) California's position as a global leader, however, is being increasingly challenged. Primary industry challenges have been identified to include competition from abroad in aerospace manufacturing, a declining in-state customer base with government contracts, and state tax credits that need modification to match incentives in other states.

SEC. 2. Part 6.8 (commencing with Section 15375) is added to Division 3 of Title 2 of the Government Code, to read:

PART 6.8. CALIFORNIA AEROSPACE AND AVIATION COMMISSION

15375. This part shall be known, and may be cited, as the California Aerospace and Aviation Act of 2018.

15376. (a) The Legislature finds that the aerospace and aviation industries in California provide unique and significant contributions to the economy and history of California.

(b) The Legislature further finds that the significant benefits provided to California by the aerospace and aviation industries are in jeopardy as a result of the concerted efforts of other states and countries to lure the industry away from California.

(c) The Legislature declares that there is a need for a concerted and collaborative effort by the state and local governments within the state to provide an environment supportive of, and conducive to, the undertakings of the aerospace and aviation industries in this state.

15377. (a) There is in the Governor's Office of Business and Economic Development, the California Aerospace and Aviation Commission consisting of ~~15~~ *17* members. Any reference in this part to the commission shall be deemed to refer to the California Aerospace and Aviation Commission. The Governor shall appoint ~~nine~~ *eleven* members, the Senate Committee on Rules shall appoint two members, the Speaker of the Assembly shall appoint two members, and two members shall be ex officio nonvoting members.

~~All~~

(b) (1) All members of the commission, other than the ex officio nonvoting members, shall serve at the pleasure of the appointing authority for a term of two years from the effective date of the ~~appointment.~~ *appointment, except that the initial term of a member appointed prior to January 1, 2020, pursuant to paragraph (2), (4), (5), or (6), inclusive, of subdivision (c) shall be three years.*

(2) An individual shall not serve more than three terms on the commission.

~~(b)~~

(c) The members appointed by the Governor shall be as follows:

(1) Two *members* shall be from ~~major~~ *large* aerospace or aviation corporations.

(2) ~~One~~ *Two members* shall be from ~~a~~ small- and medium-size aerospace or aviation ~~business.~~ *businesses.*

(3) One *member* shall be from a local or regional economic development corporation.

(4) One *member* shall be from a seaport that exports aerospace or aviation equipment.

(5) One *member* shall be from the aerospace or aviation industry supply chain.

(6) One *member* shall be from California's higher education system.

(7) Two *members* shall be members or employees of a union or guild of aerospace or aviation employees.

(8) One member shall have workforce development experience from an aerospace or aviation-related field.

~~(c)~~

(d) The ex officio nonvoting members of the commission shall be the following:

(1) The Director of the Governor's Office of Business and Economic Development, who may designate a representative to serve on his or her behalf.

(2) The Director of the California Military Department, who may designate a representative to serve on his or her behalf.

15378. (a) The Governor shall appoint the director of the commission. The commission may submit a list of recommended candidates for the position of director to the Governor for consideration.

(b) The director of the commission shall report to the Director of the Governor's Office of Business and Economic Development and shall receive a salary to be determined by the Department of Human Resources.

(c) The Director of the Governor's Office of Business and Economic Development, or his or her designee, shall act as the commission director during a vacancy in that position and during a temporary absence, disability, or unavailability of the director to perform his or her duties.

15379. (a) The commission shall meet at least four times a year, with the first meeting being scheduled on or before May 1, 2019.

(b) Commission meetings may be held in person, via the Internet, or via telephone. The commission may meet without a quorum for the purpose of talking testimony. No official acts may be approved by the commission without a quorum being present.

(c) The commission shall select a chairperson and a vice chairperson from among its members. The vice chairperson shall act as chairperson in the chairperson's absence.

(d) Each commission member shall serve without compensation. Actual and necessary travel expenses for each commission member while on official business of the commission shall be reimbursed.

15380. The commission is authorized to contract for consultants and appoint an advisory board. A member of the advisory board shall not receive any compensation, or use the name of the commission on any letterhead, business card, or identification badge except to the extent that the person is authorized to do so by the commission.

15381. (a) The director of the commission shall provide staff support to the commission. The Director of the Governor's Office of Business and Economic Development may assign additional staff on a temporary or permanent basis to support the work of the commission.

(b) Operations of the commission shall be supported through nonstate moneys.

~~(b)~~

(c) (1) Unless otherwise specified, all moneys received by the commission shall be deposited in the Aerospace and Aviation Account, which is hereby created ~~with~~ *within* the California Economic Development Fund, established pursuant to Section 13997.6. Moneys in the Aerospace and Aviation Account shall, upon appropriation by the Legislature, be used by the commission for purposes of this part.

(2) Any funds appropriated to, or for use by, the commission for purposes of this part shall be under the control of the Director of the Governor's Office of Business and Economic Development or his or her designee.

(3) (A) The commission may accept nonstate moneys, including, but not limited to, federal funds and private donations, for the purposes of operating the commission and undertaking commission activities, subject to the Political Reform Act of 1974 (Title 9 (commencing with Section 81000)).

(B) The commission shall not accept a private donation from a single donor in excess of 25 percent of the annual budget of the commission in a calendar year.

(C) For each private donation that the commission receives to fund the work of the commission, the commission shall post a report on its Internet Web site within 30 days of receiving that donation. The report shall contain all of the following information: name and address of the donor; amount of the donation; date the donation was made; name and address of the entity receiving or using the donation; a brief description of the goods or services provided or purchased, if any; and a description of the specific purpose or event for which the donation was made, if any.

(D) Nothing in this section shall affect any requirement of the Political Reform Act of 1974 (Title 9 (commencing with Section 81000)).

15382. (a) The purpose of the commission is to serve as a central point of contact for businesses engaged in the aerospace and aviation industries and to support the health and competitiveness of these industries in California.

(b) The commission shall make recommendations to the Legislature, the Governor, the Governor's Office of Business and Economic Development, and other state agencies on legislative or administrative actions that may be necessary or helpful to maintain and improve the position of the state's aerospace and aviation industries in the national and world markets.

(c) In undertaking its mission and responsibilities, the commission may do all of the following:

(1) Advise the Legislature and the Governor on issues relating to the aerospace and aviation industries.

(2) Hold hearings, meetings, and other activities designed to solicit information from aerospace and aviation businesses and related stakeholders.

(3) Host and participate in trade shows.

(4) Approve or modify any marketing and promotion plan developed by the director to promote aerospace and aviation industries in the state.

(5) Adopt operational rules and procedures, consistent with the authorities and requirements of this part, the Governor's Office of Business and Economic Development, and general operating procedures of the state.

(6) Request and obtain any information from state entities necessary to carry out the purposes of this part.

(7) Accept grant moneys for the purpose of implementing this part.

(8) Accept gifts and donations for the purpose of implementing this part.

15383. (a) Notwithstanding Section 10231.5, the commission shall annually report on its activities. At a minimum, the report shall include a list of activities, outcomes of those activities, trends impacting the competitiveness of California's aerospace and aviation industry, and key economic data about the industry.

(b) The report shall be available through a link on the commission's Internet Web site no later than 90 days following the close of the fiscal year. A notice that this requirement has been met shall be provided to the Chief Clerk of the Assembly, the Secretary of the Senate, and the relevant policy and fiscal committees of both houses of the Legislature. Reports and recommendations provided to the Legislature pursuant to this part shall be submitted pursuant to Section 9795.

O