AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP

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Identifying and Evaluating Airport Workforce Requirements

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Table of Contents

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As passengers prepare for their trip, they must check-in and gather necessary information for their journey. In a similar fashion, this report section prepares the reader by providing an introduction to the state of the industry and the need for action to meet the long-term workforce capacity needs of airports.

Prior to passengers entering the gate area, they must proceed through the screening process. Screening is a scan of the environment and it is necessary step to ensure the rest of the journey proceeds smoothly and safety. Likewise, to adequately prepare for potential workforce impacts and take the proper steps to build required capabilities, airports must screen the industry trends and challenges to identify those that could affect today and tomorrow's workforce capacity. This report section outlines the industry trends that airport stakeholders have identified as having the greatest potential impacts on their workforce capacity needs.

Similar to passengers searching for gates along the airport concourse, airport leaders considering where to invest workforce development resources would benefit from clear and informative guidance on what direction to take to build workforce capacity. In this section, the reader will learn which airport occupations were identified by key stakeholders as mission critical in light of emerging trends. For each of the mission critical occupations, the reader will be led through information on labor market projections, workforce development challenges, performance implications, and skill requirements that have a direct impact on workforce capacity needs for airports.

As passengers arrive at their destination, they begin to plan out their next steps beyond the airport. Similarly, airports must understand the implications of the workforce planning and development decisions they make with respect to their workforce capacity needs. Airports must also recognize how those decisions will impact their readiness for the future. In this section, the reader has arrived at final conclusions pertaining to major airport workforce capacity challenges and the considerations for maintaining an adequate supply of talent to fill mission-critical occupations. The importance of taking the next steps to identify solutions for the capacity needs are also discussed.

Similar to how boarding passengers contemplate their journey while in route, airports must evaluate whether they are on a path to successfully face changes such as new technologies, political pressures, customer demands, and safety requirements emerge. The airport industry must determine if it is building an adequate pipeline of future talent through the current training and education available to the industry. The reader of this section will be guided through the current landscape of airport training and education (T&E) and its sufficiency to meet industry demands. The reader will also learn where gaps are likely to exist in the competencies and skills needed for mission critical jobs based on current T&E and workforce needs.

1. State of the Airport Industry

Airports are an important asset to the communities that they serve, making it possible for citizens to connect across geographic spans and serving as an invaluable source of employment for many community members. Despite their important contributions to communities, airports may not always be recognized as the vital employers they are, and many airports could face workforce capacity deficits that impact their ability to respond to operational challenges and growing service demands. In addition to the complexity involved in ensuring smooth daily operations, maintaining safety and security of passengers and personnel, and complying with regulatory requirements, airports are facing a growing assortment of new obstacles that threaten to strain the capacity of the current workforce. Such challenges include the impact of technological developments (e.g., NextGen, hand-held mobile technologies technology); increasing competitive, financial, and political pressures; increasing demands to provide a unique passenger experience; and shifting workforce demographics related to Baby Boomer retirements and a more diverse labor pool. The impact of these and other trends on airport job requirements and personnel, and the potential for existing airport education, training, and development programs to address them are largely unknown. Further, many airports do not have workforce plans, adequate strategies, or tools to prepare for the road ahead.

State of the Industry Highlights

- *Introducing the research*
- *Context on the state of the airport industry and its unique management challenges*
- *The changing look of the airport workforce*
- *Previewing the content of this report*

The purpose of *ACRP 06-04: Identifying and Evaluating Airport Workforce Requirements* is to gather information that will help identify and evaluate the current and future airport job requirements and associated workforce capacity needs; assess the potential of current airport education, training, and other workforce development resources to address workforce gaps; and provide a practical guidebook that presents effective workforce planning and development strategies for airport professionals and other stakeholders. This report summarizes the information gathered in the first phase of this project focusing on establishing airport workforce capacity needs and evaluating airport education, training, and development programs. The next phase, pending TRB funding, will be to identify strategies and best practice examples to help airport leaders plan for those needs and address any identified workforce gaps. The research questions used to frame this project are provided in Exhibit 1-1.

Exhibit 1-1. ACRP 06-04 Research Questions	
Airport Industry Workforce Trends	What types of trends are discussed (e.g., technology, safety, types of employees)?
	What anticipated changes should be considered in the airport industry?
	What will the impact of trends be on the airport industry?
	What does the current airport industry workforce look like? How might this change over the next 5 to 10 years?
Airport Job Specifications and Mission Critical Positions	What core functions/jobs must be performed to execute the mission of airports?
	Which positions/types of jobs perform key functions? What are their major duties and work activities?
	How do airports identify employees with needed KSAOs? (Knowledge, Skills, Abilities, Other characteristics)
	What gaps exist in key competencies and skills needed?
	What airport jobs/types of jobs are difficult to hire for? Easy to hire for?
Airport Capacity Needs	Where do the largest capacity gaps exist in the current airport workforce (e.g., what jobs are hard to fill)?
	What challenges do airports face in terms of sustaining a strong workforce (e.g., recruiting and retaining employees)?
	How is the airport talent pipeline defined? Is it sufficient? How might it be expanded?
	What does the available pool of labor for airports?
	What labor market trends might impact the airport industry?
Airport Training and Educational Curricula	To what extent do current educational programs provide the needed skills and competencies for the airport industry workforce?
	How are training programs for airport employees evaluated in terms of effectiveness?
	What additional training do potential airport employees need?
Airport Workforce Development Strategies	What workforce development and human resource practices and programs are currently used by airports?
	Which airports are using the identified strategies?
	How effective are these strategies?
	How do these workforce development strategies compare to the best practices of other industries?

This report is primarily intended to serve leaders of U.S. commercial service airports and focuses specifically on the workforce of the airport operator rather than other airport businesses (e.g., airlines, fixed-base operators (FBO), and concessions). However, some findings may also be valuable to a broader audience including smaller reliever or general aviation (GA) airports, airport-based businesses, and regulators. In fact, GA airports will likely find much of the information discussed in this report to be relevant as many of the occupations and required skills are similar to those at commercial service airports. [NB: the FAA Asset report prescribes a new categorization for GA airports that is inclusive of some commercial service airports (U.S. DOT FAA, 2012)].

Exhibit 1-2 features the major stakeholder groups that participated in this project.

Exhibit 1-2. Airport Types and Stakeholders Engaged in This Research			
Stakeholder Groups	Group Components		Role in Study
Commercial Airports: Publically owned airports with scheduled passenger service and at least 2,500 passenger boarding per year	Primary: More than 10,000 passenger boarding per year	• Large hub: accounts for 1% of more of passenger boardings per year • Medium hub: at least 0.25% but less than 1% • Small hub: At least 0.05% but less than .25% • Non-hub: More than 10,000, but less than 0.05%	Trends, mission critical occupations, workforce requirements and capacity estimates, and training and education needs are directed at this audience. They have provided input to all elements of the research.
	Non-primary	• Non-hub: at least 2,500 but less than 10,000	
Academic, technical, and professional training organizations	• Universities with airport-related degree programs • Community colleges with airport-related curricula • Industry associations that provide certification and training to members (e.g., AAAE, ACI) • Private, for-profit providers of training to airports • Non-profit organizations and partnerships that focus on developing the airport workforce		These programs were engaged through surveys and interviews to collect summary information and data related to capacity, quality, MCO alignment, cost, performance, and their talent pipeline.

The remainder of this chapter introduces the current state of the airport industry that is the subject of this research, explores overarching factors affecting airport management, raises questions about how the industry can cope with these and other challenges, and lays out how this report can help provide answers to those questions.

Airports: An Industry in Flux

U.S. airports and their workforces are part of the dynamic aviation industry that has undergone a series of dramatic changes since the turn of the century. Rapid change is challenging for transportation infrastructure providers, including airports, which must balance service risks (e.g., providing adequate service to passengers, airlines and other tenants) with investment risk (e.g., investing in costly facilities). If airports do not invest and traffic grows, service will be inadequate. Conversely, if airports invest heavily, only to not see forecasted passengers materialize, they can be left with costly facilities they do not need. Finding that service-investment "sweet spot" remains a significant challenge.

The terrorist attacks in the U.S. on September 11, 2001, the severe economic recession between 2007 and 2009, and the consolidation of several mainline air carriers all put the U.S. aviation industry through a challenging and unprecedented period, where historic levels of growth in the industry were interrupted and, for a time, reversed. In the aftermath of these events, many airlines entered and emerged from bankruptcy, restructured their businesses, went through several rounds of cost cutting, downsized their workforces, cut air service to many airports, and renegotiated contracts for use of airport facilities. These latter two actions in particular had a profound negative impact on many airports in the form of declining air service and increasing cost pressures on airport management and staff. The response of many airports was to restructure, postpone capital investments and hiring, and cut costs in areas such as personnel and their development.

Fortunately, over the last five years, the remaining airlines have increased capacity and thus, stimulated renewed growth in passenger traffic. Airlines now have lower cost structures reinforced by an unexpected plunge in fuel prices and, together with a return to U.S. economic growth, have led to profitability and renewed optimism. While this has removed the sense of crisis that pervaded many airports, airports have realized they will need to change how they do business to survive and thrive amidst the many challenges that still lie ahead.

As airports emerge from this period of strain, several lessons learned are informing airport management strategies for success in the next decade and beyond:

(1) Airports are highly vulnerable to rapid changes in air service. Airports use forecasts of activity and passenger traffic to devise long-term plans spanning 5, 10, or even as many as 30 years (or more). When traffic suddenly fluctuates, airports face either unnecessary infrastructure resulting in real estate vacancies and high costs or inadequate infrastructure resulting in congestion, crowds and delays. In response, airport management teams have redoubled their efforts to not only attract new air service but also maintain and expand existing air service.

(2) Diversification of revenue bases can help mitigate the impact of changes in air service. Vulnerability to air service fluctuations means airports are putting more emphasis on generating non-aeronautical revenues, including food and beverage, retail, rental car concessions, parking fees, and development of on airport property. While some passenger spending such as food and beverage are highly correlated with air service, achieving a greater per-passenger return provides an additional degree of diversification. In an era of minimal in-cabin amenities for economy class passengers, airports have stepped in to provide food, beverages, and other goods at concessionaires adjacent to airport gates.

(3) Changes in the how airlines deliver air service have significant effects on airport infrastructure needs. On average, airlines are now flying a greater number of larger aircraft and fewer smaller aircraft, resulting in less per-passenger burden on aircraft-related infrastructure such as runways, taxiways and gates, and placing more burden on passenger-related infrastructure, such as hold rooms, screening checkpoints, roadways and parking lots. This has caused many airports to review their future capital plans to ensure airside, terminal and landside infrastructure are in balance. Where possible, airport management is also phasing developments to make sure traffic levels are realized prior to making large new investments in the airport.

(4) Airport management and boards are examining their own legal and governance structures, organizations, and operations. As commercial service airports look to diversify revenues and become more commercial and entrepreneurial in their operations, many airport board members and executives have found that their state and local agencies are ill suited to managing today's airports. Whether they are held back by inadequate human resource, budgeting, procurement, contracting, or information technology systems, airports are examining their governance and organizations to make sure they have the right organizational model and talent to fill today's and tomorrow's jobs. In many cases, this means airport business systems have more in common with commercial enterprises than they do with the government agencies that may oversee them.

Airport Governance: No Man's Land

Airport governance is an important subject to explore further given the role it plays in how airports function and approach workforce capacity issues. The ability of airports to address the myriad operational, financial, and regulatory challenges they face is compromised by the fact that airports straddle the line between government agency and commercial enterprise. In many ways, large commercial service airports "use commercial means for public ends." That distinguishes U.S. airports from most of their foreign counterparts, which are generally private, profit-making organizations. At first glance, U.S. airports may appear similar to other government organizations in that they are often owned and operated by government agencies, set public goals such as providing air service rather than prioritizing profitability, and their executive leadership is ultimately accountable to the public owners. Whether owned and operated by a state, county, city, or a single-purpose or multi-purpose governing authority (e.g., Port Authority of New York and New Jersey), U.S. airports are fundamentally public services. On further examination, however, airports also differ from other public service organizations.

Most airports do not rely on state or local taxpayers to pay for their operations or investments. Instead, like private businesses, they rely on revenues generated from their variety of users and tenants.

Existing in a space between the public and private sector often means airports are saddled with the trappings of both. For example, notwithstanding the fact the many larger airports could be financially independent, some airports still rely on (or are forced to use) shared services from their state or local owner, including their human resources systems. Consequently, they may be hindered by civil service rules and bureaucracy when a fast response is required or when hiring for positions that do not have equivalent classifications elsewhere in government.

Because of the unique role airports play and the safety and security risks involved in even routine jobs, the risk of having inadequate talent in critical positions is immense. At the same time, civil service hiring systems may limit hiring and firing flexibility, while the commercial pressures to innovate and improve the passenger experience demand an even more highly skilled workforce. As airport leaders struggle to align their workforce with the evolving demands of the industry, they may find that they cannot do it alone.

The Airport Workforce: Cracks in the Pipeline

The complex and tumultuous state of the airport industry has a direct impact on the current airport workforce, and it is unclear how well the airport education, training, and development systems will be able to cope with the changing landscape. There are many reasons to question these systems' sufficiency. First, the relatively small size of the airport workforce (not including airport tenants like airlines or retailers) means that economies of scale are difficult to achieve. As a result, airport training and education (T&E) options on any given subject may be rather limited, so T&E providers might struggle to adapt to surges in demand or feel less competitive pressure to improve their offerings to keep pace. Smaller scale also typically means less funding for airport-specific T&E, which could inhibit the ability of these T&E providers to develop high quality content or hire experienced and capable faculty. Even if quality content is developed, the time and money it takes to develop it could limit the ability of providers to update it regularly. As a result, content may be focused on what students and the industry have needed in the past, rather than what will be needed for the workforce of tomorrow. Add to the mix rapidly developing digital technologies, changes in airport operating structures and management practices, and the need for a new generation of airport leaders to take the industry into the next decade and beyond, and the industry is left with serious questions regarding the ability of airport education and training programs to supplying enough employees with the knowledge and skills required for mission critical occupations.

An external threat to the airport industry is the competition for the workforce that comes from private sector organizations. Private sector companies are often able to offer higher salaries, greater flexibility and autonomy in the work environment, and more attractive employee benefit packages. For some jobs, such as those that focus on knowledge and skills in high demand throughout the economy (e.g., IT, Engineering), it is especially hard for airports to compete for high quality talent because prospective employees may not be aware of airport job or career opportunities within transportation (CUTC, 2012) or the airport industry specifically.

These concerns come at a precarious time for the industry, not simply because of the uncertainty and complexity discussed above, but also because demographic trends in the workforce threaten to place new demands on workforce development resources. Two major trends, Baby Boomer retirements and the greater representation of ethnic minorities and women in the workforce, present unique implications for the airport workforce.

In the latest projections of 2013, the U.S Bureau of Labor Statistics (BLS) established that the labor force participation will be smaller during 2012–2022 than in the previous 10-year period predominantly due to a decline in the prime age group of workers. In other words, as baby boomers move into an older

Highlight

The Department of Employment and Economic Development projects that the aviation industry will have more than 1 million job openings in the next 10 years, while government and industry forecasts anticipate critical shortages in the next two decades as 10,000 baby boomers become eligible to retire each week.

demographic bracket, there are fewer replacement workers to fill their spots in the labor market. This shrinking labor pool presents significant obstacles for an industry such as aviation that historically has not had a strong succession strategy. Further, many retirement-eligible staff have delayed retirement due to declining value of their assets. Thus, there may be a number of employees "ready and waiting" to retire, while more workers are becoming eligible to retire each year.

As the economy improves and retirement plans rebound, airport employees could leave the workforce in masses before airports can find and develop suitable replacements. At a smaller airport, there may only be one person in each position (e.g., finance manager; director of planning, marketing; airport manager, director of operations, and assistant to the director). Thus, if any one of those individuals were to depart suddenly, the airport is unlikely to have the talent identified to fill the resulting competency gaps. Airports must also be prepared to deal with a multi-generational workforce and the work environment and job arrangements favorable to a younger workforce (Zemke, Raines, & Filipczak, 2000).

Charting a Course for Workforce Sustainability

The remainder of this report contains the results of a systematic effort to identify the specific industry trends, challenges, and future scenarios that present the greatest impact to the airport industry; document the current workforce capacity and anticipated requirements in those occupations most critical to the future of the industry; and evaluate the current airport education, training, and development landscape against these requirements. With this information in hand, airport managers and training and education providers will be able to better anticipate future workforce needs and adapt their workforce development strategies accordingly.

In conducting this research, the project team pursued several related lines of research using both quantitative and qualitative research methods. This research involved focus groups and surveys of airport human resource professionals and senior airport leaders regarding industry trends, mission critical occupations, and workforce capacity challenges. The industry survey included input from 746 airport stakeholders. These participants represented a wide range of airport types, sizes, and geographic locations. An overview of the survey participants is provided in Exhibit 1-3.

Exhibit 1-3. Mission Critical Survey Participants

Airport Size Category	▪ Large Hub: 28.5% ▪ Medium Hub: 14.8% ▪ Small Hub: 21.1% ▪ Non-hub Primary: 22.0% ▪ Other: 13.1% o Examples of other include General Aviation Airport, GA reliever
Approximate Number of Airport Employees in Respondents' Airports	▪ Mean # of Employees Reported: 2,565 (*SD = 9,084)* ▪ Median # of Employees Reported: 210 ▪ Range of Employees within Airports: 2 – 67,000
FAA Region	▪ Alaskan: 3.3% ▪ Central: 3.9% ▪ Eastern: 12.8% ▪ Great Lakes: 13.1% ▪ New England: 3.3% ▪ Northwest Mountain: 11.0% ▪ Southern: 24.0% ▪ Southwest: 16.0% ▪ Western Pacific: 11.6%

This study also analyzed U.S. Bureau of Labor Statistics and U.S Department of Education data to assess the national projections for jobs similar to those found in airports. Finally, providers of airport training and education were surveyed and in some cases interviewed to provide a comprehensive perspective on strengths and gaps in workforce development programs.

Exhibit 1-4 provides an overview of the industry experts who participated in focus groups and/or interview data collections.

Exhibit 1-4. Focus Group and Interview Participants		
Key Contact and/or Participant	Title	Airport/Organization (at time of Participation)
Focus Groups- Set 1		
Janet Barrow	HR Director	Louisville Regional Airport Authority
Belinda Butler	EVP, Adm. & Diversity	Dallas-Fort Worth International Airport
Brent Cagle	Interim Aviation Director	Charlotte Douglas International Airport
Kelly Campbell	Executive Director	Lubbock International Airport
Jeff Horton	Director of Communication and Airside Operations	Tucson Airport Authority
Davey Jones	Director of Facilities	Jacksonville Aviation Authority
Gale LaRoche	Vice President of HR, Airport Authority	Wayne County Airport Authority
Marsha Madore	HR Manager	Greenville-Spartanburg International Airport
Walt Matwijec	AVP, Continuous Improvement	Metropolitan Nashville Airport Authority
Stephanie Mayorga-Tipton	HR Manager	San Francisco Airport Commission
Sharon McGhee	Director of Community Affairs	Charleston International Airport
Kim Scharrer	Administration Manager	Erie International Airport
Steven Schultz	Director of Information Technology	Jacksonville Aviation Authority
Somer Shindler	Senior Director of Airport Infrastructure Management	Denver International Airport
Sharon Traficante	Director of Administration	Connecticut Airport Authority
Focus Groups- Set 2		
Kelly Campbell	Executive Director	Lubbock International Airport
Ann Crook	Director of Aviation	Elmira Corning Regional Airport
Bryan Elliott	Director, Airport Management and Financial Services	Delta Airports Associates
Eric Frankl	Executive Director	Lexington Blue Grass Airport
Kurt Gering	SDIA Director, Talent, Culture, and Capability	San Diego International Airport
Larry Krauter	CEO	Spokane International Airport
Gina Marie Lindsey	Former Executive Director	Los Angeles International Airport

Exhibit 1-4. Focus Group and Interview Participants		
Key Contact and/or Participant	Title	Airport/Organization (at time of Participation)
Brian Ryks	Executive Director	Gerald R. Ford Airport
Mark Sapp	SVP Business Development	AirIT
Panel Interviews		
Shane Harbinson	Assistant Director	Austin Bergstrom International Airport
Tara Harl	Airport Management Program Lead	Kansas State Polytechnic
Jeff Lindeman	Senior Director HR	San Diego County Regional Airport Authority
Case Studies		
Shane Harbinson	Assistant Director	Austin Bergstrom International Airport
Ghizlane Badawi	Deputy Chief Operating Officer	
Vivian Martin	Human Resources Supervisor	
Kevin Howell	VP and COO	Greenville-Spartanburg International Airport
Jeff Lindeman	Senior Director HR	San Diego International Airport
Education & Training Program Interviews		
Kevin Caron	Head, Global Training & Developing Nations Airport Assistance Programme	ACI
Tara Harl	Airport Management Program Lead	Kansas State Polytechnic
Stephanie Kellner	Researcher/Program Developer, Financial Tools for the Trade	Port Jobs
Heather Worthley	Executive Director	
Annie Laurie Armstrong	Consultant and Ethnographic Researcher	Business Government Community Connections (BGCC)
Kim Kenville	Graduate Program Director	University of North Dakota
Lorena de Rodriguez	President	SSI, Inc.

The research findings are presented throughout the next four chapters. The chapters are intentionally sequenced to first explain the emerging demands facing airports and then to demonstrate how those demands are likely to impact which airport occupational requirements and workforce capabilities will be critical. Finally, the skill gaps identified with respect to new requirements are compared to the current state of airport training and education to identify where workforce capacity needs still remain. Thus, the reader is encouraged to proceed through this report to see the connections across chapters. However, given the breadth of information covered within, the chapters can be individually extracted for use (including the mission critical occupational profiles within Chapter 3 that may be utilized as stand-alone resources). The remaining four chapters cover the following information:

- Chapter 2- Industry Trends and Challenges

  This chapter explores several key trends and challenges that are likely to have a bearing on the future workforce demands of the industry. The trends and challenges reflect both ongoing and anticipated industry drivers that airport leaders will have to confront. The anticipated workforce implications of each of these factors is also

discussed. Following the discussion of the trends, several future scenarios which airport leaders helped develop are presented. These hypothetical future scenarios reflect the ways the trends could interact to present dynamic challenges for airport leaders. The scenarios also formed the basis of subsequent data collections regarding the occupations most critical to the future airport workforce.

- Chapter 3- Mission Critical Occupations

  Chapter 3 begins with an introduction to the concept of mission critical occupations (MCOs) and a description of the approach to selecting airport MCOs for this study. This is followed by quantitative data from the U.S. Bureau of Labor Statistics pertaining to related occupations in the national economy to shed light on labor supply and demand issues including the competitive challenges airports might face as they search for new talent. Next, occupational profiles explore each occupation in-depth including key requirements (i.e. knowledge, skills and abilities), forecasts, challenges, impacts on performance, strategic implications, and relationships to industry trends and scenarios. Finally, potential sources for future airport talent are discussed.

- Chapter 4- Education, Training, and Development Programs

  This chapter examines a range of airport-related education, training, and development programs including both academic degree programs and professional training and certifications programs. The analysis includes a high level overview of available programs; key capacity, quality, and cost indicators; and alignment of the programs to mission critical occupations and related competencies. Finally, this chapter includes an assessment of the sufficiency of the overall airport training and education landscape for meeting future airport workforce capacity needs.

- Chapter 5- Conclusions and Recommendations

  The report concludes with a discussion of the major workforce implications derived from the findings documented throughout the report. Chapter 5 also sets the stage for development of a guidebook that airports and other industry stakeholders can use to take charge of workforce planning and development to be better prepared for the challenges of today and tomorrow.

2. Industry Trends & Challenges

Chapter 2 Executive Overview

Major Sections of Chapter

- Identification of Major Industry Trends – Presents nine industry trends that will impact airports over the next 5-10 years, including workforce implications for each.
- Future Airport Scenarios – Presents three scenarios that represent plausible, future states under which airports may operate followed by a summary of how the future scenarios change requirements of airport jobs.

Value of Chapter to Airports Industry

- Provides evidence-based future context so that airport leaders at all levels can make better strategic decisions.
- Trends were identified based on qualitative and quantitative data from a wide variety of airports nationwide via focus groups, a survey, and case studies (see Appendix B for summaries) of airport executives and stakeholders.

Key Summary Points from Chapter

- The two most significant industry trends predicted to have major workforce implications for airports include: 1) *new technologies*; and 2) *financial and commercial pressures*.
- Across a large sample of airports (over 700 respondents), top two workforce requirements expected to emerge as result of industry changes include: *increased need for airport-specific industry knowledge across all jobs* and *increased technological savvy*.

How Leaders Can Make Use of Chapter

- Use trends as stimuli for discussion in roundtable forums and focus groups with leaders. Identify how these trends could impact their specific operations and workforce capacity needs.
- Consider which staff are high potentials based on those who are well positioned, due to skills and experience, to respond to these trends.

A key objective of this report is to thoroughly investigate the industry trends that will impact airport job requirements over the next 5-10 years. In addition to the general fluctuations in supply and demand for talent in various airport jobs, the need for certain jobs may change depending on developments in the industry. New technologies may emerge or become more widespread, financial and political pressures may increase, regulations could tighten for certain areas (e.g., safety), or the characteristics, quantity, and skill level of the workforce itself could change.

Although many of these developments are themselves unpredictable, examining the overarching trends and challenges that have recently faced the airport industry, along with hypothetical future scenarios that industry experts believe airports could encounter in coming years, can help airport leaders to better anticipate how their workforce requirements may be impacted.

Identification of Relevant Industry Trends

This section presents a number of relevant industry trends identified through a literature review, a survey, two sets of focus groups, and case study interviews (see Appendix B for summaries). Senior leaders and Human Resources (HR) professionals from small, medium, and large airports nationwide played a vital role in identifying these workforce trends, many of which are already impacting airports and are likely to do so in the future. The trends that emerged are likely not surprising to airport leaders, in part because leaders are already starting to see their impacts, but it is essential that leaders understand the future workforce implications of each trend (e.g., new job requirements,

new workforce capabilities needed). The following nine trends and challenges emerged as key influencers on the airport workforce; for each trend, a related workforce implication is presented to help leaders understand how trends will likely affect airports in a meaningful way.

- New Technologies

  New technologies are rapidly emerging and having widespread impact. Many of these technologies help improve the customer service experience and meet customer expectations, such as social media, ticket kiosks, Bluetooth or beacon technology, and the analytics of data collected as passengers move through the airport (e.g., who, when, and where passengers are using concessions or retail options). Other technologies improve airport operations or how employees perform their jobs, such as biometric badging and access control, smartphone apps for clocking in, digital interfaces on equipment, or computerized maintenance management systems for asset management. With the increase in electronic data generation and reliance on technology comes a greater need for software, storage capacity, and technical expertise to utilize data and technology effectively and efficiently. As airports scramble to keep up with the rapid pace of technological development, many leaders are also concerned that newly-implemented technologies will be obsolete soon after adoption. Focus group participants commented that new technologies will also require staff to be very adaptive and creative to meet customers' and stakeholders' evolving demands and expectations. A survey participant from a smaller airport identified that small airports are not often in a financial position to justify the costs of migrating to more efficient technologies.

  Related Workforce Implication:

  New technologies are designed to expedite airport operations, but without the necessary Information Technology (IT) skills, operations could be interrupted as employees learn to perform their jobs using new systems. In addition to IT skills, implementation requires flexibility and willingness to adapt to new technology, which can pose a challenge for some long-tenured employees.

  Small Airport Perspectives on New Technologies

  "We are using technology to improve bottom line – it's easier to have a one-time technology upgrade than to continuously pay staff [to perform a repetitive function]."

  "We have one person [handling social media] who is not particularly trained. This is not a strength that we have."

- Financial and Commercial Pressures

Small Airport Perspectives on Financial Pressures

"Larger airports might hire directly [for most workforce needs], but smaller airports try to reduce overhead costs through contractors."

Airports are experiencing financial pressures with an increased focus on the bottom line and more traditionally "commercial" measures of success. Airports are typically expected to be financially self-sufficient and adopt commercial practices to deliver services more efficiently and responsively. Due to consolidation of airlines, the number of flights and passengers at many airports have declined, but overhead costs associated with operating and maintaining facilities and meeting federal safety and regulatory requirements have not subsided. All airport occupations are pressured to enact processes to control costs and to do more with less, helping to contribute to the bottom line. A common approach to meeting financial objectives despite uncertain passenger traffic levels is for airports to diversify revenues, such as finding ways to generate non-aeronautical revenues (e.g., leasing unutilized land). Airports may face various challenges, however, in diversifying revenues based on location or specific circumstances. For example, airports in urban environments may not have much unutilized land that is available to lease. Also, with the growing popularity of ride-sharing services (e.g., Uber and Lyft), which reduce taxi trips and self-parking, airports may be challenged on how best to offset the loss of revenues from the traditional players with revenues from ride-sharing services. Furthermore, the existing airport workforce does not always possess the knowledge and experience with commercial practices and cost diversification strategies needed to adapt to these pressures. According to focus group participants, hiring for these new capabilities can be especially challenging for airports that rely on municipal personnel systems that may not have the needed job in their classification system and pay scales, which can make it difficult to attract candidates with significant private sector experience.

Related Workforce Implication:

Increased financial pressures require airports to adapt and innovate, requiring staff with an entrepreneurial mindset. All employees, including those that do not directly deal with financial strategy or diversifying revenues, need to be responsible for controlling costs to help contribute to the overall airport's success.

- Political Pressures

Despite efforts to operate airports more like a business, state and local government leaders continue to wield influence over airport management and may seek to use this influence for political and social reasons, such as supporting the local economy and creating more jobs. Meanwhile, airports are moving toward greater self-sufficiency to decrease reliance on government funding and operate more entrepreneurially. Focus group participants from municipally-operated airports across the country commented that it has become increasingly difficult to operate entrepreneurially while remaining a part of a government bureaucracy. A survey participant also commented that delays in government funding until the last minute limit the airport's ability to plan large-scale projects. Furthermore, requirements to use standard civil service staffing and HR systems also substantially impact flexibility and responsiveness to staffing needs. Many airport-specific positions simply cannot be filled based on the position requirements and wage/benefit structures of state or municipal governments. Although airports generate their own revenue, municipally-run airports may still be influenced by government-wide budget cuts or hiring freezes. As a result, municipally-operated airports are facing an inherent tension between civil service/political structures and motivations and commercial/ enterprise-driven models. For example, one current challenge that airports are facing involves living wage laws. In many areas, politicians are setting wage standards and/or requirements

Related Workforce Implication:

Airport leaders must be adept at maintaining relationships with stakeholders, satisfying political leaders, while sustaining the airport financially. Timely hiring of competent staff is very difficult for airports required to rely on standard civil service positions and wage structures, especially when customization is not allowed for airport-specific jobs.

Large Airport Perspectives on Political/Government Constraints

"Over time, I think the U.S. will have to move to a privatized model to get away from the political contradictions and be more entrepreneurial like the rest of the world."

for healthcare plans, which can have significant impacts on both the airport's costs and on an airport's business partners or tenants.

- **Regulatory Environment**

Airports operate in a highly-regulated environment, which means both increased operating costs and substantial risks associated with non-compliance. Airports are required to enact processes to successfully conform to all regulations including Part 139 of the Federal Aviation Regulations, Occupational Safety and Health Administration (OSHA) regulations on workplace safety, Environmental Protection Agency (EPA) regulations on environmental impact, as well as various state and local statutes and codes. One major challenge of the regulatory environment is its financial impact. A few focus group participants lamented that regardless of fluctuations in revenue generated from gate and concession leases, airports are still required to spend roughly the same amount to keep the airport up-to-code. At the same time, new regulatory requirements (e.g., ADA compliance, Davis-Bacon requirements, and historical preservation) continue to be added, each with the potential to impact airport finances, processes, and workforce requirements. This further pressures airports to seek additional sources of non-aeronautical revenues that are less subject to short-term fluctuations. It also pressures airports to develop new and more efficient ways of monitoring and managing regulatory compliance to reduce both risk and cost.

Related Workforce Implication:

Airport employees must be quick and effective in complying with existing and new regulatory requirements, especially with simultaneous financial pressures demanding efficiency. One strategy is to implement new technologies to help employees become more efficient, though training is required to be successful.

- **Changing Demographics**

Airports are facing many impending retirements, including retirements of many high-profile and long-tenured Airport Directors. One focus group participant estimated that 50% of their workforce and 80% of their senior staff would be eligible to retire by 2020. Without proper succession planning, these widespread retirements could result in workforce gaps as well as a major loss of institutional knowledge and skills. Recruiting and integrating the younger workforce with older, more tenured employees is also challenging due to generational differences in work styles, technological proficiency, and career goals. However, one survey participant commented that integrating generations can also be beneficial, as it results in a greater variety of perspectives and skillsets. Career portability presents another challenge, as many younger employees do not anticipate spending several years in one organization. It will be necessary for airports to develop more creative means to retain the younger workforce to realize the return on investment in their training and development. Finally, focus group participants noted airport jobs may not be viewed as particularly attractive to the younger workforce, given that they seem less concerned about long-term job security and retirement benefits, while the private sector typically offers higher pay in the short term.

Related Workforce Implication:

Impending retirements require proper succession planning to prevent major losses of institutional knowledge and skills, as well as a shift in hiring practices and job flexibility to be attractive to high-quality younger candidates.

Gender and ethnic diversity are also increasing in the workplace, with potentially significant implications for the airport workforce. The aviation industry, like many others that were typically male-dominated, is beginning to recognize the benefits of broader workforce participation among women. In fact, there are some very high-profile female leaders within a number of airports, which has started to distinguish airports from airlines and other aviation companies that are still more male-dominated. This gender shift may require the industry to rethink

Commercial Airport Perspectives on Changing Demographics

"The airport industry needs to get much better at engaging talent much earlier in the [talent pipeline]. We do not have a coordinated approach at a national level to address these problems."

its development and retention strategies as women often request more family-responsive policies than their male counterparts (Zemke et al., 2000). Likewise, the number of ethnic minorities in the applicant pool is increasing. In his discussion of Transportation in the 21st Century, Robert E. Skinner, Jr., the Executive Director of the Transportation Research Board stated, "We are becoming a nation of immigrants again. The immigrant population nearly doubled between 1950 and 1990. A net population growth from immigration of 820,000 per year is assumed in Census Bureau projections through 2035" (Skinner, 2000). According to the latest projections by the U.S. Bureau of Labor Statistics (Toossi, 2013) and the U.S. Census, minority groups such as African Americans, Asians, and Hispanics are each projected to increase their labor force numbers and to account for a larger share of the labor pool in 2022 than they did in 2012; Asians are expected to be one of the fasting growing demographic groups followed by Hispanics due to increased immigration. Immigrant workers could become an invaluable asset for airports as globalization continues apace presenting language and customer service challenges for airports.

- **Succession Planning and Leadership Development Needs**

As airports increase efforts to fill positions that will be left vacant due to upcoming retirements, they may find that leadership training among current employees in entry- and mid-level positions is inadequate to prepare them for advancement. This presents a challenge in terms of succession planning across all levels of the workforce. At the same time, one participant noted that experienced professionals are difficult to recruit externally because they may not have the airport experience and training that is typically only available to current airport employees. Participants also commented that many entry- and mid-level staff lack the leadership and managerial skills required to fill leadership roles. Often, this is due to a need to "fill the job now", taking the focus and resources away from developing entry-and mid-level staff.

Related Workforce Implication:

A proactive approach to leadership development and succession planning will have long-term benefits for airports. Developing entry- and mid-level employees on leadership skills now will set up an airport with high quality internal candidates that have the requisite airport experience and knowledge to fill future executive position vacancies.

Large Airport Perspectives on Leader Development

"As a larger airport, we look into internal rotations, to help provide people with perspectives on a broader set of disciplines and multiple capabilities."

- **Gaps in Technical Trades**

Airports face a decrease in employees with technical training (e.g., plumbers, electrical, HVAC). Younger generations face pressures from societal norms, businesses, and educational systems to obtain a four-year college degree, which decreases the number of younger individuals pursuing careers in technical trades. Furthermore, many of those entering these trades may not be aware of the job opportunities available in the airport industry. For existing employees in skilled trade occupations, increased technology requires more extensive technical training that may not be seen as worthwhile for those late in their careers. One survey participant commented, "Rather than a tool belt or tool box, these trades now require a laptop computer." Many employees who have been working in skill trades their entire careers may not have received additional training to take advantage of the latest technology. The lack of computer skills leads to a skills gap that is becoming more apparent across the industry. Conversely, survey participants mentioned that employees who do receive training often move on to higher paying private sector jobs after completing training. Other long-tenured technical employees might leave their position to seek pay increases at other organizations upon reaching the maximum pay grade in the municipal personnel system, leaving no opportunity for

Related Workforce Implication:

With more emphasis on academic degree programs, there is a growing shortage of skilled trade workers across the country. This makes it difficult for airports to fill trade jobs. To exacerbate this trend, skilled trade laborers may not view airports as a source for long-term, competitive career options in their trades.

advancement in their current position.

- **Compensation Competition**

Airports are struggling to provide adequate compensation for employees in competitive career fields, which makes retaining current staff and attracting new employees more difficult. Airports have traditionally offered attractive pension, healthcare, and other benefits that offset somewhat lower salaries, but airport governing authorities have decreased these in recent years. Further, many airports are unable to increase base or merit compensation due to municipal restrictions. As a result, survey participants noted that airport wages are often not as competitive as those in the private sector. Airports face the risk of losing both job candidates and existing employees to other organizations that can offer higher pay and greater benefits. This is especially true for occupations that are functionally similar across multiple industries, such as Human Resources and Finance. One survey participant commented, "…being employed by an airport is just another company" to many of these employees. High level airport leadership positions, which require very specific knowledge and experience, are difficult to retain for some airports with municipally-run compensation systems that may be unable to pay true market value executive salaries.

Related Workforce Implication:

Because airports often cannot increase compensation to be competitive with private industry due to municipal or budget restrictions, airports must pursue creative strategies to increase attractiveness of job postings such as offering unique developmental opportunities and moving beyond static job postings to include video-based realistic job previews.

Municipal Airport Perspectives on Compensation Competition

"We're basically public institutions that are still funding defined benefits plans. Everyone on the for-profit side has moved away from that. That's another hard fixed cost, where you're at the whims of someone else and can't control the bottom line."

"A lot of airports are separate operating entities but some are parts of cities and counties, so they have to go through city's compensation and benefits system. They have a lot of constraints other airports might not have."

- **Local Job Market Factors**

Airports face local and regional job market challenges in terms of demand and competition for employees in critical occupations. Not only does demand for employees in different occupations vary across the country, but the concentration of employees varies as well. This presents two major challenges for the airport industry. On the demand side, airports must compete with organizations in the local economy that have a high demand for the same employees. For example, one survey participant noted that the labor market is very competitive in the San Francisco Bay Area, especially in IT, given the numerous private sector tech companies. The opposite problem can occur when the supply of talent is limited due to a lack of job opportunities in the local economy. A survey participant from a rural airport mentioned that it is difficult to find suitable maintenance and operations personnel due to the limited number of experienced candidates in their location. Depending on the location of the airport, the job market for employees in certain high-demand occupations may be quite small, making it difficult for the airport to find suitable candidates locally. This may force them to look further afield, increasing recruitment and compensation costs. It is often difficult for small airports with few marketing resources to sufficiently recruit employees compared to larger airports with greater resources for effective marketing and branding. Further, airports in rural or small metropolitan areas face

Related Workforce Implication:

Qualified applicants are often scarce or hard to recruit in local job markets, requiring airports to invest more time and resources into recruitment efforts or entry-level development programs to train the requisite knowledge and skills. Additionally, municipal restrictions and minimum qualifications can restrict movement across jobs making it difficult to shift talent once an employee is placed in a particular job track.

Small Airport Perspectives on Local Job Markets

"There is also a brain-drain problem in rural areas as younger people move to bigger cities for college etc., leaving smaller communities. The aviation industry will not fill the pipeline [internally], so we must reach out to allied professions (planning, engineering, accounting, finance)."

challenges effectively drawing qualified candidates from larger metropolitan areas who may be less interested in living in a smaller community.

Future Airport Scenarios

Based on these trends and challenges, a technique called "futuring" was used in focus groups with seasoned airport leaders to identify how the trends are likely to converge in real airport contexts. From this exercise, three hypothetical scenarios were developed to provide plausible, future states under which airports may operate. This allows airport stakeholders to see examples of how the future trends may combine to create changes and challenges for airports to stay efficient and functional.

As technological development was consistently seen as one of the most impactful trends facing airports in the next decade, the first two scenarios touch on different facets of technology's influence on airports and the workforce. The first scenario focuses on the emergence and integration of new technologies on airport operations in light of the changing demographics of the airport workforce. The second scenario highlights the role of technology in supporting the financial viability of the airport through improvements to the passenger experience and targeted marketing. The third future scenario focuses on financial, commercial, political, and regulatory pressures for airports, combined with some aspects of compensation competition and succession planning. Each potential future scenario is provided below followed by a summary of how the future scenarios could impact requirements of all airport jobs.

Scenario 1: Integrated Business and Safety Technological Systems.

Imagine your airport has developed into a highly-complex enterprise built around integrated systems and technologies that impact almost every airport job in some way. Advanced technology is being used in all aspects of your airport operations and administration to predict, monitor, and correct issues related to compliance, safety, and operational efficiency. For example, your airport Safety Management System leverages technology to integrate with maintenance systems to provide a risk-based approach to maintenance (e.g. tracking maintenance requests, identifying trends, recommending inspection and improvements). This transition has been difficult for many long time airport employees, while attracting a new generation of technology savvy employees has also proven difficult in some occupations. NextGen, GIS, and mobile technologies, in general, have enabled unparalleled detail on the movement of aircraft, equipment, and personnel, while the associated data storage and processing power required to manage this information has grown exponentially. Environmental reporting systems are collecting and analyzing data from multiple sensors to monitor and mitigate environmental impact and expedite response during emergencies. Support functions (HR, finance, security/badging) all rely on off-the-shelf solutions that may need to integrate with other airport systems. Equipment involved in almost every operational role requires the use of computers or touch screens.

Scenario 2: The Passenger-Centric Airport.

Imagine that your airport is designed with passenger experience first and foremost to your business. You are already leveraging or are considering technology and data analytics to customize the passenger experience. Customer-facing technologies such as ticket kiosks, mobile apps, social media, Wi-Fi, Bluetooth, and beacon technology all collect data as passengers move through the airport. With the power of big data and analytics, your airport is trying to take advantage of available data (e.g., which passengers are using which concessions, how much time passengers spend in each location within the airport) and use it to both improve the passenger experience and add value to your tenants. For example, mobile apps are available to passengers to locate parking based on availability and provide personalized information on distance to their terminal and length of the trip. Social media are seen as a primary tool for engaging with passengers, informing the public about events or emergencies and reinforcing the airport brand. Your airport is considering predictive technology that can be used to anticipate bottlenecks at security, for example, and provide updates to passengers to manage expectations and avoid flight delays. Over time, your airport hopes to use data to improve airport designs and improve traffic flow of vehicles, passengers, and aircraft. At the same time, your airport must remain accessible to non-adopters and visitors who may be uncomfortable or unfamiliar with many of these technologies; it is important to ensure those passengers do not become overwhelmed or disoriented. Further, many of the newer and younger airport employees are more comfortable with electronic forms of communication but some do not demonstrate the communication skills and confidence expected in customer-facing roles.

Scenario 3: Increased Financial, Market, and Political Pressure.

Imagine your airport is feeling continuous competing pressures (e.g., political, regulatory, customer) to provide a financial return while also offering competitive wages and benefits, maintaining positive community relations, and increased security regulations following a terrorist attack at another airport. To respond to these pressures, your airport has sought to be more entrepreneurial, innovative, and competitive by establishing an independent airport authority, avoiding traditional civil service personnel systems and pensions, and seeking alternative revenue streams such as commercial real estate development on your unused airport land. All airport employees are expected to be more efficient and "do more with less." At the same time, many highly-tenured employees have elected to retire or seek positions elsewhere in the civil service and there is little time to recruit, train, and develop the new employees that will take their place. Simultaneously, following the terrorist incident, the FAA and TSA are examining activities at your and other airports, many of which are traditional airport security responsibilities, to reassure the public. Notwithstanding the move to an authority, local political leaders strive to maintain influence over significant airport decisions, such as outsourcing and construction of an airport hotel. Moreover, airline consolidation has produced a smaller number of domestic airlines, resulting in a sense of increased competitiveness to maintain access to important markets. Your airport is increasingly looking for ways to differentiate itself in the eyes of passengers, tenants, and other stakeholders to maintain and grow business with all of them.

Impact of Future Scenarios

The future airport scenarios were presented to participants in a web-based survey administered to over 700 airport personnel and leaders. Participants were asked to imagine their airport was facing this scenario and then to respond to a series of questions about how the scenario would affect jobs within their airport.

Results demonstrate that airport jobs that are mission critical today would become *even more* vital to the success of the airport under each of the future scenarios presented. That is, it is expected that key airport jobs will be more tightly bound to the strategic direction of the airport, be more important for achieving performance objectives of the airport, and more likely to result in significant issues if and when job vacancies occur. Additionally, the survey results indicated high agreement that requirements of airport jobs are going to be influenced by the future trends and challenges identified. This finding reinforces the need to focus on workforce capacity and take a proactive approach to workforce development.

Across all three future scenarios, two workforce requirements emerged as the top two capabilities most likely to increase in importance (see Exhibit 2-1):

- Industry-specific airport knowledge
- Increased technological savvy.

This finding indicates that the future will likely require all airport employees to have airport industry knowledge as well as technology skills to be successful. More on this finding can be found in Chapter 5: Conclusions and Recommendations, but it has implications for workforce recruitment, hiring, and training, at a minimum.

Additionally, results indicate that airports will require stronger managerial skills for airport leaders, increase the negative impacts of job vacancies, increase interdependency of airport jobs across functions, and require higher levels of knowledge of safety standards and regulations. Exhibit 2-1 provides the percentage of airport professionals that agree or strongly agree that each workforce requirement will be necessary in the future.

Exhibit 2-1. Workforce Requirement Impacts of Future Airport Scenarios

Scenario Impact	% Agree or Strongly Agree
Industry-specific knowledge about airports required	85.0%
Increased technological savvy required	80.9%
Strong managerial skills required	76.7%
Job vacancies will cause serious difficulties	75.7%
Increased interdependency of jobs	75.2%
Knowledge of safety standards and regulations required	72.3%
Specialized certifications or educational attainment required	66.6%
Jobs will be difficult to fill because they require specialized knowledge or skills	53.5%

These future workforce requirement findings apply to all airport jobs, but the trends and future scenarios can differentially influence airport jobs now and in the future as they continue to become more prevalent and impactful. The next chapter, *Chapter 3: Mission Critical Occupations*, focuses on specific impacts for mission critical airports occupations that will be in high demand, make a significant impact on operations and business, and where workforce development should be prioritized in the future.

3. Mission Critical Occupations

Chapter 3 Executive Overview

Major Sections of Chapter

1. Definition of Mission Critical Occupations (MCOs) - Provides an overview of what an MCO is, the value in identifying MCOs, and the process used in this study to select airport MCOs.
2. Identification of MCOs - Describes criteria used to select the MCOs as well as the data gathered from participants.
3. Information for Each Mission Critical Occupation - Includes a profile of each MCO that describes the occupation, forecasts the future number of employees, and identifies occupation-specific information relevant to recruitment, turnover, training and development, and performance challenges. National trend data on occupational employment are also presented.
4. Demand for Mission Critical Occupations - Provides an overview of data on concentration of MCOs across the U.S.
5. Determining Mission Critical Executive-Level Positions - Explains perceived impact of executive-level airport positions on the future scenarios described in Chapter 2.
6. Identification of Sources of Talent to Fill MCOs - Describes ways to bring in new employees from other industries or educational programs to ensure sufficient talent is available within the MCOs.

Value of Chapter to Airport Industry

- Airport MCOs are the occupations that will be in high demand, make a significant impact on operations and business, and where workforce development should be prioritized. Sustaining and recruiting talent for these MCOs can be challenging in a labor market that has a small labor pool of qualified workers, is highly competitive, or where potential employees may not be aware of opportunities within the airport industry. Thus, it is important that airports focus HR strategies on MCOs to ensure they can continue to meet community and customer demands while adopting new advances to their business and operations.
- Airport MCOs for the next 5-10 years were identified and include:
  - *Airport Development*
  - *Airport Operations*
  - *Airport Security*
  - *Electrician*
  - *Engineering*
  - *Financial Analysis and Planning*
  - *Information Technology (IT)*
  - *Project Planning*
- Information on each of the MCOs, including job requirements, challenges, and expected demand can give leaders a better understanding of upcoming needs in airports and how to best address them.

Key Summary Points from Chapter

- All MCOs are expected to increase in employment over the next 10 years; only two job types within the MCOs are expected to decrease – *Transportation Security Screeners* and *Computer Programmers.*
- The three MCOs with the greatest projected increase in employment (2014-2024) across all industries include: *Electrician, Information Technology*, and *Financial Analysis and Planning.*
- Across all MCOs, airports have difficulty providing sufficient developmental opportunities and recruiting qualified employees due to the need for a highly specialized skillset. All MCOs except *Airport Security* were found to lack a solid career track within airports and to have high competition across industries for employees.
- Demand for MCOs varies by state; airports may be able to better understand and overcome their recruitment and retention challenges when considering local demands.
- Challenges with filling workforce gaps with skilled talent had led to the use of contractors; particularly for IT professionals.

How Leaders Can Make Use of Chapter

- Focus their workforce development efforts on MCOs to maximize impact on organizational performance.
- Anticipate hiring challenges associated with MCOs to fill openings more quickly with qualified applicants.
- Identify potential sources of talent to fill the MCOs, such as downsizing industries like Manufacturing or the Federal Government, as well as relevant educational programs.

All of the jobs that individuals fill in airports are important and needed for the successful function of the organization. However, there are some jobs that are more directly related to the mission of airports and the ability to achieve strategic and performance goals. A key objective of this project was to identify occupations that will be mission critical in the next 5-1CIP0 years so that airport leaders can develop targeted recruitment strategies and prioritize their investments in workforce development.

Defining Mission Critical Occupations (MCOs)

Mission critical occupations (MCOs) for airports are those that are essential to executing the airport's mission including supporting daily operations and executing on the airport long-term strategic goals. While all current occupations within airports are valued and contribute to mission success, there are some occupations that will be more critical for airport longevity, effective operations, and innovative business successes in the next 5-10 years.[1] "Mission critical" does not simply imply a job that is needed for continuity of operations; it also refers to jobs for which there is a current or anticipated shortage of staff or knowledge required for the position despite its importance. Thus, for these occupations it is especially critical that airports develop creative strategies to minimize the potential for extended vacancies.

The MCOs identified in this research should be broadly applicable to most commercial service airports, but that does not mean they will be the most critical positions for every airport. For example, snowplow drivers could be particularly challenging to hire for some airports that operate in harsh winter conditions. While the MCOs identified in this chapter may be most deserving of industry-wide attention, airport leaders must consider their own airport's needs and challenges when contemplating investments in workforce capacity.

Value in Identifying MCOs. There are several ways in which knowledge of the occupations most critical to an airport's success can help airport leaders prepare for the future. Examples include:

- Employee and leader development: Roll out a development strategy for employees currently in the MCOs and for the internal talent with high potential for leadership positions within the MCOs. This includes identifying how the jobs will change over the next few years, investing in assessment of proficiency levels in the required skills, and providing developmental opportunities such as training, experiential learning (e.g., coaching, job shadowing), and on-the-job experiences to those personnel.
- Retention and recruitment strategy: Articulate how existing talent will be supported and encouraged to remain within the organization; this includes providing necessary resources and learning opportunities to address shifts in their roles. Simultaneously, airports need to outline a recruitment strategy for finding new talent in the labor market (within and outside the industry), attracting that talent to airport jobs, and preparing them with the airport-specific knowledge required.
- Succession planning: Prepare a succession pipeline of workers capable of promotion into positions with increasing levels of responsibility. This includes growing a talent pipeline up to 2-3 levels deep of talent for each MCO. The first level of talent should be "ready immediately" whereas the next two levels should be grown to assume roles of their predecessors. Thus, development of MCO skills should expand beyond current employees within the MCOs to prepare the next level of workers.

Beyond identifying those occupations that will be mission critical in airports, it is important to understand job competencies that are mission critical for the airport workforce. Competencies can be generally understood as related elements of knowledge, skills, and abilities (KSAs) that enable successful job performance. By determining which competencies are needed to perform MCOs and the best sources for that talent, airports can begin to map out

[1] Information regarding the job responsibilities and required knowledge, skills, and abilities for all covered airport occupations is provided in Appendix B. This includes both occupations that were identified as mission critical as well as other occupations included in the organizational chart that were not selected as the most mission critical.

how to best attract the new talent. The competencies can also be used to develop new position descriptions, update existing positions, create new positions, select airport staff, or procure contractors with the necessary expertise.

Criteria for Selecting Airport MCOs. Expert practitioners in workforce development that identify MCOs use multiple criteria to assess criticality (U.S. OPM, 2005; GNB, 2010). Three commonly accepted criteria were used to identify MCOs in this study:

- Strategic alignment to the airport's future plans: The occupation is integral to executing the strategic vision of airport leadership and implementing the initiatives that move the airport forward. The occupation could impact internally focused aspects of airport strategy (e.g., maintaining strong customer relations with passengers and airlines) or external aspect of strategy (e.g., addressing new safety regulations) that further the airport's long-term growth and sustainability.
- Required to achieve key performance measures: The occupation ensures the airport is able to achieve its goals around key performance criteria such as financial requirements, on-time departures, customer expectations, and safety and security standards.
- High impact of vacancy: The occupation requires specialized skill sets that are difficult to find in applicants, is expecting a large number of retirements, or will have an insufficient pipeline of future talent (i.e., hard to fill vacancies). Should vacancies occur within this occupation, continuity of operations could be seriously threatened.

Process for Identification of Mission Critical Occupations

The process depicted in Exhibit 3-1 was used to analyze airport occupations based on the above stated criteria and identify those that will be essential for airports in the next 5-10 years. Both qualitative (Steps 1 and 2) and quantitative data (Steps 3-5) were collected to support this analysis.

Exhibit 3-1. Steps in the Identification of Mission Critical Airport Occupations

Step	Explanation and Potential Qualification(s) for Inclusion
1. Occupations Identified as Important in Existing Publications	▪ During the literature review, the research team noted if specific occupations were called out as being important to airports, likely to become more important due to expected changes, or closely tied to the achievement of airport strategic goals. ▪ Because literature on airport professions was sparse, this did not serve as a disqualification for occupations but rather a first step in identification of MCOs.
2. Identification of MCOs by Mid-Level Airport Leaders	▪ Focus groups with mid-level leaders from a variety of airports of different sizes and in different regions included a focus on identifying mission critical occupations. ▪ Example questions asked of the leaders included: o *Which occupations in airports, if not performed, would compromise the safety of passengers and/or aviation personnel?* o *Which jobs, if not performed, would halt or significantly delay delivery of service?* o *Which positions are instrumental in delivering on commitments and meeting airport strategic goals?* o *What occupations are most necessary to support safety management?* ▪ Input from leaders was considered in the final identification of MCOs and job requirements; however, omission of an occupation from the focus group discussion was not grounds for elimination of the occupation from consideration.

Exhibit 3-1. Steps in the Identification of Mission Critical Airport Occupations	
Step	Explanation and Potential Qualification(s) for Inclusion
3. Input on Occupation Criticality from Industry Stakeholders	▪ On the *Mission Critical Survey,* members of AAAE were asked to select the top five airport occupations that would be the most mission critical in the next 5-10 years based on strategic alignment of the job, impact if vacant, and relationship to key airport performance measures. ▪ Analyses were conducted to examine the percentage of participants who rated each occupation as being among the top 5 most mission critical. ▪ Occupations that were indicated as being in the top 5 by at least 20% of respondents were included in the list of MCOs (*Note:* All occupations that met this criteria were retained, but this criteria did not eliminate occupations, specifically if the occupations met other criteria noted below.)
4. Linkage to Airport Performance Criteria	▪ Survey respondents were asked about the impact of occupations on airport performance criteria including: o On-time flight departures o Airport finances o Improved passenger experience and meeting passenger expectations o Improved customer service with other stakeholders, such as airlines/tenants, concessionaires, contractors, TSA, and the FAA o Ensuring proper safety and security o Environmental sustainability, water, and air quality ▪ Results were aggregated into a *mission critical index* that factored in the above performance criteria as well as vacancy risk, difficulty filling open positions, impact on airport strategic goals, involvement in key decisions, and expected negative consequences if the job is not performed properly. ▪ Analyses were conducted for each occupation, with those receiving the highest ratings for impact on performance criteria being included in the final list of MCOs.
5. Confirmation of MCOs Through BLS Projections	▪ BLS data for identified occupations were examined to ensure that the occupations would continue to be in high demand in the next 10 years. ▪ Occupations could be excluded if a large decrease was expected in the number of jobs from 2014 to 2024.

In summary, occupations identified in Steps 1 and 2 were deemed mission critical if at least 20% of the survey participants included the occupation in their list of top 5 MCOs and/or the occupation ranked in the top 10 of the airport occupations on the mission critical index. The mission critical index is a composite of factors that each occupation was rated on including its relationship to these performance criteria:

- On-time flight departures
- Strong finances of overall airport
- Improved passenger experience and meeting of passenger expectations
- Improved customer service with other stakeholders, such as airlines/tenants, concessionaires, contractors, TSA, and the FAA
- Ensuring proper safety and security
- Environmental sustainability, water, and air quality

The mission critical index also factors in vacancy risk, meeting airport strategic goals, impact on key decision making and the high consequence of error for the airport if the job is not performed properly. Any occupation that fell below the 20% threshold of being rated in the top 5 airport MCOs and yet was retained as an MCO had a particularly high mission critical index (i.e., 3.80 or greater out of 5). No mission critical occupations were excluded as a result of Step 5 as the projections confirmed continued high demand for these occupations in the economy.

Results of the Mission Critical Occupation Survey

Using these criteria, 13 MCOs were identified. Some of these occupations were grouped into categories based on similarity in the work requirements performed as well as how the occupations fit within the organizational and operational structure of airports, resulting in a total of eight occupations/occupational clusters. Ratings for the selected MCOs and the major factors that contributed to their selection are provided in Exhibit 3-2.

Exhibit 3-2. Survey Ratings for Mission Critical Occupations

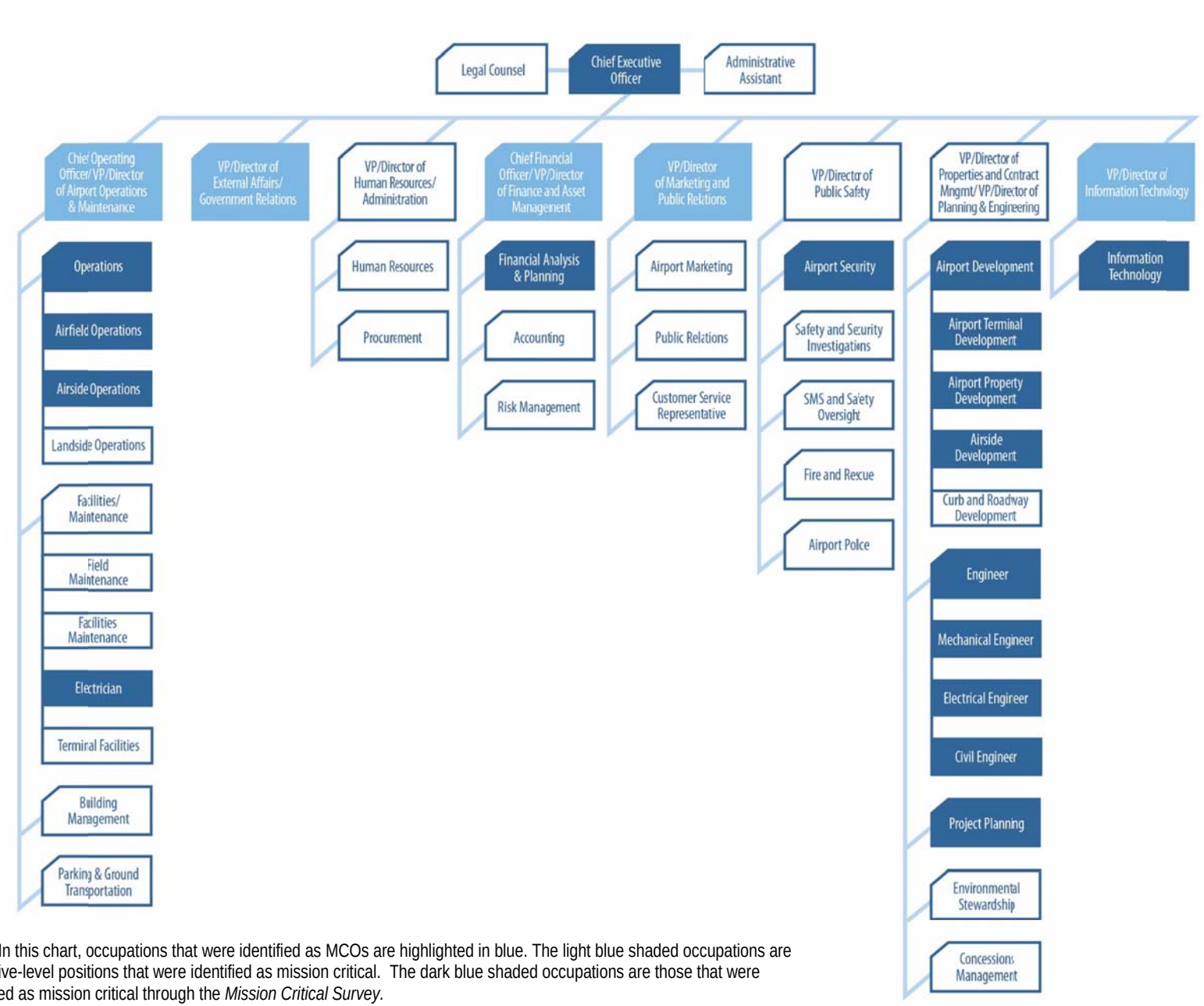
Mission Critical Occupation	% Participants Rating Occupation in Top 5 Mission Critical	Mission Critical Index	Top 3 Index Factors (for MCOs below 20%)
Airport Development			
Airport Terminal Development	13.3%	4.08	• Improved passenger experience and meeting of passenger expectations (4.57) • Improved customer service with other stakeholders (4.37) • Key to Decision Making (4.33)
Airport Property Development	24.2%	3.55	(Top 5, met 20%)
Airside Development	14.0%	3.95	• Ensuring proper safety and security (4.42) • Key to Decision Making (4.30) • On-time flight departures (4.19)
Airport Operations			
Airfield Operations	35.8%	3.90	(Top 5, met 20%)
Airside Operations	34.9%	3.88	(Top 5, met 20%)
Airport Security	36.1%	3.74	(Top 5, met 20%)
Electrician	5.8%	3.89	• High Consequence of Error (4.68) • Ensuring proper safety and security (4.58) • Vacancy Risk (4.42)
Engineering			
Civil Engineer	5.6%	3.91	• High Consequence of Error (4.67) • Meets Strategic Goals (4.47) • Key to Decision Making (4.47)
Electrical Engineer	2.4%	4.03	• Ensuring proper safety and security (4.67) • On-time flight departures (4.33) • Strong finances of overall airport (4.33) • High Consequence of Error (4.33)
Mechanical Engineer	2.4%	4.05	• Vacancy Risk (5.00) • On-time flight departures (4.50) • Ensuring proper safety and security (4.50) • Environmental sustainability, water, and air quality (4.50) • Meets Strategic Goals (4.50)
Financial Analysis and Planning	36.1%	3.67	(Top 5, met 20%)
Information Technology (IT)	32.5%	3.89	(Top 5, met 20%)
Project Planning	21.3%	4.00	(Top 5, met 20%)

To gather information on executive-level occupations, a separate survey was sent out to a different subset of AAAE members. Executive-level occupations were presented in a separate survey because it was expected that most airport stakeholders would view the executive jobs as all mission critical since they are required for oversight and continuity of operations. Thus, to avoid overshadowing identification of the essential MCOs that are not necessarily present at the leadership level, a randomly selected group of airport stakeholders were asked to provide input on executive occupations. Participants were asked which type of executive-level position (e.g., Airport Operations and Maintenance, Information Technology, Properties and Contract Management) would be the most essential for each of the three future scenarios. Survey questions were similar to those on the general mission critical survey.

After being presented with the futuring scenarios (described in Chapter 2), survey participants indicated that some categories (or divisions or areas) of executive-level positions will be more critical to meeting airports' future work requirements. These included the executive-level areas/divisions of:

- Airport Operations and Maintenance
- External Affairs/Government Relations
- Finance and Asset Management
- Information Technology (IT)
- Marketing and Public Relations

Using information gathered from the literature review, focus groups, and the surveys, a sample organizational chart was created to show the location of mission critical occupations within the context of many different airport occupations. It should be noted that this chart is designed to illustrate the wide variety of airport occupations, highlighting those that are mission critical. Each airport will likely have an organizational chart that differs somewhat from this example because of the varying structures and reporting authorities that are used to organize airport functioning. For example, some airports consider Risk Management to be a part of Administration whereas other airports consider Risk Management to be a part of Finance under the Chief Financial Officer (CFO). Further, to ensure breadth of coverage in our survey data collection, we separated executive-level positions into nine distinct categories; however, most airports will combine these categories in some way and will only include 4-6 major divisions within their airport structure. For example, in some airports Business Development is combined with Marketing while in others it is combined with Planning, Engineering, or Finance. In sum, the organizational chart presented on the following page is a hypothetical example of an airport organization structure and where the identified mission critical occupations would be located within it.



Note. In this chart, occupations that were identified as MCOs are highlighted in blue. The light blue shaded occupations are executive-level positions that were identified as mission critical. The dark blue shaded occupations are those that were identified as mission critical through the *Mission Critical Survey*.

National Labor Statistics and Projections for Mission Critical Occupations

Data from the Bureau of Labor Statistics (BLS) were examined to better understand the current number of employees within each mission critical occupation across the nation as well as projections for the number of employees that will be needed by 2024. In addition to providing the current and projected number of employees in each of the mission critical occupations, BLS data also provide information related to the expected number of job openings due to both growth and retirements, median salaries, and typical educational requirements for each occupation. These data are presented on the following page in Exhibit 3-3.

While BLS data are not available strictly for airport employees, the national data BLS provides are relevant as many airport employees work in jobs that are 'industry agnostic'—that is, they appear in a number of different industries with generally similar job requirements. For example, engineers may require specific knowledge (e.g. FAA regulations) to work at an airport, but the talent pool that airports can draw from could include engineers working in a wide range of other industries, so the BLS numbers for the occupation as a whole are presented in the following estimates and projections.

Though not specific to airport jobs, the national trends and expectations for future job openings revealed in the data have real implications for the airport workforce. For example, if the number of IT jobs is increasing in the U.S., airports could face increased competition for qualified IT personnel. If airports do not have a solid retention and succession strategy for their MCO jobs, they may find it difficult to recruit new employees in the broader marketplace, especially if other firms can offer better compensation and more developed career opportunities for potential employees. A similar challenge has already been experienced in Northern California, where municipal-run airports find it difficult to offer competitive compensation to IT professionals due to the close proximity of private industry in Silicon Valley and the large number of IT-related jobs in the area. This inability to bring in professionals often leads to the use of contractors, which is not necessarily a long-term, sustainable strategy, especially given the importance of IT occupations to the future of airports. In all MCOs, but particularly those in which increased competition and demand can be expected, it is important for airports to invest in their current talent and begin developing future talent to assume or compete for these positions.

Within the table of BLS data, there are multiple job types (based on Standard Occupational Classification or SOC codes) that relate to each of the airport MCOs. For example, within IT there are 13 types of jobs that airports typically employ, such as computer systems analysts, computer programmers, or information security analysts. Since the data are not airport-specific, a number of relevant occupations were identified for each of the identified MCOs based on similarities in the required competencies and skillsets. For example, the occupation of Property, Real Estate, and Community Association Managers was identified as a source for Airport Development professionals because these individuals work with commercial and industrial leases, such as those that would be required for vendors in airport food courts or for bonded warehouses that reside on airport property. Additionally, architects were identified as a part of Airport Development because of the need for these employees to work on designs and finalize plans for improvements to airport terminals or other structures. When examining these occupations, it is important to consider that no individual occupation listed in the data may fully capture the competencies required in an airport environment and that each airport may have different names for these occupations.

Exhibit 3-3. National Occupational Data and Projections for Airport Mission Critical Occupations								
SOC Code	Occupation Title	# of Jobs, 2014	Projected # of Jobs, 2024	Change in # of Jobs	Percent Change (2014-2024)	Job Openings Expected due to Growth and Replacement Needs	National Median Annual Salary	Typical Education Needed For Job Entry
--	*Airport Development Total*	*737,000*	*778,400*	*41,400*	*5.62%*	*133,400*	--	--
11-9141	Property, Real Estate, and Community Association Managers	313,800	339,100	25,300	8.1%	79,900	$54,270	High school diploma or equivalent
13-2021	Appraisers and Assessors of Real Estate	85,800	92,500	6,700	7.8%	20,500	$52,570	Bachelor's degree
17-1011	Architects	112,600	120,4000	7,800	6.9%	26,300	$74,520	Bachelor's degree
41-9022	Real Estate Brokers	337,400	346,800	9,400	2.8%	33,000	$40,990	High school diploma or equivalent
--	*Airport Operations Total*	*2,624,400*	*2,782,900*	*158,500*	*6.04%*	*931,300*	--	--
15-2031	Operations Research Analysts	91,300	118,900	27,600	30.2%	43,900	$76,660	Bachelor's degree
43-5011	Cargo and Freight Agents	78,800	84,300	5,500	7.0%	31,300	$41,380	High school diploma or equivalent
53-1011	Aircraft Cargo Handling Supervisors	5,800	5,800	0	0.0%	1,900	$47,760	High school diploma or equivalent
53-2022	Airfield Operations Specialists	7,200	7,500	300	4.2%	2,500	$49,180	High school diploma or equivalent
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	2,441,300	2,566,400	125,100	5.1%	851,700	$24,430	No formal education credential
--	*Airport Security Total*	*1,142,000*	*1,193,300*	*51,300*	*4.49%*	*216,200*	--	--
33-9032	Security Guards	1,095,400	1,150,900	55,500	5.1%	209,600	$24,410	High school diploma or equivalent
33-9093	Transportation Security Screeners	46,600	42,400	-4,200	-9.0%	6,600	$38,090	High school diploma or equivalent
47-2111	*Electrician Total*	*628,800*	*714,700*	*85,900*	*13.7%*	*181,800*	*$51,110*	*High school diploma or equivalent*
--	*Engineering Total*	*737,300*	*777,300*	*40,000*	*5.43%*	*250,300*	--	--
17-2051	Civil Engineer	281,400	305,000	23,600	8.4%	106,700	$82,050	Bachelor's Degree
17-2071	Electrical Engineer	178,400	180,200	1,800	1.0%	41,100	$93,260	Bachelor's Degree
17-2141	Mechanical Engineer	277,500	292,100	14,600	5.3%	102,500	$83,060	Bachelor's Degree
--	*Financial Analysis and Planning Total*	*1,671,100*	*1,847,400*	*176,300*	*10.55%*	*604,100*	--	--
13-2011	Accountants and Auditors	1,332,700	1,475,100	142,400	10.7%	498,000	$65,940	Bachelor's degree
13-2031	Budget Analysts	60,800	62,300	1,500	2.5%	16,700	$71,220	Bachelor's degree
13-2051	Financial Analysts	277,600	310,000	32,400	11.7%	89,400	$78,620	Bachelor's degree
--	*IT Total*	*3,916,100*	*4,404,700*	*488,400*	*12.47%*	*1,083,800*	--	--
15-1111	Computer and information research scientists	25,600	28,300	2,700	10.7%	6,000	$108,360	Doctoral or professional degree

Exhibit 3-3. National Occupational Data and Projections for Airport Mission Critical Occupations								
SOC Code	Occupation Title	# of Jobs, 2014	Projected # of Jobs, 2024	Change in # of Jobs	Percent Change (2014-2024)	Job Openings Expected due to Growth and Replacement Needs	National Median Annual Salary	Typical Education Needed For Job Entry
15-1121	Computer systems analysts	567,800	686,300	118,600	20.9%	191,600	$82,710	Bachelor's degree
15-1122	Information security analysts	82,900	97,700	14,800	17.9%	25,500	$88,890	Bachelor's degree
15-1131	Computer programmers	328,600	302,200	-26,500	-8.0%	81,000	$77,550	Bachelor's degree
15-1132	Software developers, applications	718,400	853,700	135,300	18.8%	238,000	$95,510	Bachelor's degree
15-1133	Software developers, systems software	395,600	447,000	51,300	13.0%	107,900	$102,880	Bachelor's degree
15-1134	Web developers	148,500	188,000	39,500	26.6%	58,600	$63,490	Associate's degree
15-1141	Database administrators	120,000	133,400	13,400	11.1%	39,200	$80,280	Bachelor's degree
15-1142	Network and computer systems administrators	382,600	412,800	30,200	7.9%	79,400	$75,790	Bachelor's degree
15-1143	Computer network architects	146,200	158,900	12,700	8.7%	31,500	$98,430	Bachelor's degree
15-1151	Computer user support specialists	585,900	661,000	75,100	12.8%	150,500	$47,610	Some college, no degree
15-1152	Computer network support specialists	181,000	194,600	13,600	7.5%	36,900	$61,830	Associate's degree
15-1199	Computer occupations, all other	233,000	240,800	7,700	3.3%	37,700	$83,410	Bachelor's degree
--	*Project Planning*	*251,500*	*272,700*	*21,200*	*8.43%*	*88,900*	--	--
13-1051	Cost Estimator	213,500	232,300	18,800	8.8%	79,500	$60,050	Bachelor's degree
19-3051	Urban and Regional Planners	38,000	40,400	2,400	6.3%	9,400	$66,940	Master's degree

Information for Each Mission Critical Occupation

On the following pages, information is presented for each of the identified mission critical occupations. For these occupations, the following data are available:

- Overview of occupation (example job titles, job description elements, and KSAs)
- Forecast of current and future employment within the occupations (BLS data)
- Training and development challenges (% of survey respondents reporting each challenge)
- Recruitment and turnover challenges (% of survey respondents reporting each challenge)
- Impacted performance criteria (% of survey respondents reporting impact on each of the criteria)
- Strategy and decision making (% of survey respondents reporting impact on each factor)
- Airport trends that will impact the occupation (% of survey respondents reporting each trend will impact the occupation)
- Future scenarios and their impact in 5-10 years (considerations for each scenario).

Below and on the following pages is a key that shows how this information is shared, the questions that were asked related to each section, and the possible responses that could be highlighted in the templates.

Key for Airport Mission Critical Occupations Template

This introductory section provides an overview of the type of work performed within the occupation, key elements included in job descriptions, and example knowledge, skills, and abilities (KSAs) required to be successful in the job.

Forecast of Current & Future Job Numbers

This section provides information from the Bureau of Labor Statistics (BLS) data on the current number of jobs in the occupation, the projected number of jobs in 2024, median annual salary range for jobs within the occupation, and educational requirements.

Training and Development Challenges

Survey participants were asked about various challenges related to training and development, specific to the occupation. Specific questions for each occupation were:

Throughout the template, particularly strong findings are highlighted in callout boxes

- Lack of training and development to support technical skills
- Lack of training and development to support personal effectiveness
- Lack of solid career track in airports for this occupation
- Lack of focus on leadership development
- The education and training available to prepare workers for this occupation is insufficient to meet future job needs
- Because of knowledge loss due to retirements, employees in this occupation will need additional developmental opportunities

In this section, training and development challenges that were identified by more than 75% of survey participants are indicated by a red exclamation mark icon. Challenges identified by 50-74.4% of respondents are identified with a yellow exclamation point icon; those identified by less than 50% of respondents were excluded.

Recruitment and Turnover Challenges

Challenges specific to employee recruitment and turnover were asked about in the survey. These challenges were:

- Small applicant pool when/if needing to fill a vacancy
- Skill set required of this occupation is highly specialized, making finding employees difficult
- High level of turnover within this occupation
- High competition across industries for skill sets required in this occupation / Better compensation or job attractiveness elsewhere
- Lack of talent in existing airport employees to fill future vacancies in this occupation
- This occupation will be at risk for vacancy within my airport in the next 5-10 years due to turnover or retirement
- This occupation will be difficult to fill in the next 5-10 years due to insufficient skill sets, knowledge, or interest in the labor market

In this section, recruitment and turnover challenges that were identified by more than 75% of survey participants are indicated by a red exclamation mark icon. Challenges identified by 50-74.4% of respondents are identified with a yellow exclamation point icon. The challenges identified by less than 50% of respondents were excluded from the template.

Key for Airport Mission Critical Occupations Template – Sidebar indicates the occupation being covered, to ensure clarity

Impacted Performance Criteria

One important aspect of a MCO is that it has a strong impact on airport performance criteria. As such, survey participants were asked about the level of impact the occupation has on each of six different airport performance criteria. These included:

- On-time flight departures
- Strong finances of overall airport
- Improved passenger experience and meeting of passenger expectations
- Improved customer service with other stakeholders, such as airlines/tenants, concessionaires, contractors, TSA, and the FAA
- Ensuring proper safety and security
- Environmental sustainability, water, and air quality

Performance criteria are included in this section for the occupation if at least 50% percent of survey respondents indicated that the occupation has a strong impact on that criterion.

Strategy and Decision Making

The impact of MCOs on airport strategy and decision making is important to understand. Specific ways in which the occupation could have an impact on strategy and decision making included:

- This occupation will be essential to meeting strategic goals related to an increased focus on the bottom line or commercialization of airports
- This occupation involves key decision making that impacts overall airport business functioning
- Consequences of an error by an employee in this occupation will pose significant costs or challenges

These elements were included in the template if at least 50% of respondents indicated agreement with the statements for the specific occupation. They are marked with a green exclamation point because they are not a challenge, but rather information about the occupation's involvement in strategy.

Airport Trends

This section provides an overview of workforce and technology trends that will likely impact the occupation, as identified by survey participants. Potential trends that could impact the occupation in the next 5-10 years included:

- Emerging technologies will require new skill sets for employees within this occupation
- Changing demographics, such as having a younger workforce, is likely to impact this occupation in airports
- The complexity of tasks performed in this position will increase significantly in the next 5-10 years

In this section, trends are marked by a red exclamation point if at least 75% of survey participants agreed with the trend for the occupation. Trends identified by 50-74.4% of respondents are identified with a yellow exclamation point icon. Trends identified by less than 50% of participants were excluded from the template.

Future Impacts of Scenarios – Impact in 5-10 Years

This section focuses on the future scenarios presented in the surveys (see Chapter 2), and indicates the percentage of respondents who felt the occupation would become more mission critical under each scenario. It also presents the impact of the scenarios on both capabilities/skill needs and job/workforce development considerations.

Key for Airport Mission Critical Occupations Template – Sidebar indicates the occupation being covered, to ensure clarity

Airport Development Occupations

Airport Development employees are involved in the design and development of airport property and facilities, as well as the real estate transactions in which airports participate. They help ensure that the airport's facilities enable it to meet regulatory, financial, and commercial demands, while supporting efficient movement of aircraft and passengers. Given the growing pressures of these demands, Airport Development employees are becoming increasingly vital to the long-term success of an airport (Carlisle, 2015).

Example Job Titles:

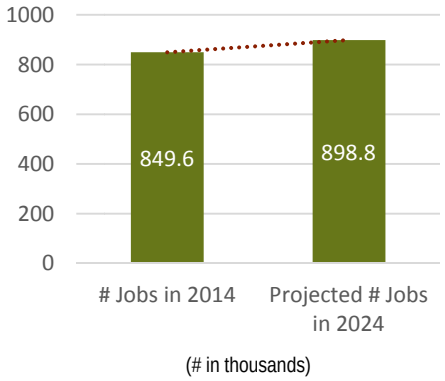
- Air Terminal Development Manager
- Terminal Development Coordinator
- Aviation Real Estate Manager
- Properties Coordinator
- Commercial Development Coordinator
- Airport Real Estate Specialist
- Airside Development Coordinator

Example Job Description Elements: Airport Development employees manage resources for the design and development of airport property and facilities. This involves identifying retail and dining options for terminals, potential development opportunities for unused property, and parties willing to develop facilities/businesses on airport property. They also conduct land use feasibility studies and are responsible for expansion and land acquisition. These employees work with airlines, airport authorities, regulators, and construction staff to ensure the airport develops in line with airport strategic goals and the needs of its stakeholders.

Example KSAs

- Knowledge of legal practices, procedures, and terminology as they relate to airport management and leasing.
- Knowledge of the statutes and ordinances governing the lease and management of real estate property.
- Knowledge of design standards, codes, and criteria for airport facilities.
- Knowledge of landlord/tenant laws.
- Knowledge of FAA regulations and grant assurances.
- Knowledge of and ability to analyze, develop, and draft financial reports, proposals, and facility budgets.
- Knowledge of airport and airfield layout plans.
- Knowledge of the key interactions between airport operations, development, design, retail, advertising, and transport modes at the airport.
- Knowledge of an airport master plan and the various elements related to airside, landside, and facilities of the airport.
- Basic computer skills and proficiency in application to office and record management techniques.
- Ability to identify and understand airport development and planning capacity.
- Ability to allocate limited resources in a cost-effective manner.
- Ability to conduct an environmental assessment to determine the impact of potential development.
- Ability to negotiate and carry to completion complex real estate transitions involved in meeting the property needs of airports.
- Ability to read construction plans and surveys and to make calculations using architectural/engineering scales.
- Ability to understand, draft, and apply the provisions of legal documents.
- Ability to establish and maintain effective internal and external working relationships.
- Ability to communicate clearly and effectively, both orally and in writing.
- Ability to supervise and motivate the performance of subordinates.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	898,800
% Increase in Jobs, 2014-2024	5.79%
Median Annual Salary Range*	$40,990 - $74,520
Minimum Education Required	High school diploma or equivalent*

Note: Numbers gathered from BLS Occupational Employment data.
*While some jobs, such as Real Estate Appraisers and Architects, require a Bachelor's degree other Airport Development jobs can be completed with a high school diploma or equivalent combined with at least moderate-term on-the-job training.

*This median salary range includes all of the various occupational titles within Airport Development (i.e., Property Managers, Appraisers of Real Estate, Architects, and Real Estate Brokers). Given that some of these are lower paying jobs in other parts of the economy, this salary range may be underestimated. Also note, this is the median range, meaning that half of the incumbents in an occupation with a median salary of $74,520 actually make above this amount given the definition of median as the middle in a series of numbers.

Training and Development Challenges

Due to potential position vacancies, Airport Development employees require greater developmental opportunities to prevent a potential gap in knowledge and skills. There is also a lack of training and development to support both personal effectiveness and technical skills for these occupations, and the field generally lacks a solid career track. Airports can overcome these challenges by identifying and providing greater growth, development, and promotional opportunities for their Airport Development employees. These training and development challenges, as identified by survey respondents, are listed below with the percentage of respondents indicating each area as a challenge following the statements:

- Additional developmental opportunities needed (68.7%)
- Lack of training and development for personal effectiveness (65.2%)
- Lack of training and development for technical skills (64.3%)
- Lack of solid career track in airports (63.4%)
- Insufficient education and training available (52.6%)

5 of the 6 possible training and development challenges were identified as problematic for Airport Development occupations.

Recruitment and Turnover Challenges

Airport Development occupations require a highly specialized skillset, making the process of recruiting and hiring employees a challenge for airports. Furthermore, there is a small applicant pool for these positions and a lack of talent in existing airport employees to fill vacancies. For example, a leader in a small municipally-operated airport expressed difficulties hiring Airport Development employees with the necessary skills due to the airport-specific knowledge that is required in the positions. The hiring challenge in this airport is exacerbated because it is a small airport with fewer people in the airport and surrounding community than other, larger airports often have. Another challenge experienced is the high competition for these skills across industries, some of which offer higher compensation and greater job attractiveness than the airport industry. These challenges put these positions at risk for vacancy.

Survey respondents indicated the following roadblocks for airports seeking to fill Airport Development positions:

Of the 7 possible retention and recruitment challenges included in the survey, 5 were selected as a challenge for Airport Development by at least 50% of survey respondents.

- Highly specialized skillset (69.1%)
- Small applicant pool (63.4%)
- Lack of talent in existing airport employees (61.8%)
- High competition across industries (60.1%)
- Risk for vacancy (52.9%)

Impacted Performance Criteria

Airport Development employees impact many aspects of an airport's overall performance. For example, they can impact an airport's financial performance by identifying strategies and opportunities for generating greater commercial revenue. In a focus group, a large airport leader mentioned Airport Development employees can also provide an airport with the ability to understand how to gain additional funds and where funding sources are available. Additionally, their need to engage with local politicians and community groups in support of development projects means they can have a significant impact on perceptions of the airport among its stakeholders. Finally, such employees impact the airport's environmental sustainability, safety, and security. Survey respondents indicated these occupations are likely to have a strong impact on the following performance measures, with the percentage of participants who agreed that Airport Development employees will significantly impact these measures following each criterion:

- Finances (78.4%)
- Customer service with stakeholders (65.6%)
- Environmental sustainability (65.2%)
- Passenger experience and expectations (64.6%)
- Safety and security (56.3%)

Strategy and Decision Making

Greatest Impact on Strategy and Decision Making:

87.8%

of participants indicated airport development occupations impact meeting strategic goals and key decision making

Due to the nature of responsibilities in developing airport facilities, Airport Development employees have a large impact on an airport's ability to meet strategic goals. Additionally, these employees impact key decisions that affect airport business functioning. For example, in a focus group, an executive at a large municipally-operated airport mentioned that these occupations have a large focus on understanding what the airport needs and why. This then enables the airport to adjust its business strategy accordingly. A leader at a large airport authority also shared the importance of Airport Development employees in determining the look of the airport as well as its functionality. Survey respondents indicated these employees have a strong impact on:

- Meeting strategic goals (87.8%)
- Key decision making (87.8%)
- Errors result in significant costs/challenges (69.5%)

Airport Trends

Evolving technologies will require new skillsets for Airport Development employees. The complexity of tasks performed in these occupations is also expected to increase within the next 5-10 years. For example, a leader for a large airport authority expressed growing regulatory compliance issues that Airport Development employees must be aware of. By incorporating these changes into training, development, and promotional opportunities, airports can ensure these positions remain aligned with the airport's business strategies. Survey results indicate that the following airport trends will impact Airport Development occupations:

- New skillsets due to technology (68.8%)
- Increase in complexity of tasks (64.4%)
- Impacted by changing demographics (57.1%)

Future Impacts of Scenarios – Impact in 5-10 Years

Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
53.3% of respondents believe this scenario would make Airport Development occupations become more mission critical.	63.3% of respondents believe this scenario would make Airport Development occupations become more mission critical.	74.4% of respondents believe this scenario would make Airport Development occupations become more mission critical.

Future Job Impacts to Consider for Airport Development Occupations

Across the three scenarios, there were some differences in expectations regarding the importance of various capabilities/skill needs and the impact of the scenarios on job and workforce requirements.

Among the capabilities/skill needs asked about, the following findings emerged:

- Across all three scenarios, **industry-specific knowledge** about how the airport functions emerged as the most important requirement for Airport Development employees.
- In Scenarios 1 and 3, having **strong managerial skills** will also be highly important to execute Airport Development jobs effectively.

Regarding Scenario 3, the greatest impact on job and workforce requirements is expected to be:

- **Vacancies in Airport Development positions** will cause **serious difficulties** in delivering on the commitments and priorities of airports.

For both Scenario 1 and Scenario 2, all of the job and workforce requirements were found to be less important for success in Airport Development jobs given the future scenarios than the capabilities and skill needs included in the survey.

Airport Operations Occupations

Airport Operations employees are critical to an airport, as they ensure everything is in place on airfield and airside environments for safe and efficient flight operations. Due to the greater regulatory pressures and the impacts on airport operating performance, these employees are becoming increasingly significant (Carlisle, 2015). Furthermore, Airport Operations employees have a large impact on an overall airport's ability to deliver its services.

Example Job Titles:

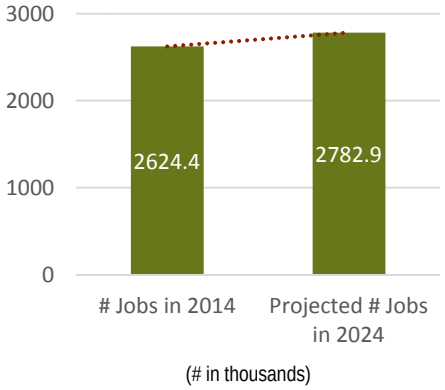
- Airfield Operations Specialists
- Ramp Operations
- Ground Services
- Baggage Handling
- Cargo & Freight Agents
- Baggage Porters
- Laborers and Freight, Stock, and Material Movers

Example Job Description Elements: Employees in Airport Operations occupations work closely with airlines to ensure the airfield is safe and supports efficient movement of aircraft, equipment, personnel, and passengers. This involves managing runways, friction testing, gate scheduling, and more. These employees are also coordinators for first response incidents, and are responsible for managing emergency operation incidents while adhering to National Incident Management System (NIMS) standards. Additionally, Airport Operations employees' schedule, coordinate, and conduct FAR-139 Airport Daily Self-Inspections to ensure Part 139 compliance. This includes documenting, reporting, and tracking deficiencies discovered during inspections. Finally, these employees ensure a high level of customer service to stakeholders and passengers. They handle complaints and critical issues to ensure safe, secure, customer-focused operations.

Example KSAs

- Knowledge of runway and lighting regulations.
- Knowledge of safety and security requirements of FAR-139, Transportation Security Administration (TSA), Federal Aviation Administration (FAA), Occupational Safety and Health Administration (EPA), and other pertinent regulatory agencies.
- Knowledge of airline/airport ground and flight operations, terminology, and procedures.
- Knowledge of all rules and regulations applicable to the airside and airfield operational environment.
- Knowledge of airport security regulations and how to interface with airport safety and security personnel.
- Skill in systems analysis and determining how an airport should work and how changes in conditions, operations, and the environment will affect outcomes.
- Skill in complex problem solving including identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- Skill in ensuring effective communications regarding the use of airport facilities and services.
- Ability to understand current aviation-related issues and factors impacting the airport environment.
- Ability to analyze operational information quickly and make appropriate decisions.
- Ability to accurately read and interpret federal and state regulations.
- Ability to acquire and apply knowledge, subject matter expertise, tradecraft, and/or technical competency necessary to achieve results.
- Ability to implement airfield safety procedures to ensure a safe operating environment for personnel and aircraft operation.
- Ability to coordinate with agencies such as air traffic control, engineers, and command posts to ensure support of airfield and airside management activities.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	2,782,900
% Increase in Jobs, 2014-2024	6.04%
Median Annual Salary Range	$24,430 - $76,660
Minimum Education Required	High school diploma or equivalent*

Note: Numbers gathered from BLS Occupational Employment data.
*Some Airport Operations jobs, including jobs such as operations analysts, may require a college degree. Other Airport Operations jobs, such as Airfield Operations Specialists, require on-the-job training in addition to the required high school diploma or equivalent.

Training and Development Challenges

Due to upcoming retirements, Airport Operations employees require greater developmental opportunities to prevent a gap in knowledge and skills. Some respondents indicated that this is because airports lack a solid career track for these employees. With regard to *Airfield* Operations in particular, survey respondents indicated that employees lack training and development opportunities to support personal effectiveness. However, this concern was not as strong for *Airside* Operations in general. It is also important to note that results suggest most Airport Operations employees have sufficient training and development opportunities focusing on leadership development, as indicated by 62% of respondents. The training and development challenges for Airport Operations employees, as identified by survey respondents, are listed below with the percentage of respondents agreeing with each statement provided following the statement:

For Airport Operations, 1 of the training and development challenges was identified by over 75% of respondents. Two other challenges were identified by at least 50% of respondents.

- Additional developmental opportunities needed (75.7%)
  - Lack of solid career track in airports (52.9%)
  - Lack of training and development for personal effectiveness for Airfield Operations only (50.7%)

Recruitment and Turnover Challenges

Airport Operations occupations face risk for vacancy due to upcoming retirements. These occupations also require a highly specialized skillset, further increasing the challenge for airports looking to recruit employees. Additionally, the airport industry must compete with other industries that may offer higher pay or greater job attractiveness, making it even more difficult to attract those with specialized skillsets. One airport stakeholder noted that their airport experienced 100% turnover in the operations/communication center team in the past year. This was due to new employees struggling to pay off high student loan debt (taken on to gain the needed skills) with entry-level pay of $30,000 a year. To overcome this challenge, as the leader sought to reclassify positions into higher pay categories. In terms of additional challenges, a small applicant pool further increases the challenge of hiring Airport Operations employees. To address the challenge, one large airport reported attempting to hire employees from other airports or retraining employees currently working for ground handlers or airlines at the airport. Additionally, the airport hires temporary employees and trains them in a 6-month boot camp, so they are able to apply for and potentially fill vacant operations positions. Survey respondents indicated the following roadblocks for airports seeking to fill Airport Operations positions:

- Risk for vacancy (72.1%)
- Highly specialized skillset (67.7%)
- High competition across industries (61.2%)
- Small applicant pool (53.9%)

Impacted Performance Criteria

Given their responsibility for implementing safety and security procedures, Airport Operations employees strongly impact proper safety and security actions at an airport. They have a large impact on the airport's performance in customer service with stakeholders due to their role in maintaining relationships with airlines, airport tenants, and regulatory governmental agencies. In a focus group, the leader of a large municipally-operated airport shared that Airport Operations employees play a significant role in providing a stable and reliable platform for business partners. This, in turn, helps to mitigate risks and deliver a functional terminal to partners. These employees also impact on-time flight departures and, as a result, passenger experience and expectations. Finally, they impact an airport's performance in environmental sustainability. Survey respondents indicated Airport Operations employees strongly impact the following performance measures, with the percentage of participants who agreed that these employees will significantly impact these measures following each criterion:

Greatest Impacted Performance Criteria:

96.0%

of respondents noted Airport Operations occupations strongly impact proper safety and security

- Safety and security (96.0%)
- Customer service with stakeholders (73.7%)
- On-time flight departures (72.5%)
- Passenger experience and expectations (64.3%)
- Environmental sustainability (55.0%)

Airport Operations employees were seen as having a strong impact on 5 of the 6 identified performance criteria.

Strategy and Decision Making

Airport Operations employees have a large impact on an airport's strategy and any errors they make can result in significant costs and challenges for the airport. A number of airport executives expressed that Airport Operations is the most critical function in an airport, and many of them identified gaps in these employees' skill sets. For example, a leader at a large commercially-operated airport mentioned that these employees are very technically strong and skilled at day-to-day duties, but often lack an appreciation of the bigger picture or overall airport strategy. Airport Operations employees influence key decisions that impact overall business functioning, as well as the airport's ability to meet strategic goals related to the increasing pressures of commercialization that airports are currently experiencing. In a focus group, another airport leader mentioned that any tasks required of these employees that are not completed would significantly impact the airport's ability to deliver services and meet performance goals. Survey respondents indicated Airport Operations employees have a strong impact on:

- Significant costs/challenges due to errors (87.0%)
- Key decision making (83.7%)
- Meeting strategic goals (78.3%)

Airport Trends

Greatest Impact on Airport Trends:

87.2% noted Airport Operations employees will need new skillsets due to technology

Evolving technologies will require new skillsets for Airport Operations employees. Additionally, upcoming retirements and new younger employees will lead to a shift in the demographics of the airport workforce. Further, these occupations are expected to increase in complexity in the next 5-10 years. By incorporating these changes into training, development, and promotional opportunities for Airport Operations employees, airports can ensure these positions remain aligned with the emerging airport trends and are able to meet varying airport needs. Survey results indicate that the following airport trends will have the greatest impact on Airport Operations occupations:

- New skillsets required due to technology (87.2%)
- Changing demographics (75.8%)
- Increase in complexity of tasks (73.5%)

Future Impacts of Scenarios – Impact in 5-10 Years		
Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
69.4% of respondents believe this scenario would make Airport Operations occupations more mission critical.	44.3% of respondents believe this scenario would make Airport Operations occupations more mission critical.	66.7% of respondents believe this scenario would make Airport Operations occupations more mission critical.

Future Job Impacts to Consider for Airport Operations Occupations

As can be seen above, Scenarios 1 and 3 are expected to have the greatest impact on Airport Operations occupations in terms of mission criticality. Findings regarding the skill needs and job impacts of these scenarios on these jobs are provided below.

Across all three scenarios, the capabilities/skill needs that were identified as the most important for the future included:

- Knowledge of specific safety standards and regulations will become increasingly important for effective response.
- Industry-specific knowledge about how the airport functions will be required.

For Scenarios 1 and 3, with regard to job and workforce requirements, the greatest impact is expected to be:

- Vacancies in Airport Operations jobs will cause serious difficulties in delivering on the commitments and priorities of airports.
- Reliance on Airport Operations employees by those in other airport jobs will be increasing and an important element of ensuring effective operations.

Airport Security Occupations

In the post-9/11 world, security has become a foremost concern across many industries. This is especially true for the airport industry, given that air travel is a major transportation mode and a prominent target for terrorists. Airport Security ensures all airport facilities, employees, and passengers are sufficiently protected from any potential threats. Airport Security jobs are a product of federal regulations in addition to the needs of airports. Recently, DHS/TSA has attempted to shift duties to airports (such as exit lane monitoring) and airports frequently create non-screener positions to enable TSA to use their personnel for screening—which only they can do.

Example Job Titles:

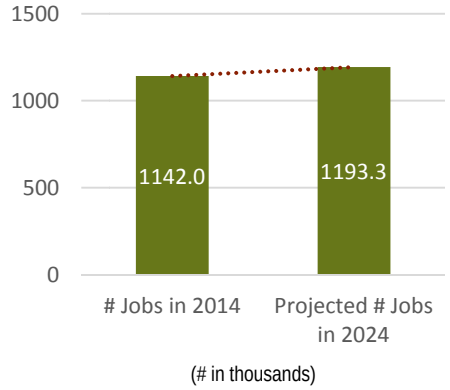
- Airport Security Coordinator
- Airport Security
- Transportation Inspector
- Airfield Security

Example Job Description Elements: Airport Security personnel are responsible for ensuring safety and security of an airport and all facilities, from parking to terminals to the airfield. These employees are in charge of badging of all employees, tenants, and concessionaires to ensure they have been cleared. They patrol the airport to oversee continued, safe functioning in the terminal and on the airfield, and they perform a critical emergency response function in collaboration with fire fighters and local law enforcement. Airport Security employees control access to aircraft, baggage areas, customer pick-up locations, and other areas with restricted access such as control towers, operations, and the airfield itself. This means that there is responsibility for the safety of passengers and employees and screening baggage, but also for verifying vehicles are authorized to be where they are and making sure access to restricted areas of the airport is controlled for all means of entry. Finally, Airport Security employees must also complete reports when there are security breaches and keep written logs of security activities.

Example KSAs

- Knowledge of FAA security procedures for airports.
- Knowledge of international accords, laws, rules and regulations governing airport operation and security.
- Knowledge of the standards by which the quality of public safety services are evaluated.
- Knowledge of the functions of other governmental agencies as they relate to public safety services.
- Skill in managing crisis situations.
- Ability to analyze, evaluate, and make rapid, accurate decisions regarding critical factors in emergencies.
- Ability to remain calm and resourceful in crisis situations.
- Ability to convey ideas clearly and effectively, both orally and in writing.
- Ability to plan, organize, staff, coordinate, and direct the activities of a multi-function, cross-trained public safety department.
- Ability to establish priorities, standards, and procedures for public safety.
- Ability to establish and maintain effective working relationships with subordinates, Board officials, other public officials and the public.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	1,095,400
% Increase in Jobs, 2014-2024	4.49%*
Median Annual Salary Range	$24,410 - $38,090
Minimum Education Required	High school diploma or equivalent**

Note: Numbers gathered from BLS Occupational Employment data.
*The number of Transportation Security Screeners is expected to decrease by 9% from 2014 to 2024; however, the number of general security guards is expected to increase, explaining the overall increase in jobs seen here.
**Airport Security jobs typically require short-term on-the-job training in addition to this educational requirement.

Training and Development Challenges

Upcoming retirements could potentially cause a gap in knowledge and skills of Airport Security employees. Additional developmental opportunities will be needed to prevent gaps from occurring. These employees also lack training and development to support personal effectiveness. For these challenges, the percentage of respondents indicating each area as a challenge is presented below following the statement:

2 of the 6 potential training and development challenges were selected as being problematic for Airport Security Employees.

- Additional developmental opportunities needed (67.2%)
- Lack of training and development for personal effectiveness (54.0%)

Recruitment and Turnover Challenges

Recruiting applicants for Airport Security positions is a challenge due to the increased need for highly specialized skillsets, which further adds to the challenge of filling Security occupations. Additionally, survey respondents indicated that these occupations are at risk for vacancy due to upcoming retirements. Gaps in the security workforce are likely to have significant negative impacts on an airport, as they may lead to greater potential safety and security threats. Survey respondents indicated the primary roadblocks for airports seeking to fill security positions are:

- Highly specialized skillset (58.4%)
- Risk for vacancy (52.7%)

Impacted Performance Criteria

Given the nature of their work, Airport Security employees have a very large impact on airport safety and security and they are in frequent contact with stakeholders and passengers. Thus, they can have a significant impact on the airport's performance in customer service and passenger experience. For example, they patrol terminals and handle security badging, which creates an experience in which airport customers feel safe within the airport. Survey respondents indicated Airport Security jobs are likely to strongly impact the following performance measures, with the percentage of participants who agreed security jobs will significantly impact these measures following each criterion:

- Safety and security (94.6%)
- Customer service with stakeholders (86.3%)
- Passenger experience and expectations (75.4%)
- On-time flight departures (61.8%)

Greatest Impacted Performance Criteria:

94.6% of respondents indicated Security employees largely impact safety and security

Strategy and Decision Making

Due to the importance of Airport Security to an airport's overall function and activities, employees in these occupations have a large impact on an airport's strategy. Because errors made by Security personnel can potentially put the airport and all employees and passengers in danger, consequences of errors are likely to result in significant costs and/or challenges. The growing importance of security in airports also increases the impact these occupations have on key decision making processes and the airport's ability to meet strategic goals. Survey respondents indicated Security occupations have a strong impact on:

- Errors will have significant costs/challenges (81.7%)
- Key decision making (77.1%)
- Meeting strategic goals (63.4%)

Airport Trends

Greatest Impact due to Airport Trends:

90.8% noted that new security skillsets are required due to updated technology

New technologies provide airports the ability to increase safety and security measures, an objective that has become highly important post-9/11 (Carlisle, 2015). However, new technologies come with a need for new skillsets for the Airport Security employees who will be utilizing the technologies. Additionally, these new technologies, along with greater travel regulations, will lead to an increase in the complexity of tasks performed by these employees. Finally, upcoming retirements and new younger employees are causing a shift in workforce demographics, which will impact Security occupations in airports. Survey respondents indicated the following airport trends will impact Security occupations:

- New skillsets due to technology (90.8%)
- Increase in complexity of tasks (77.9%)
- Changing demographics (59.5%)

Future Impacts of Scenarios – Impact in 5-10 Years

Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
70.6% of respondents believe this scenario would make Airport Security occupations become more mission critical.	71.7% of respondents believe this scenario would make Airport Security occupations become more mission critical.	82.5% of respondents believe this scenario would make Airport Security occupations become more mission critical.

Future Job Impacts to Consider for Airport Security Occupations

In each of the three scenarios, expectations for future skill needs and the impact of the scenarios on job requirements were very similar. As such, it is likely that, regardless of the specific future experienced in airports, the types of skills needed by Security employees and the impact of the scenario on job requirements will be similar. The following findings highlight the anticipated future impacts of the scenarios on Airport Security jobs:

Among the included capabilities/skill needs, three were rated as being very important across all three scenarios:

- **Knowledge of specific safety standards and regulations** will become increasingly important for effective response.
- More **advanced technological savvy** will be required of Security employees for airports to successfully perform; employees will need new skills based on specific technology innovations incorporated by their airports.
- **Industry-specific knowledge** about how the airport functions will be required.

Across scenarios, the greatest impacts on job and workforce requirements are expected to be:

- **Vacancies in Airport Security positions** will cause serious difficulties in delivering on the commitments and priorities of airports.
- **Reliance on Airport Security employees by those in other airport jobs** will be increasing and an important element of ensuring effective operations.

Airport Electricians

Airports rely on complex electrical systems both indoors and outdoors to ensure smooth operation and efficiency. This electrical work spans lighting, runway equipment, communication equipment, and more. Both airport employees and passengers heavily rely on these electrical systems, and Electricians are critical to the maintenance and repair of the systems that keep airports in operation.

Example Job Titles:

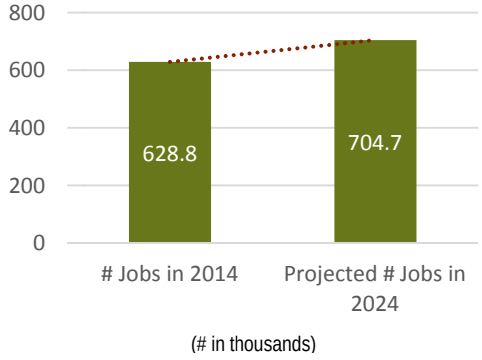
- Electrician
- Electrical Worker
- Electrical Technician
- Airport Electrician
- Airfield Electrician

Example Job Description Elements: Airport Electricians are responsible for installation, maintenance, inspection, and repair of all airport electrical systems, including power distribution, security, and communication. They are responsible for layout and planning of any new electrical wiring, equipment and need to install these electronic elements based on specifications and local codes. Electricians ensure all electrical lines, equipment, and lighting are in accordance with the National Electrical Code and Federal Aviation Regulations. They are also responsible initiating supply action to obtain proper equipment for testing and repairs, within airport guidelines.

Example KSAs

- Knowledge of FAA regulations and recommendations for airport lighting systems.
- Knowledge of electrical terms and understanding of the function of electrically controlled equipment.
- Knowledge of International Building Codes (IBCs) and/or NFPA.
- Skill in the use of tools and equipment, such as power construction equipment, measuring devices, power tools, and testing equipment.
- Skill in troubleshooting to determine causes of operating errors and determining what to do about errors.
- Skill in repairing machines or systems using needed tools.
- Ability to locate and correct electrical trouble promptly.
- Ability to handle and operate high voltage testing equipment and high voltage switchgear and transformers.
- Ability to deal courteously and effectively with airport staff, tenants, and representatives of other agencies.
- Ability to use ladders, scaffolds, or roofs to conduct work.
- Ability to provide assistance during emergencies by operating flood lights or generators, placing flares, or driving needed vehicles.
- Ability to provide primary sketches or cost estimates for service.
- Ability to earn and maintain a current Electrician's license.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	714,700
% Increase in Jobs, 2014-2024	13.66%
Median Annual Salary	$51,110
Minimum Education Required	High school diploma or equivalent

Note: Numbers gathered from BLS Occupational Employment data.

Training and Development Challenges

Airport Electricians lack a solid career track and opportunities to develop personal effectiveness; however, there may be relevant Electrician career tracks outside of airports that can be utilized and amended for Airport Electricians. Upcoming retirements also require greater development for Electricians to prevent a gap in knowledge and skills. In a focus group, an airport authority executive mentioned the importance of succession planning, to ensure the workforce is prepared to face retirements. However, these challenges are escalated by the lack of education and training programs with airport-specific curriculum to prepare Electricians for airport careers. Airports can begin to overcome these challenges by identifying and providing greater growth, development, and promotional opportunities. The training and development challenges identified by survey respondents are listed below, with the percentage of respondents indicating each area as a challenge following each statement:

- Additional developmental opportunities needed (94.7%)

- Lack of training and development for personal effectiveness (63.2%)
- Lack of solid career track in airports (52.6%)
- Insufficient education and training (52.6%)

Recruitment and Turnover Challenges

A small applicant pool and insufficient skillsets, knowledge, and interest in the labor market make it difficult to recruit and hire Airport Electricians, leading to potential workforce gaps. Upcoming retirements also increase the risk for vacancies. Furthermore, as noted in a focus group by the leader of a large airport, airports must compete with other industries that potentially offer higher pay or greater job attractiveness to Electricians. Finally, there is a lack of talent among current airport employees to fill vacancies in Electrician positions. Survey respondents indicated the following roadblocks for airports seeking to fill electrician positions:

5 of the 7 challenges were identified as problematic for Airport Electricians by over 75% of survey respondents.

- Small applicant pool (94.7%)
- Highly specialized skillset (94.7%)
- High competition across industries (94.7%)
- Risk for vacancy (89.5%)
- Insufficient skillsets, knowledge, interest in labor market (84.2%)

- Lack of talent in existing airport employees (68.4%)

Impacted Performance Criteria

Given the widespread nature of Electricians' duties in an airport, they are expected to largely impact several aspects of overall performance in the next 5-10 years. Airports rely heavily on electrical systems to function properly and ensure safety on the airfield and in the terminal. Electricians must be able to install and maintain these systems to sustain the high pace of airport operations. Survey respondents indicated Electricians are likely to strongly impact the following performance measures:

Greatest Impacted Criteria:

100% indicated Electricians impact proper safety and security

- Safety and security (100.0%)
- Customer service with stakeholders (73.7%)
- On-time flight departures (63.2%)
- Passenger experience and expectations (52.6%)

Strategy and Decision Making

Electricians have a large impact on airport strategy and decision making, due to an airport's dependence on electrical systems. For example, errors made by Electricians can result in significant costs to the airport, as they maintain lighting and other equipment vital to safe airport operations. As a key element of safe landside and airside operations, Electricians can have a great impact on the function of the business and pursuit of an airport's strategic goals. Survey respondents indicated electricians have a strong impact on airports due to:

- Significant costs/challenges due to errors (100.0%)
- Meeting strategic goals (78.9%)
- Business functioning (52.6%)

Greatest Impact on Strategy and Decision Making:

100%

of respondents indicated there are significant costs/ challenges when Electricians make errors

Airport Trends

Upcoming retirements and younger generations entering the workforce will lead to a shift in the demographics of the Electrician workforce in airports. Additionally, evolving technologies will require new skillsets for these employees. By incorporating these changes into training, development, and promotional opportunities for electricians, airports can ensure electrician positions remain aligned with the airport's business strategies. Survey results indicate that the following trends will have the greatest impact on Airport Electricians:

- Impacted by demographic changes (84.2%)
- New skillsets required due to technology (78.9%)
- Increase in complexity of tasks (77.8%)

Future Impacts of Scenarios – Impact in 5-10 Years

Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
66.7% of respondents believe this scenario would make Electricians become more mission critical in airports.	83.3% of respondents believe this scenario would make Electricians become more mission critical in Airports.	77.8% of respondents believe this scenario would make Electricians become more mission critical in Airports.

Future Job Impacts to Consider for Airport Electrician Occupations

Findings regarding the importance of capabilities/skill needs and the impact of the scenarios on job requirements differed slightly across scenarios. The following findings highlight the anticipated future impacts of the scenarios on Airport Electrician jobs.

The most important capability/skill need considering Scenario 1 is:

- **Knowledge of specific safety standards and regulations** will become increasingly important for effective response.

Considering Scenarios 2 and 3, the most important capability/skill need for the future was identified as:

- More **advanced technological savvy** will be required of Electricians for airports to successfully perform.

For Scenario 1, the greatest impact on job and workforce requirements is expected to be:

- **Specialized knowledge/skills** will make Electrician positions **more difficult to fill.** This was seen as a having a greater impact than each of the skill needs included in the survey.

For Scenario 2, the greatest impact on job and workforce requirements is expected to be:

- **Vacancies in Electrician positions** will cause serious **difficulties in delivering** on the commitments and priorities of airports.

For Scenario 3, the greatest impact on job and workforce requirements is expected to be:

- **Reliance on Electricians by those in other airport** jobs will be increasing and an important element of ensuring effective operations.

Airport Engineers

Airport Engineers are heavily involved in all aspects of airport planning, including facilities design, construction, and inspection. Facilities and design have a large impact on the airport's overall performance, including aspects such as operational efficiency and passenger safety. As a result, Engineers (including mechanical engineers, electrical engineers, and civil engineers) are critical to an airport's ability to meet strategic goals and objectives.

Example Job Titles:

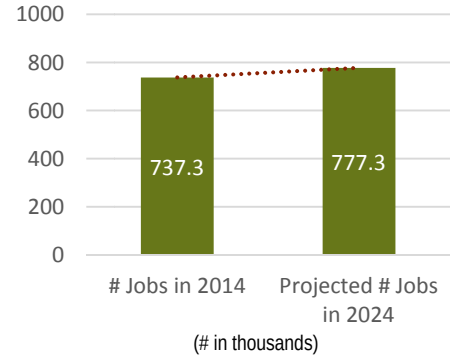
- Civil Engineer
- Electrical Engineer
- Mechanical Engineer
- Senior Engineer

Example Job Description Elements: Engineers are responsible for project planning, design, construction, repair, and maintenance of airport facilities and equipment. They also assist in the preparation of concept layouts for proposed facilities. This includes preparing budget costs estimates, providing measurements, and developing maintenance and repair programs as well as organizing work to ensure that proper evaluation of soils, pavement conditions, and materials occurs as needed. Additionally, Airport Engineers conduct inspections and evaluations of airport facilities, equipment, and materials. Finally, they may be involved in managing and administering relevant contracts, including reviewing and recommending contract awards, change orders, and claims and payment requests for major capital projects.

Example KSAs

- Knowledge of the engineering principles and practices relating to the maintenance and construction of airport buildings and equipment.
- Knowledge of federal, state, and local laws, rules, regulations, and guidelines relating to engineering, construction, facilities, building codes, and operations of a commercial airport.
- Knowledge of the financial dimensions of facility development programs.
- Knowledge of aircraft operational characteristics and the uses of traffic forecasts, landing and take-off criteria and procedures, runway, taxiway and apron characteristics, drainage, access routes and roads.
- Skill in the area of computer-aided design (CAD).
- Skill in project management.
- Skill in quality control and monitoring costs.
- Ability to negotiate and partner effectively with a variety of constituent groups, both internal and external, with a win-win mindset and approach.
- Ability to review and understand difficult and complex engineering estimates, design documents, and specifications.
- Ability to create and execute initiatives in areas of responsibility that are aligned with the Airport's Strategic Business Plan and facilitate the implementation of the Plan.
- Ability to effectively communicate verbally and in writing, with individuals of varied professional backgrounds.
- Ability to analyze soil and materials to provide technical recommendations for projects.
- Skill in the successful oversight and management of large and complex airport (or related/adjacent industry) capital development programs, delivering on time, on budget, and on spec.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	777,300
% Increase in Jobs, 2014-2024	5.43%
Median Annual Salary Range	$82,050 - $93,260
Minimum Education Required	Bachelor's degree

Note: Numbers gathered from BLS Occupational Employment data.

Training and Development Challenges

Additional developmental opportunities will be needed for Airport Engineers to prevent potential knowledge and skill gaps that are expected to occur when older engineers retire. Most engineers are trained in general engineering programs rather than airport-specific programs, so airports may not have sufficiently robust training and development programs available for the engineers they employ. Finally, the airport industry currently lacks a solid career track for these positions. The greatest training and development challenges for Engineers in airports, as identified by survey respondents, are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- Lack of solid career track in airports (75.0%)
- Additional developmental opportunities needed (75.0%)
- Lack of training and development for personal effectiveness (52.4%)

Recruitment and Turnover Challenges

5 of the 7 recruitment and turnover challenges were identified as problematic for Airport Engineers, with 2 selected by over 80% of survey participants.

Engineers are highly sought after employees across industries, leading to greater competition to hire them. In a focus group, an executive for a small municipally-operated airport expressed a great need for Engineers in airports, but found it difficult to offer competitive compensation compared to private sector engineering organizations. High competition along with the need for specialized skillsets makes it difficult for airports to attract potential Engineering employees. This challenge is further exacerbated by the small pool of Engineers in the labor market who are aware of and apply for Airport Engineering jobs. Additionally, there is a lack of talent in existing airport employees to fill vacancies in these positions, creating gaps in the workforce. Survey respondents indicated the primary roadblocks for filling Engineering positions and keeping them filled are:

- High competition across industries (84.2%)
- Highly specialized skillset (80.0%)
- Lack of talent in existing airport employees (65.0%)
- Small applicant pool (61.9%)
- Risk for vacancy (55.6%)

Impacted Performance Criteria

Airport Engineers impact many aspects of an airport's overall performance, due to the effect the airport's facilities and design have on airport performance. Specifically, Engineers largely impact the airport's environmental sustainability as well as airport safety and security. They also impact the airport's performance in customer service, given their role in developing and maintaining relationships with stakeholders. An airport's facilities and design also impact the airport's finances and overall passenger experience, increasing the influence of Engineers on airports overall. For example, poorly designed facilities resulting in passenger congestion are likely to result in passenger dissatisfaction as well as a decrease in retail spending by passengers. This impacts the passenger experience and overall airport revenue (Carlisle, 2015). Survey respondents indicated Engineers are likely to strongly impact the following performance measures, with the percentage of participants who agreed that Engineers will significantly impact these measures indicated following each performance criterion:

- Environmental sustainability (87.5%)
- Safety and security (81.3%)
- Customer service with stakeholders (72.2%)
- Passenger experience and expectations (66.7%)
- Finances (50.0%)

Strategy and Decision Making

Airport Engineering job activities align with and impact the airport's mission and goals. They impact cost performance a schedule, which is a predicate for airports having a more commercial focus. Furthermore, errors made by these employees can result in significant costs and challenges for the airport. Survey results indicate that Engineers have the greatest impact on the following aspects of strategy and decision making:

- Errors will pose significant costs/challenges (100.0%)
- Meeting strategic goals and commercialization (94.1%)
- Key decision making (88.2%)

Greatest Impact on Strategy and Decision Making

100%

of respondents indicated errors by Engineers cause significant costs/challenges

Airport Trends

As new technologies become increasingly prevalent in the airport industry, Engineers will need to acquire new skillsets to utilize these technologies. Additionally, the nature of Engineering tasks and duties in airports is likely to become more complex. In a focus group, a large municipally-operated airport executive suggested that the role of Engineers has become more involved due to federal requirements becoming more intense and increased scrutiny by the FAA. As a result, those involved in airport planning, including Engineers, need to become specialists in federal process guidelines in addition to being experts in their technical areas. Additionally, upcoming retirements and younger employees entering the workforce will cause a shift in workforce demographics. By incorporating these changes into their workforce plans, airports can better ensure they have sufficient numbers of these employees. Survey results indicate that the following airport trends will have the greatest impact on Engineering positions:

- Increase in complexity of tasks (88.9%)
- New skillsets required due to technology (81.3%)
- Impacted by demographic changes (56.3%)

Future Impacts of Scenarios – Impact in 5-10 Years		
Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
75.0% of respondents believe this scenario would make Airport Engineers become more mission critical.	33.3% of respondents believe this scenario would make Airport Engineers become more mission critical.	50.0% of respondents believe this scenario would make Airport Engineers become more mission critical.

Future Job Impacts to Consider Airport Engineer Occupations

Survey participants indicated the scenario regarding integrated business and safety systems (Scenario 1) is likely to have the largest impact on Airport Engineers and they would become more mission critical in this scenario. In understanding workforce capacity, it will be important to consider the following findings about greatest future needs in Engineering jobs:

Under Scenarios 2 and 3, the most important capabilities/skill needs identified were as follows:

- **Knowledge of specific safety standards and regulations** will become increasingly important for effective response.
- More **advanced technological savvy** will be required of engineers for airports to successfully perform.

Considering Scenario 1, the capabilities/skill needs identified as most important were:

- **Industry-specific knowledge** about how the airport functions will be required.
- **Knowledge of specific safety standards and regulations** will become increasingly important for effective response.

For Scenario 1, the greatest impact on job and workforce requirements is expected to be:

- **Vacancies in Engineering jobs** will cause serious difficulties in delivering on the commitments and priorities of airports.

Under Scenarios 2 and 3, the greatest impact on job and workforce requirements is expected to be:

- **Specialized certifications or advanced educational attainment** will be required to perform effectively.

Airport Financial Analysis and Planning Occupations

Given the importance of financial expertise in funding day-to-day operations and sustaining the long-term viability of the airport, Financial Analysis and Planning occupations play a critical role in the airport industry. These occupations are becoming increasingly significant under the shifting landscape of the airport industry, in which airports are challenged to develop strategies aligned with growing regulatory, financial, political, and commercial pressures (Carlisle, 2015).

Example Job Titles:

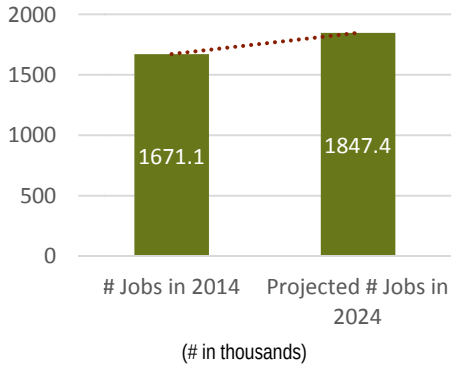
- Assistant Finance Manager
- Auditor
- Financial Analyst
- Airport Economic Planner
- Comptroller

Example Job Description Elements: Airport Financial Analysis and Planning employees are responsible for financial and economic business planning, development, and management. This involves managing airport budgets and computing airline rates, fees, or charges. These employees are also responsible for tracking and projecting revenues and conducting financial analysis. They also monitor, analyze, and summarize airport and air traffic trends to determine impacts of airport finances. Lastly, they conduct and oversee economic impact studies.

Example KSAs

- Knowledge of the principles of public finance administration including complex financial arrangements.
- Knowledge of FAA grant assurances and regulations that affect financial strategy and revenue.
- Knowledge of the theories, principles, and practices of organizational structure, management, and administration.
- Knowledge of investment strategies to maximize returns on investment of funds.
- Knowledge of the sale and issuance of public revenue bonds.
- Knowledge of the principles and practices governing the operation and management of a major international airport or governmental agency.
- Skill in the supervision, motivation, and direction of professional and technical staff.
- Skill in the implementation of a change effort or transformation of the finance function such as work redesign, introduction of best practices, or integrating financial and other information management systems.
- Ability to communicate clearly and effectively, both orally and in writing and to maintain harmonious internal and external relationships at all levels.
- Ability to deal tactfully and effectively with the public and community representatives.
- Ability to apply financial expertise to key strategic and operational decisions.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	1,847,400
% Increase in Jobs, 2014-2024	10.55%
Median Annual Salary Range	$65,940 - $78,620
Minimum Education Required	Bachelor's degree

Note: Numbers gathered from BLS Occupational Employment data.

Training and Development Challenges

Survey results indicate airport employees in Financial Analysis and Planning occupations will need further developmental opportunities to address knowledge and skills gaps. Additionally, Financial Analysis and Planning occupations lack a solid career track in airports. Similar to other occupations, it may be the case that this is due to the required KSAs not being taught in airport-specific training programs or the fact that these employees do not receive sufficient airport-focused training. The greatest training and development challenges for these jobs, as identified by survey respondents, are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

2 of 6 challenges related to training and development were identified for Financial Analysis and Planning Employees.

- Additional developmental opportunities needed (63.2%)
- Lack of solid career track in airports (50.6%)

Recruitment and Turnover Challenges

Although Financial Analysis and Planning occupations typically have a transferrable skillset, it is a highly specialized skillset. There is also high competition across industries for these occupations, with some other industries offering higher compensation and greater job attractiveness than the airport industry. Highly specialized skillsets and high competition, along with a small applicant pool, makes recruiting these employees challenging for airports. Furthermore, current airport employees lack the talent needed to fill vacancies in these occupations. This puts Airport Financial Analysis and Planning occupations at potential risk for vacancy, which would cause additional difficulties for airports in meeting financial goals and performance criteria. Survey respondents indicated the primary roadblocks for airports seeking to fill Financial Analysis and Planning jobs are:

5 of the 7 possible challenges in this area were selected by between 50% and 70% of survey respondents

- Highly specialized skillset (64.8%)
- High competition across industries (63.6%)
- Risk for vacancy (60.8%)
- Lack of talent in existing airport employees (58.4%)
- Small applicant pool (55.6%)

Impacted Performance Criteria

Greatest Impacted Performance Criteria:

95.5%
noted Financial Analysis & Planning employees impact strong airport finances

Due to Financial Analysis and Planning employees' roles and responsibilities in managing an airport's budget, these employees have a large impact on the airport's overall finances. Additionally, their relationships with various stakeholders, such as government officials and the FAA, means that they directly impact the airport's performance in customer service. Finally, these employees are critical to an airport's increased focus on the passenger experience, as they must meet financial pressures without sacrificing the satisfaction of airport passengers. Survey respondents indicated Financial Analysis and Planning jobs are likely to strongly impact the following performance measures, with the percentage of participants who agreed listed after each criterion:

- Finances (95.5%)
- Customer service with stakeholders (60.8%)
- Passenger experience and expectations (51.9%)

Strategy and Decision Making

Financial Analysis and Planning plays a large role in key decisions made by airport executives to meet the overall airport's strategic goals and objectives. Given the nature of tasks and duties performed in Financial Analysis and Planning occupations, these employees have a large impact on decision making and the airport's ability to achieve goals. Along these lines, financial errors can have widespread negative impacts on an airport's activities, and can potentially result in significant costs and challenges. Survey respondents indicated Financial Analysis and Planning occupations have a strong impact on:

Greatest Impact on Strategy and Decision Making:

94.7%
of respondents indicated Financial Analysis and Planning employees impact key decision making

- Key decision making (94.7%)
- Meeting strategic goals (91.3%)
- Consequences of error include significant costs/challenges (78.9%)

Airport Trends

New technologies in airports will require Financial Analysis and Planning employees to acquire new skillsets to utilize the technologies. The greater financial and regulatory pressures that airports are experiencing will also impact these jobs. In a focus group, a leader at a large commercially-operated airport mentioned the importance of increasing efficiencies and focusing on innovation and customer service to receive greater returns. These emerging focus areas may increase the complexity of tasks performed in Financial Analysis and Planning jobs. Finally, upcoming retirements and younger new employees will lead to a shift in workforce demographics. Survey respondents indicated the following airport trends have a strong impact on Financial Analysis and Planning jobs:

- New skillsets due to technology (69.1%)
- Increase in complexity of tasks (66.4%)
- Impacted by changing demographics (60.8%)

Future Impacts of Scenarios – Impact in 5-10 Years

Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
74.6% of respondents believe this scenario would make Airport Financial Analysis and Planning occupations more mission critical.	60.0% of respondents believe this scenario would make Financial Analysis and Planning occupations more mission critical.	88.9% of respondents believe this scenario would make Financial Analysis and Planning occupations more mission critical.

Future Job Impacts to Consider for Financial Analysis and Planning Occupations

In each of the three scenarios for Airport Financial Analysis and Planning jobs, expectations for future skill needs and the impact of the scenarios on job requirements were very much alike.

Among the capabilities/skill needs asked about, the one that emerged as most important across all three scenarios was:

- **Industry-specific knowledge** about how the airport functions will be required.

Related to job and workforce requirements, under Scenarios 1 and 3, the greatest impact was indicated to be:

- **Reliance on Financial Analysis and Planning employees by those in other airport jobs** will be increasing and an important element of ensuring effective operations.

For Scenario 2, the greatest impact on job and workforce requirements is expected to be:

- **Vacancies in Financial Analysis and Planning positions** will cause **serious difficulties** in delivering on the commitments and priorities of airports.

Airport IT Occupations

Given the rapid progression and increased use of technology in airports currently and in upcoming years (Herrmann & Hazel, 2012), IT occupations play a critical role in the airport industry. This role is becoming increasingly significant with the introduction of technologies to improve operational efficiency like computerized maintenance management systems, customer-facing technologies like ticket kiosks, and other technology changes such as use of mobile devices and social media (Institute for the Future, 2015). During a focus group, an HR executive at a large airport noted the importance of cybersecurity expertise in today's airport IT workforce. However, given the high private sector demand for and limited supply of these skills, it is difficult for the airport to attract highly qualified candidates.

Example Job Titles:

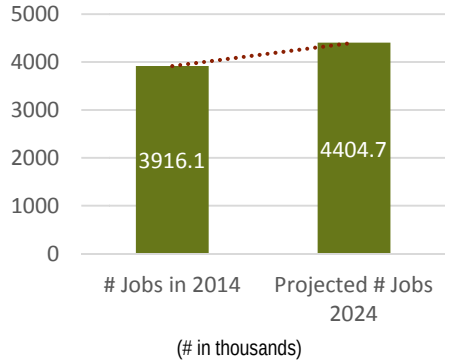
- Network Administrator
- Help Desk Technician
- IT Services Specialist
- IT/Computer Systems Analyst
- System Security Analyst
- Server Administrator
- Cyber Security Programmer
- Software Engineer
- Computer Network Support Specialist

Example Job Description Elements: IT employees in airports troubleshoot a variety of technology issues to ensure all airport systems are functioning properly. They design, install, and manage security mechanisms to protect an airport's networks and systems from cyber security threats and attacks. They also plan and direct IT functions within the airport, such as network infrastructure and helpdesk and support functions, and oversee contractors providing a variety of services.

Example KSAs

- Knowledge of information systems design, development, and implementation strategies
- Knowledge of network and wireless communication systems, dispatch equipment and cabling, and current IT platforms and developments
- Knowledge of principles and practices of business administration
- Knowledge of CRM business-to-consumer technologies
- Ability to think strategically about using technology to move airport forward
- Ability to ensure ITS risks are managed, including IT security, disaster recovery and business continuity
- Ability to collect, analyze, evaluate, and report complex technical data
- Ability to build and promote cross-functional business teams
- Skills in project management, negotiation, and effective communication

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	4,404,700
% Increase in Jobs, 2014-2024	12.47%*
Median Annual Salary Range	$47,610-$108,360
Minimum Education Required	Bachelor's degree**

Note: Numbers gathered from BLS Occupational Employment data.
*Computer Programmers are expected to decrease 8%
**Computer Network Support Specialist and Web Developer require at least an Associate's degree; Computer User Support Specialist requires at least some college; Few jobs require more than a Bachelor's degree.

Training and Development Challenges

IT occupations in airports lack a solid career path and opportunities to develop personal effectiveness. Additionally, upcoming retirements require further development for IT employees to prevent a gap in needed knowledge and skills. To overcome these challenges, airports will need to focus on identifying and standardizing growth, development, and promotional opportunities for these employees. In a focus group, an executive from a large airport indicated that IT employees are not only critical in implementing new technologies, but also in ensuring there is technology training in place for other employees. The greatest training and development challenges for airport IT jobs, as identified by survey respondents are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- Lack of solid career track in airports (64.9%)
- Additional developmental opportunities needed (60.8%)

Recruitment and Turnover Challenges

Upcoming retirements coupled with generally high turnover may lead to potential gaps in the IT workforce, which will impact the airport's overall performance. However, recruiting employees to fill these gaps is a challenge as well, due to the need for specialized skill sets, competition with other industries, and a lack of talent in current airport employees. Both an HR leader at a large airport and a leader in a large municipally-operated airport noted that it is difficult to recruit IT employees, as they are in high demand across industries and tend to be offered higher compensation in the private sector. Additionally, airports located in technology hubs, such as San Francisco or Austin, have a difficult time retaining their IT employees. Many of these employees will receive training at the airport, but leave due to more attractive opportunities or higher pay at other companies in the area. Survey respondents indicated the primary roadblocks for airports seeking to fill IT jobs are:

Greatest Recruitment/Turnover Challenge:

90.4% of respondents indicated high competition across industries for IT

- High competition across industries (90.4%)
- Highly specialized skillset (72.1%)
- Lack of talent in existing airport employees (65.9%)
- Risk for vacancy (61.7%)
- High turnover (53.7%)

Impacted Performance Criteria

Because IT employees develop and maintain all of an airport's networks, systems, and databases, they are expected to have a large impact on the airport's overall performance in the next 5-10 years. For example, in focus groups, Executive Directors from both municipally-operated and independently operated airports of various sizes indicated IT employees play a role in meeting changing customer expectations as a result of new technologies (e.g., mobile devices). New technologies can also provide small airports with opportunities to increase revenue and large airports opportunities to decrease operational costs (Carlisle, 2015). Airport IT staff must be able to deploy and maintain these technologies so the airport can utilize them to increase overall performance. Survey respondents indicated IT jobs are likely to strongly impact the following performance measures, with the percentage of participants who agreed that they will significantly impact these measures following each criterion:

- Customer service with stakeholders (87.2%)
- Passenger experience and expectations (86.5%)
- Safety and security (85.0%)
- On-time flight departures (60.2%)
- Finances (56.9%)

Airport IT employees were seen as having a strong impact on 5 of the 6 identified performance criteria

Strategy and Decision Making

Due to the increased reliance on technology across airports, IT occupations have a great impact on the strategy and decision making that are used to guide airports into the future. New technologies come with new opportunities, such as increased commercial revenues and greater operational efficiencies, which will enable airports to better achieve strategic goals (Carlisle, 2015). However, an airport may need IT expertise to administer the technology and fully take advantage of these opportunities. Survey respondents indicated IT jobs have a strong impact on:

- Meeting strategic goals (87.6%)
- Business functioning (85.4%)
- Significant costs/challenges due to errors (81.5%)

Airport Trends

Greatest Impact on Strategy and Decision Making:

95.4%

noted that new IT skillsets are required due to updated technology

With rapidly progressing technologies comes a need for new skills and abilities, particularly for employees in IT occupations. During focus groups, two airport Executive Directors indicated that one personal attribute that is becoming increasingly important for IT employees is adaptability and flexibility. A leader at a small, municipally-operated airport spoke of a need for IT employees who can think strategically, to help determine how to use new technology to push the airport to the next level. These skills are in addition to the technical knowledge that is needed to develop, deploy, and maintain new technology. Furthermore, upcoming retirements and younger new employees will cause a shift in the demographics of the workforce. These changes need to be incorporated into airport strategy so that IT employees are prepared and able, to do the work that will be required of them. Survey results indicate that the following changes will have the greatest impact on airports with regard to IT:

- New skillsets required due to technology (95.4%)
- Increase in complexity of tasks (89.2%)
- Impacted by demographic changes (75.4%)

Future Impacts of Scenarios – Impact in 5-10 Years		
Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
98.5% of respondents believe this scenario would make IT occupations become more mission critical	96.1% of respondents believe this scenario would make IT occupations become more mission critical	92.9% of respondents believe this scenario would make IT occupations become more mission critical

Future Job Impacts to Consider for Airport IT Occupations

Across the three scenarios presented to survey participants findings regarding the future job impacts for Airport IT employees were similar.

Among the capabilities/skill needs included in the survey, the one that emerged as most important across all three scenarios was:

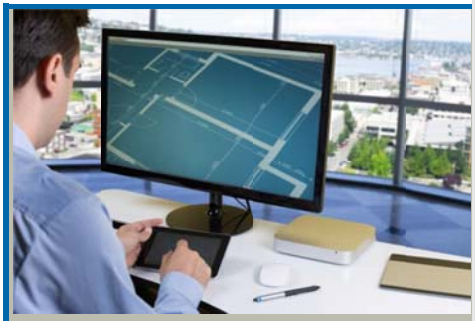
- More **advanced technological savvy** will be required of IT employees for airports to successfully perform; employees will need new skills based on specific technology.

Related to job and workforce requirements, the greatest impact under all three scenarios was indicated to be:

- **Reliance on IT employees by those in other airport jobs** will be increasing and an important element of ensuring effective operations.

Airport Project Planning Occupations

Planning is a key element in ensuring that airports are able to effectively meet the needs of all stakeholders, accomplish projects that need to be completed, and achieve strategic goals for the direction of the airport. Airport Project Planners are heavily involved in all aspects of airport planning, including creating airport plans, developing master plans, and understanding the future needs of the airport and customers to ensure they can be met. As a result, they are critical to the success of an airport. According to a large municipally-operated airport executive, the role of airport planning has started to shift due to stricter federal requirements. Under FAA's greater scrutiny, Planners tend to be specialists in interpreting and meeting federal guidelines, rather than becoming engineers or developing their construction/design background.



Example Job Titles:

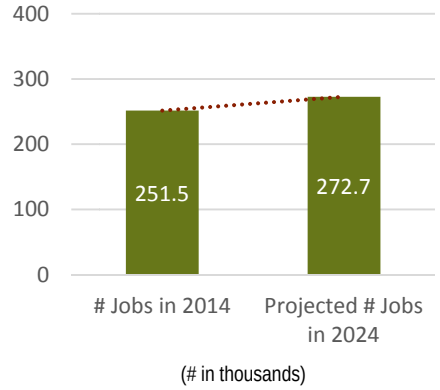
- Project Planner
- Airport Planner
- Aviation Planner

Example Job Description Elements: Airport Project Planning employees develop and revise airport plans, ranging from long-term strategic plans for airport growth to short-term development and business plans. They are responsible for the management, preparation, and quality control of airport planning documents. Additionally, these employees participate in public hearings and meetings related to airport projects, and work with airport stakeholders to solve demands and anticipate future needs. Finally, they participate in the development of airport master plans.

Example KSAs

- Knowledge of FAA regulations and FAA advisory circulars that pertain to planning and design.
- Knowledge of federal laws related to airport planning and design.
- Knowledge of airport master plans, airport layout plans, design standards, safety and security analysis, emergency plans, and other relevant planning documents.
- Knowledge of regulatory compliance requirements related to airport development and construction.
- Knowledge of strategic planning and project management.
- Knowledge of large-scale procurement programs and the laws and regulations that pertain to such in a public or governmental context.
- Knowledge of the financial dimensions of facility development programs.
- Knowledge of environmental regulations.
- Skill in contract administration.
- Skill in presenting to and liaising with a board of directors.
- Skill in communication, active listening, and speaking.
- Ability to interact with others and communicate effectively with varied audiences.
- Ability to conduct simulation modeling for airside or terminals.
- Ability to allocate limited resources in a cost-effective manner.
- Ability to manage complex planning projects with consultants and developers.
- Ability to develop requests for proposals and develop contracts related to needed services.

Forecast of Current & Future Job Numbers



Projected # of Jobs, 2024	272,700
% Increase in Jobs, 2014-2024	8.43%
Median Annual Salary Range	$60,050 - $66,940
Minimum Education Required	Bachelor's degree*

Note: Numbers gathered from BLS Occupational Employment data.
*Urban and Regional Planners require a Master's degree to be hired into these positions.

Training and Development Challenges

Employees within the Airport Project Planning occupation lack a solid career track in airports as well as training and development to support both technical skills and personal effectiveness. Upcoming retirements and the associated potential knowledge and skill gaps also present a need for greater developmental opportunities for these employees. Airports can overcome these challenges by identifying and providing greater growth, development, and promotional opportunities for Planning staff. These training and development challenges, as identified by survey participants, are listed below, with the percentage of respondents indicating each area as a challenge following the statements:

- Additional developmental opportunities needed (66.7%)
- Lack of solid career track in airports (57.3%)
- Lack of training and development for technical skills (52.8%)
- Lack of training and development for personal effectiveness (52.8%)

4 of the 6 possible training and development challenges were identified as problematic for Airport Project Planning occupations.

Recruitment and Turnover Challenges

Project Planning occupations in airports require a highly specialized skillset, given the airport-specific knowledge of regulations, federal laws, and finance and procurements that are required. The applicant pool for these occupations is also small, with high competition for these employees across industries. As a result, it is difficult for the airport industry to recruit and hire Planning staff, especially given that other industries may offer higher compensation and greater job attractiveness. These challenges put these occupations at risk for vacancy. Survey respondents indicated the following roadblocks for airports seeking to fill Project Planning positions and retain employees in these jobs:

- Highly specialized skillset (71.9%)
- Small applicant pool (63.6%)
- Lack of talent in existing airport employees (60.2%)
- High competition across industries (58.4%)
- Risk for vacancy (53.8%)

5 of the 7 possible recruitment and turnover challenges were identified as problematic for Airport Project Planning occupations.

Impacted Performance Criteria

Airport Project Planning spans many aspects of an airport's activities and functions. For example, the layout of an airport can have a large impact on passenger experience and expectations, which, in turn, impacts airport finances (Carlisle, 2015). The layout and design of an airport also affects the environmental sustainability. Additionally, Project Planning employees frequently participate in public hearings and collaborate with stakeholders, impacting the airport's performance in customer service. Survey respondents indicated Airport Project Planning employees are likely to strongly impact the following performance measures, with the percentage of participants who agreed that these employees will significantly impact the measures noted following each performance criterion:

- Passenger experience and expectations (82.3%)
- Environmental sustainability (82.3%)
- Finances (79.7%)
- Safety and security (79.7%)
- Customer service with stakeholders (79.5%)
- On-time flight departures (58.2%)

Airport Project Planning employees were seen as having a strong impact on all 6 of the identified performance criteria.

Strategy and Decision Making

Given their critical role in both short- and long-term airport development and business planning, Project Planning staff strongly impact strategy and decision making in airports. Additionally, errors made by these employees have the potential to result in significant costs and challenges for the airport. Survey results indicate that these employees will have the strongest impact on airport strategy and decision making regarding:

Greatest Impact on Strategy and Decision Making:

92.2% noted Project Planning occupations impact key decision making related to airport business functioning

- Key decisions (92.2%)
- Meeting strategic goals (91.0%)
- Significant costs/challenges due to errors (80.8%)

Airport Trends

As new technologies are introduced to airports, Project Planning employees will have to acquire new skillsets to utilize the technologies. Additionally, tasks performed by these employees are expected to increase in complexity. Finally, upcoming retirements and new younger employees entering the workforce will lead to demographic changes that are expected to impact these occupations. By incorporating these new trends and associated changes into training, development, and promotional opportunities for Project Planning occupations, airports can ensure these positions remain aligned with the airport's business strategies. Survey results indicate that the following airport trends will have the greatest impact on Project Planning occupations:

- New skillsets required due to technology (83.3%)
- Increase in complexity of tasks (76.9%)
- Impacted by demographic changes (74.4%)

Future Impacts of Scenarios – Impact in 5-10 Years		
Scenario 1: Integrated Business and Safety Technological Systems	Scenario 2: Passenger-Centric Airport	Scenario 3: Increased Financial, Market, and Political Pressure
75.0% of respondents believe this scenario would make Airport Project Planning Occupations more mission critical.	81.5% of respondents believe this scenario would make Airport Project Planning occupations more mission critical.	77.8% of respondents believe this scenario would make Airport Project Planning occupations more mission critical.

Future Job Impacts to Consider for Airport Project Planning Occupations

Considering the scenarios and related future skill needs and job implications, Scenarios 1 and 2 were quite similar in findings while Scenario 3 differed slightly for Airport Project Planners.

For Scenarios 1 and 2, two of the capabilities/skill needs included in the survey were rated as the most important considerations for the future of Airport Project Planners. These capabilities/skill needs were:

- **Knowledge of specific safety standards and regulations** will become increasingly important for effective response to the scenario.
- **Industry-specific knowledge** about how the airport functions will be required.

For Scenario 3, the capabilities/skill needs identified as most important were:

- **Industry-specific knowledge** about how the airport functions will be required.
- **Strong managerial skills** in Project Planners will become increasingly important to execute the job effectively.

Related to job and workforce requirements, under Scenarios 1 and 2, the greatest impact was indicated to be:

- **Reliance on Airport Project Planning employees by those in other airport jobs** will be increasing and an important element of ensuring effective operations.

Demand for Mission Critical Occupations Across the U.S.

While each of the mission critical occupations described previously will be important in airports across the U.S., demand for employees in these fields varies across the country. Regional demand is important to consider when preparing a workforce development strategy that includes recruitment and engagement of talent within the local labor market or even in preparing for a national search. When there is higher demand for an occupation in a specific area compared to the national average, it will be more difficult to find and keep employees in those positions due to the local competition. Conversely, when there is relatively little presence of a job within a state, finding employees with relevant experience can be difficult as talented candidates are less likely to gravitate toward an area that presents few job opportunities. Thus, extreme highs or lows in terms of concentration of occupations in a region can create challenges for airports trying to recruit and retain employees in those areas.

BLS data were used to explore state-by-state demand for each mission critical occupation. Specifically, the location quotient (LQ) for each of the identified mission critical occupations was examined. The LQ shows the concentration of an occupation in a region compared to the national concentration of that occupation. Therefore, an LQ of 1.0 means that the percentage of employees in a certain occupation is the same for the state and the nation as a whole. Conversely, an LQ of less than 1.0 means that there is a lower concentration of that occupation in the state. An LQ of 0.5 would mean that the state has half the concentration of that occupation as compared to the U.S. as a whole (e.g., 5% of employees in a state are civil engineers and 10% of employees in the country are civil engineers). An LQ above 1.0 means that there is a greater concentration of that occupation in the state than in the nation.

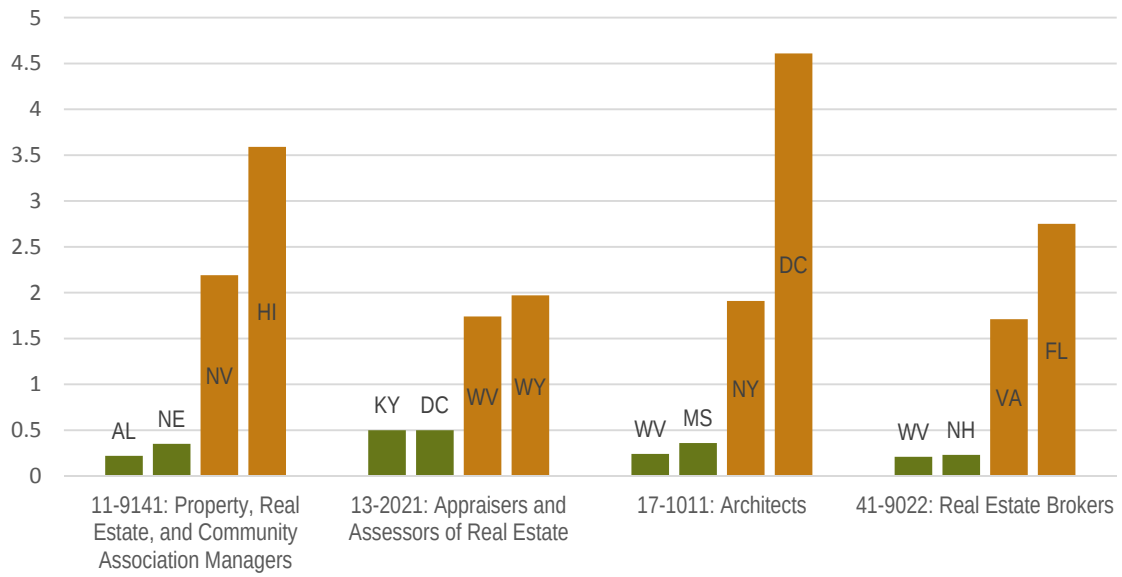
In this section, for each of the MCOs identified, LQs are provided for the two states that have the highest concentration of jobs similar to the MCO and the two states that have the lowest concentration of related jobs. Charts will have more than four states if the various occupations that fall within the category differ in their highest and lowest LQs. LQs for each of the MCOs in all U.S. states are provided in Appendix C.

Airport Development Related Occupations

As described previously in the *Identification of Mission Critical Occupations* section of this chapter, *Airport Development* is not an occupation specifically referenced in the BLS data. Thus, data from multiple similar occupations were combined to provide projections and information for the *Airport Development* MCO. These are industry-spanning occupations which have similar job tasks and KSA requirements to *Airport Development* occupations. The most closely related Airport Development occupations include: *Property, Real Estate, and Community Association Managers*; *Appraisers and Assessors of Real Estate; Architects;* and *Real Estate Brokers.*

These various occupations used to create the Airport Development MCO projections can also inform recruitment strategy for airports, particularly given the lack of airport-trained talent currently available in the labor market. As can be seen in Exhibit 3-4, one of the similar occupations used in the Airport Development projections- *Property, Real Estate, and Community Association Managers* (which includes individuals responsible for industrial and commercial leases)- are most highly concentrated in Hawaii and Nevada. This indicates there is a greater percentage of these positions in those states' labor markets than in other states in the U.S. This also suggests there will be many job opportunities for employees, and competition for employers in these states for *Property, Real Estate, and Community Association Managers*. *Appraisers and Assessors of Real Estate*, on the other hand, can be found in the greatest proportions in West Virginia and Wyoming; the lowest concentration of these jobs are in Kentucky and Washington, DC. With regard to *Architects*, Washington, DC has a very high concentration of these employees. Finally, *Real Estate Brokers* are most highly concentrated in Florida and Virginia. Airports in the states with a high LQ for each occupation need to understand that there may be greater competition for these employees, while airports in the states with low LQs may realize that they have difficulty finding employees to fill *Airport Development* job vacancies.

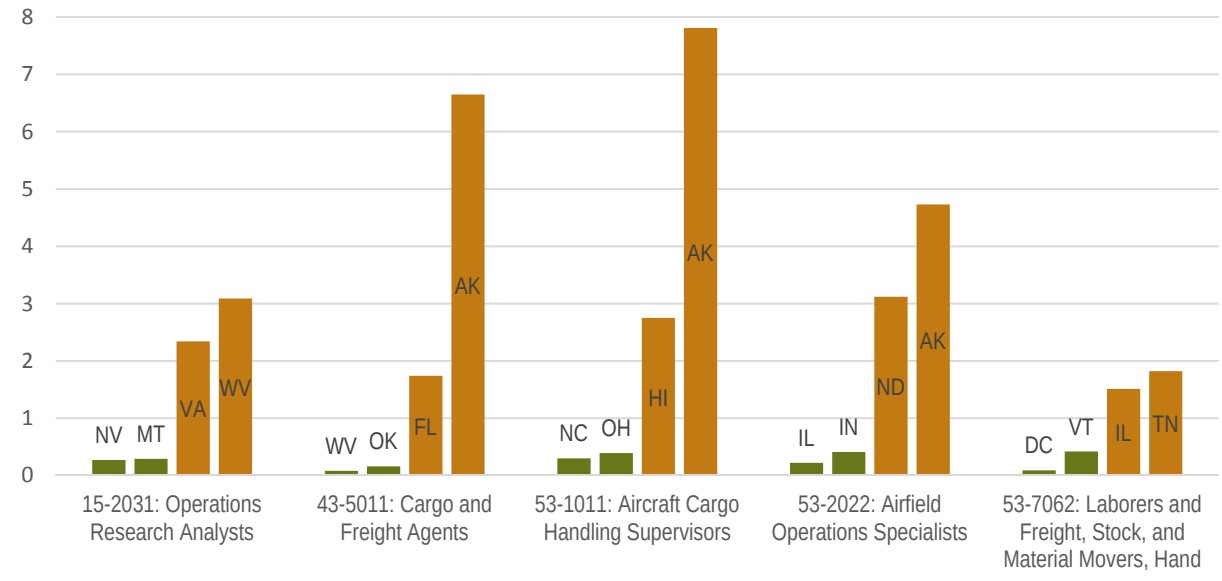
Exhibit 3-4: Concentration of Airport Development Occupations in States with Highest and Lowest LQ



Airport Operations Related Occupations

The next MCO, *Airport Operations*, includes five different occupations from the BLS data, as seen in Exhibit 3-5. The majority of these Airport Operations occupations have a high concentration in Alaska. Specifically *Cargo and Freight Agents, Aircraft Cargo Handling Supervisors, and Airfield Operations Specialists* are more highly concentrated in Alaska than in the U.S. as a whole. This means that it may be easier to find employees within these occupations to fill airport openings in Alaska than in other states. Airports could consider the impact of these high concentrations on filling other airport jobs, since other airport jobs could benefit from having employees with these skills. Looking specifically at *Operations Research Analysts*, the greatest concentrations are found in Virginia and West Virginia, meaning competition is likely high for these employees in these two states.

Exhibit 3-5: Concentration of Airport Operations Occupations in States with Highest and Lowest LQ



Airport Security Related Occupations

When looking to fill Security positions within airports, employees may potentially be classified as *Security Guards* or *Transportation Security Screeners*. LQ data for these occupations are provided in Exhibit 3-6. For *Security Guards*, the greatest concentration of these employees can be found in Nevada and Washington, while South Dakota and Maine have fewer job opportunities for *Security Guards*. Considering *Transportation Security Screeners*, there is likely little competition with other employers in Iowa and Kansas because of the low concentration of employment in this occupation. However, Alaska and Hawaii have a relatively large percentage of their employment in the area of *Transportation Security Screeners*.

Exhibit 3-6: Concentration of Airport Security Occupations in States with Highest and Lowest LQ

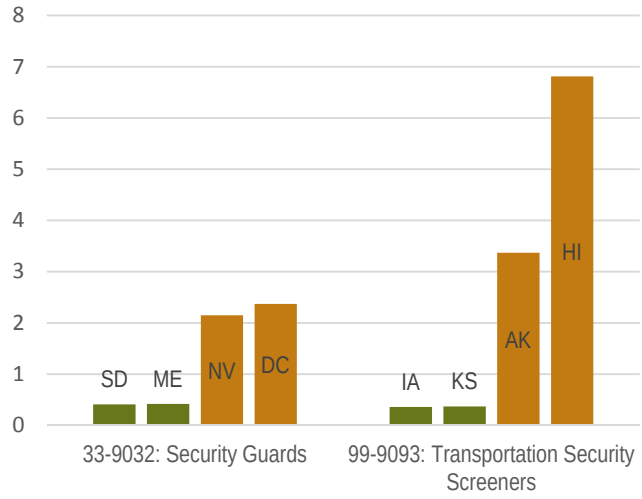
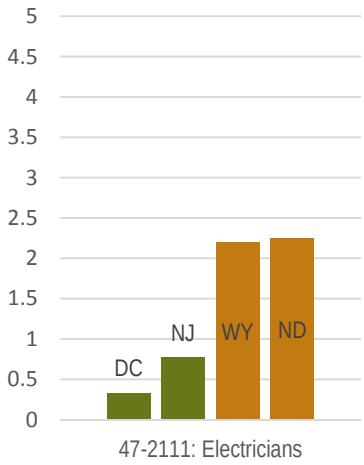


Exhibit 3-7: Concentration of Airport Electrician Occupations in States with Highest and Lowest LQ



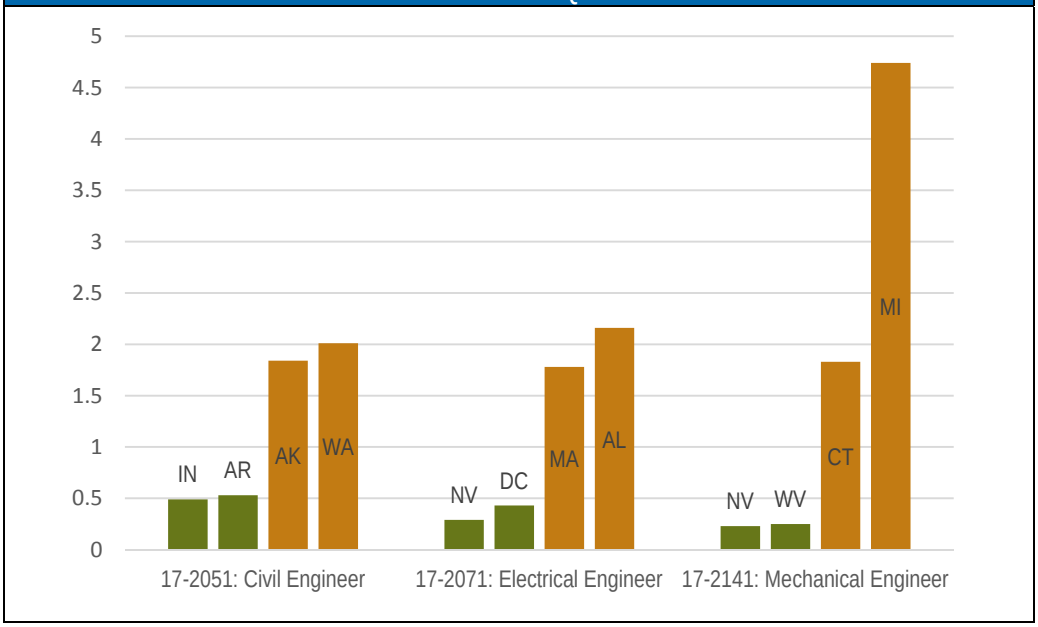
Airport Electrician Related Occupations

Another occupation identified as an MCO through this project is *Electricians*. *Electricians* perform a variety of work in airports and are important to ensuring effective operations both within and outside of the terminal. Both Wyoming and North Dakota have just over twice the concentration of *Electricians* as the national average (see Exhibit 3-7). With this large concentration of Electricians in Wyoming and North Dakota, there is likely to be greater competition for Electricians in these areas. Conversely, the lowest concentration of *Electricians* is found in Washington, DC and New Jersey. However, it the concentration of *Electricians* in New Jersey is not a great deal lower than the national average.

Airport Engineer Related Occupations

Engineers were also identified as mission critical for airport operations, and specifically in the areas of civil, mechanical, and electrical engineering. LQ data for the states with the highest and lowest concentration of engineers is provided in Exhibit 3-8. For both *Electrical* and *Mechanical Engineers*, the state with the lowest concentration compared to the entire nation is Nevada. Both Indiana and Arkansas have relatively low concentrations of *Civil Engineers*; about half the concentration of the U.S. Considering the states where there will likely be the greatest competition for engineering employees due to the higher concentration of employment, Alaska and Washington have the greatest concentration of *Civil Engineers*, Massachusetts and Alabama have the greatest concentration of *Electrical Engineers*, and Connecticut and Michigan have the greatest concentration of *Mechanical Engineers*. The concentration of *Mechanical Engineers* in Michigan is over 4.5 times that of the U.S. as a whole.

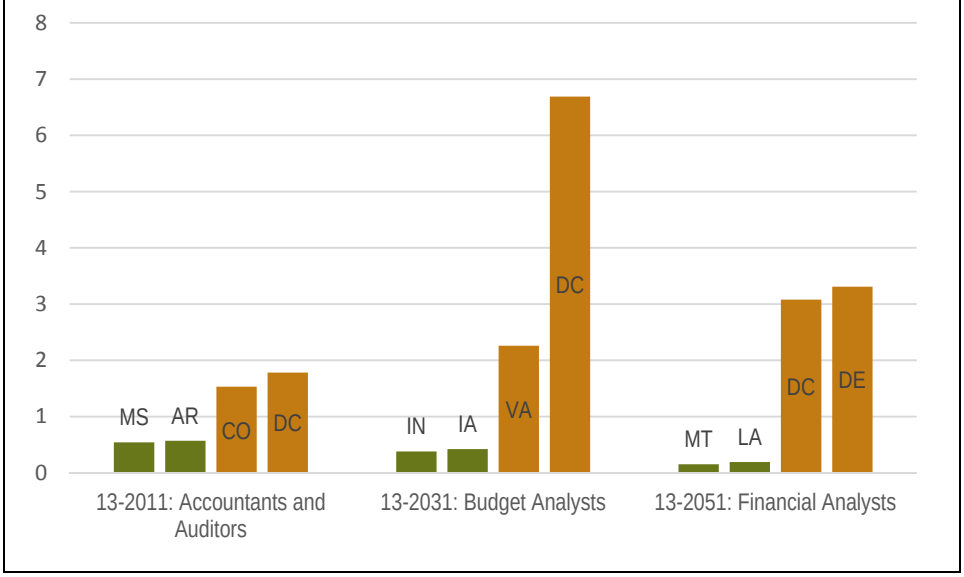
Exhibit 3-8: Concentration of Airport Engineer Occupations in States with Highest and Lowest LQ



Airport Financial Analysis and Planning Related Occupations

In the Washington, DC area, there is a high concentration of *Accountants and Auditors, Budget Analysts, and Financial Analysts* which could impact selection of talent for airport *Financial Analysis* and *Planning* occupations, as can be seen in Exhibit 3-9. The concentration of *Budget Analysts* in Washington, DC is especially high with almost seven times the concentration of the nation's average. Areas with lower concentrations of employees within this MCO include Mississippi and Arkansas for *Accountants* and *Auditors*, Indiana and Iowa for *Budget Analysts*, and Montana and Louisiana for *Financial Analysts*. These states with low concentrations may not have a very large applicant pool available for airport positions that become vacant or need to be filled.

Exhibit 3-9: Concentration of Airport Financial Analysis and Planning Occupations in States with Highest and Lowest LQ



Airport IT Related Occupations

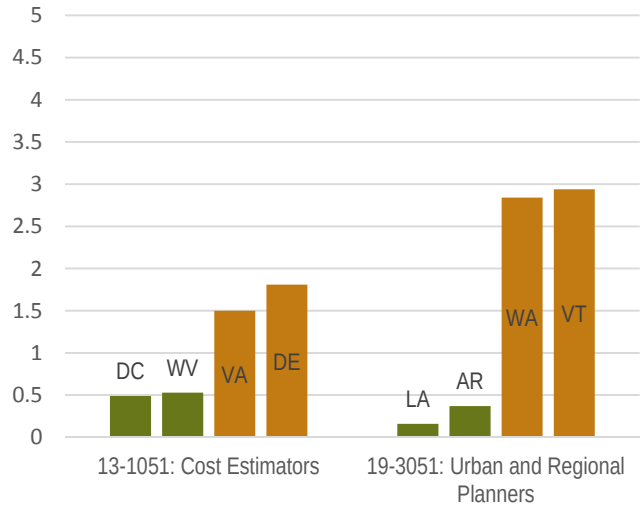
Exhibit 3-10 provides the LQ data for the various IT occupations. There are many different types of jobs that IT employees are needed to fill, as can be seen by the high number of BLS occupations in the figure below. When considering LQs and the concentration of employment within IT occupations, Washington, DC and Virginia each have high concentrations of employees in IT. Virginia has one of the highest concentrations for eight of the 13 IT occupations while DC has one of the highest concentrations for five of the occupations. This means that airports in and around DC and Virginia will likely experience a great deal of competition for IT employees, much of which will be from industries outside of airports and possibly higher salaries than airports can offer. The states with the lowest concentrations of IT employment vary by type of IT job, however both Alaska and Louisiana have one of the lowest concentrations of IT employment in six of the 13 BLS IT occupations. Therefore, Alaska and Louisiana likely do not have a large pool of IT employees available to fill needed positions in airports.

Exhibit 3-10: Concentration of Airport Information Technology (IT) Occupations in States with Highest and Lowest LQ

Airport Project Planning Related Occupations

Finally, the *Airport Project Planning* Occupations are shown in Exhibit 3-11. Virginia and Delaware have the greatest concentration of *Cost Estimators*, whereas Washington and Vermont have the greatest concentration of *Urban and Regional Planners*. Considering the states with the lowest concentrations for these occupations, it may be difficult to find *Cost Estimators* in areas such as Washington, DC or West Virginia. Similarly, there are likely not a large number of *Urban and Regional Planners* available for jobs in Louisiana and Arkansas. When looking to recruit for *Airport Planning* positions, states should be aware of these findings.

Exhibit 3-11: Concentration of Airport Security Occupations in States with Highest and Lowest LQ



Mission Critical Executive-Level Positions

This section provides information gathered about the executive-level positions in terms of their perceived impact on airport performance, workforce challenges, and influence of airport trends. For each of the three scenarios presented in Chapter 2, the following executive-level positions were identified as being the most essential given the potential future described:

Scenario 1: Integrated Business and Safety Technological Systems
- Critical executive-levels: Airport Operations & Maintenance; Information Technology (IT)

Scenario 2: The Passenger-Centric Airport
- Critical executive-levels: Airport Operations & Maintenance; Marketing & Public Relations; IT

Scenario 3: Increased Financial, Market, and Political Pressure
- Critical executive-levels: External Affairs/Government Relations; Finance and Asset Management; Marketing and Public Relations

Survey respondents were asked to consider the impact of the most critical executive-level positions on various airport performance criteria. The table in Exhibit 3-12 provides the mean (i.e., average) responses (on a 5-point scale) regarding the level of impact of the positions on each of the performance criteria. As can be seen in this table, *Airport Operations* and *Maintenance* executive positions are seen as the most impactful on the performance measure of having flights depart on time. Both *IT* and *Marketing/Public Relations* executive-level positions have their greatest performance impact in the area of improved passenger experience and the meeting of passenger expectations. Alternatively, *External Affairs/Government Relations* executive-level positions have their greatest impact on improved customer service with other stakeholders, such as airlines/tenants, concessionaires, contractors, TSA, and the FAA.

Exhibit 3-12: Executive-Level Positions: Perceived Impact on Airport Performance Criteria (Mean Values)

	Airport Operations and Maintenance	External Affairs/ Government Relations	Finance and Asset Management	Information Technology (IT)	Marketing and Public Relations
On-time flight departures	3.55	2.33	2.50	3.15	2.50

Strong finances of overall airport	4.00	3.67	5.00	3.46	3.90
Improved passenger experience and meeting of passenger expectations	4.45	3.33	4.25	4.85	4.80
Improved customer service with other stakeholders, such as airlines/tenants, concessionaires, contractors, TSA, and the FAA	4.82	4.33	4.25	4.62	4.60
Ensuring proper safety and security	4.64	3.67	3.25	4.46	3.20

Note. Responses on the scale ranged from the positions (1) Not at all having an impact to (5) Having an extreme impact.

Next, specific challenges and trends associated with each of the identified executive-level positions are explored. For these executive-level positions, the following data are provided:

- Training and development challenges
- Recruitment and turnover challenges
- Airport trends
- Skills that will be required to effectively function under the future scenarios.

Airport Operations and Maintenance Executive-Level Positions

Training and Development Challenges

According to survey participants, *Airport Operations and Maintenance* executive-level positions within airports lack training and development both for personal effectiveness, such as managerial and interpersonal skills, but also for technical skills that will be needed to effectively function in the future scenarios proposed. The greatest challenge identified for these executive-level positions is that new leader development programs will be needed to effectively lead the airport under the scenarios in which it was deemed most essential, specifically the first scenario about integrated business and safety technological systems and the second scenario about creating a passenger-centric airport. To overcome these challenges, airports will need to focus on ensuring that training programs are ready to prepare leaders to be successful in these positions. The greatest training and development challenges for *Airport Operations and Maintenance* executive-level positions, as identified by survey respondents, are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- New leader development programs needed for future scenario situations (81.8%)
- Lack of training and development to support technical skills needed (72.8%)
- Lack of training and development to support personal effectiveness (54.6%)

Recruitment and Turnover Challenges

Overall, recruitment and turnover was not seen as a significant challenge with regard to the *Airport Operations and Maintenance* executive-level positions. In fact, 54.6% of survey respondents indicated that they felt there are ample successors, at least 2-3 levels deep, in their airports to fill executive-level positions within this category of executive-level jobs. However, one challenge noted is the competition for executives with the required skill sets from other industries, and specifically from industries where there is better compensation for executives or elements of the job/ workplace that make the other industries more attractive to applicants. Accordingly, survey respondents indicated the primary roadblock for airports seeking to fill *Airport Operations and Maintenance* executive-level positions is:

- Competition across industries for skillsets required of these executives (100.0%)

Airport Trends

Due to potential changes that airports might experience due to increased technology and integrated business systems or creating an airport that is more passenger focused, *Airport Operations and Maintenance* executive-level positions will have a significant impact on their airports in the next 5-10 years. These changes will require executives to have more technological expertise to conduct their work as well as stronger knowledge of safety standards and regulations. These trends will impact how executives need to be prepared to be successful in their positions. Survey respondents indicated these executive-level jobs will entail:

- More advanced technological savvy (81.9%)
- A change in the types of stakeholders with whom executives must interact (72.7%)
- Increasing complexity of job tasks (69.9%)
- Deep knowledge of specific safety standards and regulations (60.0%)

Airport External Affairs/Government Relations Executive-Level Positions

Training and Development Challenges

Two of the greatest training challenges for *Airport External Affairs/Government Relations* executive-level positions, as identified by survey participants were the lack of training and development programs to support both personal effectiveness (e.g., managerial skills) and technical effectiveness. As such, training and development is needed to prepare employees in this area to take on future openings for the executive-level positions. Additionally, survey participants indicated that there are not career maps to show how employees can progress through these executive-level positions. This group of positions was identified as being particularly important for a potential future that includes increased financial, market and political pressures for airports to deal with. The greatest training and development challenges for *Airport External Affairs/Government Relations* executive-level positions, as identified by survey respondents, are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- Lack of training and development to support personal effectiveness (100.0%)
- Lack of training and development to support technical skills needed (75.0%)

- Lack of effective career maps to direct personnel into this executive-level track (66.7%)
- New leader development programs will be needed for this executive-level occupation (66.7%)

Recruitment and Turnover Challenges

As with the *Airport Operations and Maintenance* executive-level positions, recruitment and turnover was not seen as a significant challenge with regard to the *Airport External Affairs/Government Relations* executive-level positions. In fact, about half of respondents did not indicate challenges with regard to high levels of turnover or competition with other industries for these executive-level employees. A noted challenge is the lack of internal talent to fill these positions; however, survey respondents indicated that there is not a lack of talent for these positions in the labor market. This finding, combined with the lack of competition for employees, indicated that airports should be able to fill *Airport External Affairs/Government Relations* executive-level positions to meet future needs. Overall, survey respondents indicated the primary roadblocks for airports seeking to fill *these* executive-level positions are:

- Decline in talent among existing airport employees to fill future vacancies (66.7%)
- Lack of ample successors to fill these positions when executives leave (66.7%)

Airport Trends

Especially when considering a future scenario involving increased financial and market pressures, *Airport External Affairs/Government Relations* executive-level positions will have a significant impact on their airports in the next 5-10 years. These changes will require executives to interact with new people and have deep, specialized knowledge for their jobs. Multiple trends will impact how executives need to be prepared to be successful in their positions; survey respondents indicated these executive-level jobs will entail:

- A change in the types of stakeholders with whom executives must interact (66.7%)
- Increasing complexity of job tasks (66.7%)
- Jobs require specialized knowledge or skills and will therefore be hard to fill (66.7%)
- Deep knowledge of specific safety standards and regulations (66.7%)

Airport Finance and Asset Management Executive-Level Positions

Training and Development Challenges

Airport Finance and Asset Management executive-level positions were identified as especially important for the third scenario, which examined the potential impact of airports having to deal with increased financial, market, and political pressure. According to survey participants, these executive-level positions do not have sufficient training and development opportunities to support participants either personal effectiveness or needed technical skills. One positive finding regarding training and development for the *Airport Finance and Asset Management* executive-level positions is that three quarters of participants indicated that there are adequate leadership development opportunities, including both training and experiential learning, to prepare individuals in these executive-level positions for the new requirements that will come with a future focused on increased financial, market, and political pressure. This suggests that there are some developmental opportunities, likely focused on the jobs themselves, but that there are areas where more training is needed. The greatest training and development challenges for these executive-level positions, as identified by survey respondents are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- Lack of training and development to support personal effectiveness (100.0%)
- Lack of training and development to support technical skills needed (75.0%)

Recruitment and Turnover Challenges

Multiple challenges were noted for *Airport Finance and Asset Management* executive-level positions with regard to employee recruitment and retention. The greatest challenges focused on the high level of competition from other industries to hire individuals with the skillset that is needed to be successful in these executive-level positions. This challenge is compounded because of the apparent lack of internal talent to fill positions that become vacant. On their responses, survey participants identified the following as the greatest challenges encountered when hiring and retaining *Airport Finance and Asset Management* executive-level employees:

- Competition across industries for skillsets required of these executives (75.0%)
- Lack of ample successors in the airport to fill vacancies (75.0%)

- Decline in talent among existing airport employees to fill future vacancies (67.0%)

Airport Trends

Due to a potential future in which airports feel continuous competing pressures (e.g., political, regulatory, customer) to provide a financial return while also offering competitive wages and benefits, maintaining positive community relations, and maintaining a safe airport, *Airport Finance and Asset Management* executive-level employees will likely experience increasing complexity in their job requirements. Conversely, survey respondents did not indicate that this type of scenario will impact these executive-level occupations in terms of an increasing need for technical savvy, specialized knowledge, deep knowledge of safety standards, or the types of stakeholders with which executives must interact. The only trend that was noted as having an impact is that *Airport Finance and Asset Management* executive-level positions will entail:

- Increasing complexity of job tasks (75.0%)

Airport Information Technology (IT) Executive-Level Positions

Training and Development Challenges

According to survey participants, *Airport IT* executive-level positions lack training and development opportunities to support the technical skills that IT executive-level positions require. The greatest challenge identified for these executive-level positions is that new leader development programs will be needed to effectively lead the airport under the scenarios in which it was deemed most essential, specifically the first scenario about integrated business and safety technological systems and the second scenario about creating a passenger-centric airport. To overcome these challenges, airports will need to focus on ensuring that training programs are ready to prepare leaders to be successful in these positions. The greatest training and development challenges for *Airport IT* executive-level positions, as identified by survey respondents are listed below. For these training and development issues, the percentage of respondents indicating each area as a challenge is presented following the statement:

- New leader development programs needed for future scenario situations (84.6%)
- Lack of training and development to support technical skills needed (61.6%)

Recruitment and Turnover Challenges

When considering the recruitment and retention of employees for executive-level positions in *Airport IT,* the greatest challenge for airports is the high level of competition across industries for employees with the appropriate skill sets. IT is a growing occupation across industries, with these employees in high demand in many different organizations – organizations which may be able to offer better pay to employees than airports. In addition to competition, other recruitment challenges for *Airport IT* executive-level employees include that there are not enough qualified successors within airports to take over these positions and even outside of airports there is a perceived decline in the level of talent of potential employees. Accordingly, survey respondents indicated the primary roadblocks for airports seeking to fill *Airport IT* executive-level positions are:

- Competition across industries for skillsets required of these executives (100.0%)
- Lack of successors to fill this executive-level position if current leaders leave (61.5%)
- Decline in talent among existing airport employees to fill future vacancies (53.9%)

Airport Trends

Due to potential changes that airports might experience in futures such as those described in the scenarios about integrating business and safety technology solutions or creating a passenger-centric airport, *Airport IT* executive-level positions will have a significant impact on their airports in the next 5-10 years. These changes will require executives to have more technological expertise to conduct their work as well as abilities to meet increasing demands due to the jobs becoming more complex. All survey respondents selected these two trends as impacting *Airport IT* executive-level employees. Overall, survey respondents indicated these executive-level jobs will entail:

- Increasing complexity of job tasks (100.0%)
- More advanced technological savvy (100.0%)
- Will be difficult to fill because of a need for specialized knowledge/skills given future scenarios (76.9%)
- Deep knowledge of specific safety standards and regulations (61.6%)

Airport Marketing and Public Relations Executive-Level Positions

Training and Development Challenges

According to survey participants, *Airport Marketing and Public Relations* executive-level positions will be especially critical in future scenarios that focus on creating a passenger-centric airport and those where there are increased financial, market, and political pressures. Within these scenarios, leaders perceive there to be a lack of leader development programs to adequately prepare executives for these potential futures. As such, it is important that airports begin to develop training programs that focus on these futures and what leaders will need in them to be effective. One potential area to build on some positive findings is that 40 percent of the survey respondents indicated that there are effective career maps for these executive-level positions. Leveraging these available career maps may prove useful in preparing employees for the *Airport Marketing and Public Relations* executive-level positions. The greatest training and development challenges for *Airport Marketing and Public Relations* executive-level positions, as identified by survey respondents are listed below. For these challenges, the percentage of respondents indicating each area as a challenge is presented following the statement:

- New leader development programs needed for future scenario situations (80.0%)
- Lack of adequate leadership development opportunities to prepare employees to meet new requirements (60.0%)

Recruitment and Turnover Challenges

For *Airport Marketing and Public Relations* executive-level positions, the greatest recruitment and retention challenge identified is the high level of competition for these executive across industries. In fact, 80 percent of the survey respondents indicated that the skills these executives need to have are also in high demand outside of airports. Adding to the challenges encountered when trying to recruit for these executive-level positions is the perception that both within airports and across the labor market as a whole, there is a decline in the talent needed to fill these jobs. Accordingly, survey respondents indicated the greatest challenges for airports seeking to fill *Airport Marketing and Public Relations* executive-level positions are:

- Competition across industries for skillsets required of these executives (80.0%)
- Decline in talent among existing airport employees to fill future vacancies (60.0%)
- Decline in talent across the labor market to fill these positions (60.0%)

Airport Trends

Due to potential changes that airports might experience due to potential future scenarios, *Airport Marketing and Public Relations* executive-level positions will have a significant impact on their airports in the next 5-10 years. These changes will require executives to function in an environment in which their jobs become more complex and the work requires a greater degree of technical expertise. These trends will impact how executives need to be prepared to be successful in their positions. Survey respondents indicated *Airport Marketing and Public Relations* executive-level jobs will entail:

- Increasing complexity of job tasks (100.0%)
- More advanced technological savvy (100.0%)
- A change in the types of stakeholders with whom executives must interact (60.0%)

Identifying Sources of Talent to Fill Mission Critical Positions

For each of the occupations that have been identified as mission critical, it will be necessary for airports to ensure these positions remain filled by a workforce that has the capacity to fully execute the necessary job requirements. It may be possible for airports to hire employees from other airports, which would yield employees who have relevant skillsets that will transfer easily to their new jobs. However, sustaining and recruiting talent for these MCOs can be challenging in a labor market that has a small labor pool of qualified workers, is highly competitive, or where potential employees may not be aware of opportunities within the airport industry. There will not always be employees in other airports who are available and willing to fill open positions. In thinking strategically about how to fill MCOs as their demand expands, airports should consider the implications of two systems for growing the talent pipeline of qualified workers:

- Renewal Systems: This comprises opportunities to recruit new talent to the airport industry through the retraining of employees in other industries, and specifically those that are downsizing or shrinking.
- Advancement Systems: This source of employees considers the educational system and focuses on opportunities to attract new talent to the airport industry from community and technical colleges, four-year universities, and graduate programs.

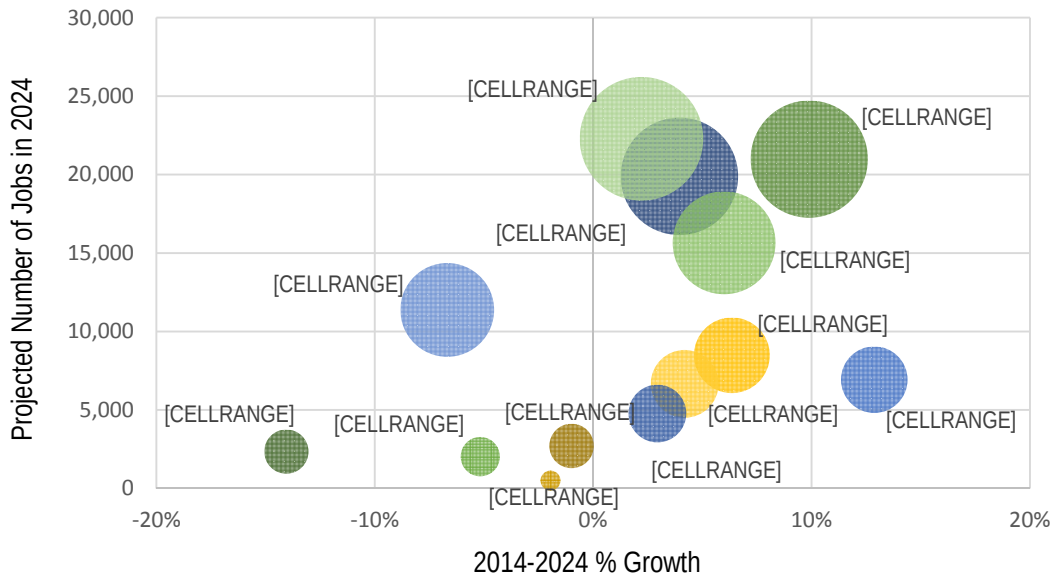
Analysis for each of these systems, specific to the airport industry and the identified mission critical occupations, is provided in the following sections.

Renewal Systems: Finding Employees from Shrinking Industry Sectors

Potential pools of new workers exist within industry sectors related to airports or the mission critical occupations that are expected to experience downsizing over the next 10 years. It is likely that many employees in these industry sectors will be seeking new job opportunities as their fields shrink. In cases where the migrating employees possess KSAs similar to those needed in the airport mission critical occupations, they can be retrained to meet staffing demands in airports. For example, employees from the manufacturing industry sector may be well qualified to fill positions within the Airport Development or Engineering occupations.

In this section, industry sectors that are forecasted to shrink at the national level between 2014 and 2024 are identified. A bubble chart in Exhibit 3-13 presents the size and relative growth or shrinkage of prominent industry sectors between 2014 and 2024. The bubble chart is followed by a tabular representation of the same information with 2014 and 2024 occupational numbers. Estimates in the table with red text are those industry sectors that are projected to decrease in size between 2014 and 2024.

Exhibit 3-13: Industry Sector Size and Growth Estimates



*Bubble size represents 2014 jobs in each industry sector.

Industry Description	2014 # of Jobs (in thousands)	Projected 2024 # of Jobs (in thousands)	Projected Growth (in thousands)	% Growth
Agriculture, forestry, fishing, and hunting	2,138	2,028	-111	-5%
Construction	6,138	6,929	790	13%
Financial activities	7,980	8,487	507	6%
Government - Federal	2,729	2,346	-383	-14%
Government - State and local	19,134	19,890	756	4%
Information	2,740	2,713	-27	-1%
Leisure and hospitality	14,710	15,651	941	6%
Manufacturing	12,188	11,374	-814	-7%
Other services	6,394	6,662	268	4%
Professional and business services	19,096	20,986	1,889	10%
Transportation and warehousing	4,640	4,777	137	3%
Utilities	553	505	-11	-2%
Wholesale and retail trade	21,191	22,281	469	2%

In reviewing the industry sector size and growth estimate data, it is clear that opportunities exist for the retraining of workers from downsizing industries. For example, the *Agriculture, forestry, fishing, and hunting; Federal Government; Information; Manufacturing; and Utilities* industry sectors are projected to experience shrinkage over the next 10 years. The *Federal Government* sector alone is projected to experience a decrease of about 383,000 jobs nationwide while the *Manufacturing* industry sector is estimated to lose more than 814,000 jobs in the U.S. This indicates that migrating workers from these industries could be prime candidates for targeted recruitment into MCOs, if training and development programs specific to airports are provided.

Advancement Systems: Finding Employees from Relevant Educational Programs

Beyond other industries or internal hires, new talent can be identified from the nation's educational system. This can include hiring graduates of local technical/community colleges and national four-year universities or graduate

programs. This section provides an overview of the types of educational programs from which airports can draw employees into the mission critical occupations.

As a first step in identifying the appropriate advancement systems, the National Center for Education Statistics' (NCES) crosswalk between DOL SOC codes and Department of Education (DOE) Classification of Instructional Programs (CIP) codes was used to derive a mapping of the SOC list to existing U.S. educational programs for each of the MCOs. The resultant list of CIP codes and their alignment with the MCOs is presented in Exhibit 3-13.

Exhibit 3-13: CIP Codes Related to Airport Mission Critical Occupations

Mission Critical Occupation	CIP Code	Standard Education Program Description
Airport Development	04.1001	Real Estate Development.
	52.1501	Real Estate.
Airport Operations	49.0105	Air Traffic Controller.
	14.3701	Operations Research.
	52.0408	General Office Occupations and Clerical Services.
Airport Security	--	*No CIP Code match identified, as only a high school diploma or equivalent is required*
Electrician	46.0302	Electrician.
	46.0303	Lineworker.
Engineering	14.0801	Civil Engineering, General.
	14.0802	Geotechnical and Geoenvironmental Engineering.
	14.0803	Structural Engineering.
	14.0804	Transportation and Highway Engineering.
	14.0805	Water Resources Engineering.
	14.0899	Civil Engineering, Other.
	14.1001	Electrical and Electronics Engineering
	14.1099	Electrical, Electronics and Communications Engineering, Other.
	14.1901	Mechanical Engineering.
	14.3301	Construction Engineering.
	14.4101	Electromechanical Engineering.
Financial Analysis and Planning	27.0305	Financial Mathematics.
	30.1601	Accounting and Computer Science.
	43.0117	Financial Forensics and Fraud Investigation.
	52.0301	Accounting.
	52.0303	Auditing.
	52.0304	Accounting and Finance.
	52.0305	Accounting and Business/Management.
	52.0801	Finance, General.
	52.0806	International Finance.
	52.0807	Investments and Securities.
	52.0808	Public Finance.
	52.1601	Taxation.
Information Technology (IT)	01.0106	Agricultural Business Technology.
	11.0101	Computer and Information Sciences, General.
	11.0102	Artificial Intelligence.
	11.0103	Information Technology.
	11.0104	Informatics.
	11.0199	Computer and Information Sciences, Other.
	11.0201	Computer Programming/Programmer, General.

Exhibit 3-13: CIP Codes Related to Airport Mission Critical Occupations		
Mission Critical Occupation	CIP Code	Standard Education Program Description
	11.0202	Computer Programming, Specific Applications.
	11.0203	Computer Programming, Vendor/Product Certification.
	11.0299	Computer Programming, Other.
	11.0301	Data Processing and Data Processing Technology/Technician.
	11.0401	Information Science/Studies.
	11.0501	Computer Systems Analysis/Analyst.
	11.0701	Computer Science.
	11.0801	Web Page, Digital/Multimedia and Information Resources Design.
	11.0802	Data Modeling/Warehousing and Database Administration.
	11.0803	Computer Graphics.
	11.0804	Modeling, Virtual Environments and Simulation.
	11.0901	Computer Systems Networking and Telecommunications.
	11.1001	Network and System Administration/Administrator.
	11.1002	System, Networking, and LAN/WAN Management/Manager.
	11.1003	Computer and Information Systems Security/Information Assurance.
	11.1005	Information Technology Project Management.
	11.1006	Computer Support Specialist.
	14.0901	Computer Engineering, General.
	14.0903	Computer Software Engineering.
	14.0999	Computer Engineering, Other.
	15.1204	Computer Software Technology/Technician.
	26.1103	Bioinformatics.
	26.1104	Computational Biology.
	30.0801	Mathematics and Computer Science.
	30.1601	Accounting and Computer Science.
	30.3001	Computational Science.
	30.3101	Human Computer Interaction.
	43.0116	Cyber/Computer Forensics and Counterterrorism.
	51.0709	Medical Office Computer Specialist/Assistant.
	51.2706	Medical Informatics.
	52.1201	Management Information Systems, General.
Project Planning	04.0301	City/Urban, Community and Regional Planning.
	04.1001	Real Estate Development.
	45.1201	Urban Studies/Affairs.
	14.1801	Materials Engineering.
	14.1901	Mechanical Engineering.
	14.3301	Construction Engineering.
	14.3601	Manufacturing Engineering.

Exhibit 3-13: CIP Codes Related to Airport Mission Critical Occupations		
Mission Critical Occupation	CIP Code	Standard Education Program Description
	15.1001	Construction Engineering Technology/Technician.
	52.0101	Business/Commerce, General.
	52.0201	Business Administration and Management, General.

While each of these educational programs is related to the airport MCOs, not all programs are likely targeted by airports to find applicants for jobs. Even those educational programs that are not currently considered by airports to be relevant to their workforce may have a strong potential to prepare the next generation of the airport workforce. Thus, graduates from these different educational programs could be targeted in future recruitment efforts. As an example, one airport reports that the majority of their airport operations staff come from pilot or aviation management programs.

Chapter 4 of this report will provide more detailed information on an evaluation of airport-specific education, training, and development programs. The relationship between current airport training and education with respect to the MCOs and related KSAs described in this chapter will also be further analyzed in Chapter 4.

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4. Education, Training, and Development Programs

Chapter 4 Executive Overview

Major Sections of Chapter

1. Programs at a Glance – Summary data on all training and education programs, with more detail for those that responded to a survey.
2. Meeting the Need for MCOs – A breakout of the percentage of total course offerings that address each competency within each MCO.
3. Profiling Programs in Depth – A more in-depth review of 5 training and education program providers
4. Evaluating the Education, Training, and Development Pipeline – Findings from the analyses above including assessment of T&E program sufficiency based on the evaluation criteria.

Value of Chapter to Airports Industry

- Consolidates summary information for a wide range of airport training and education programs in a single location.
- Aligns the content of those programs to the knowledge and skills needed for mission critical occupations
- Provides an in-depth look at T&E program features and content to dig beneath the surface of publically available information.
- Highlights gaps and areas of relative strength in current education and training programs in light of current and future airport needs

Key Summary Points from Chapter

- Airport training and education programs are largely centralized among a handful of trade associations and universities, which provides some economies of scale but limits options and availability for students.
- Most aspects of airport operations are covered in multiple airport-specific training and education programs, but some critical technical occupations like Electricians, Engineers, and Information Technology professionals have virtually no publically available airport-related content.
- Airport T&E programs have capacity to expand to meet demand from students, but it is not clear whether student demand will equal demand for talent from airports themselves.
- Most T&E providers demonstrated several indicators of quality (qualified staff, exposure to industry experts, high completion rates), but there is varying reliance on external accreditation or auditing of programs to monitor program quality.

How Leaders Can Make Use of Chapter

- Identify training and education providers to target as sources for future talent based on anticipated needs and courses offered.
- Review training and education program content and alignment to mission critical jobs to inform decisions about which T&E options might be beneficial for staff to pursue.
- Identify gaps in the existing training and education landscape and develop/procure internal training offerings to address gaps.

Prior research into airport training and education (T&E) programs has shown that despite the relatively small size of the airport workforce in proportion to the overall aviation industry workforce, a number of T&E programs advertise their ability to develop competent airport employees. Programs include academic degree programs, technical training programs, leadership development programs, certification programs, and academic/industry partnerships. What the industry currently lacks is an examination of how well these programs actually align with the needs of the industry and whether they can scale and adapt as those needs evolve.

To address these questions, this section of the report provides a multidimensional and multi-tiered evaluation of the current airport education and training landscape with respect to the future workforce capacity needs of airports. It captures basic information on program content, quality, capacity, and cost for a broad set of relevant programs, in addition to exploring several programs in greater depth to better understand what works well and how programs are evolving. By understanding the capabilities of various training and education programs, their potential to grow and adapt with the industry, and the gaps and opportunities for new programs to fill, airport leaders and education and training providers can begin to develop strategies to prepare the workforce of the future and ensure a sustainable talent pipeline for the industry.

To evaluate T&E programs against the future needs of the industry, a set of criteria were identified in collaboration with industry stakeholders. The goal of these criteria is to evaluate the extent to which current education and training programs align with the airport mission critical occupations, have the capacity to meet the expected demand and growth in the industry, demonstrate pedagogical best practices and consistent performance, and remain affordable and accessible by the majority of potential students. The specific criteria used to evaluate the sufficiency of each airport training and education program are presented below.

Sufficiency Criteria

- Type of program (education, training, certification, recruitment/outreach, internship)
- Type of organization (Private university/college, public university/college, secondary/technical school, trade association, partnership, other)
- Degree/certificate offered (Associates, Bachelors, Masters, Certificate, None)
- Number of relevant courses/labs/field work/internships offered (incl. examples of each)
- Mission critical occupations supported
    - Topics related to relevant competencies
- Capacity indicators
    - Number of students enrolled per year
    - Number of degrees/certificates awarded per year
    - Annual growth rate
    - Maximum obtainable growth in 1 yr. /5 yrs.
- Quality indicators
    - Accreditation
    - Graduation/completion rate
    - Qualifications for faculty
    - Access to airport industry experts
    - Job placement rates
    - Other evaluation and performance data
- Cost/ROI
    - Average cost per course
    - Average cost per degree/certificate
    - Average ROI per course or degree/certificate (included only if information available from provider)
- Talent pipeline
    - Selection criteria
        - Required qualifications

To fully evaluate the sufficiency of programs, the following steps were taken:

Step 1: Defining the Scope: Airports, like any modern business, consist of a myriad of professionals and workers with educational and training backgrounds as diverse as the airports themselves. Most major universities in the country have likely had at least one graduate pursue a career in airports regardless of whether that university catered to airport or aviation education specifically. Likewise, a financial analyst or public affairs specialist at an airport is more likely to have come from a general business administration or communications academic program than an airport-focused program. In some respects then, evaluating the entire airport T&E landscape would mean evaluating the national education landscape, a task which is both beyond the scope of this effort and better addressed in the higher education literature. Given that the ultimate goal of this project is to provide the *airport* industry with strategies and tools it can use to address *airport* workforce needs, general business education, science, and liberal arts programs were excluded from the analysis.

The next task was to determine how to approach the role of aviation T&E programs that may provide little airport-specific content. The majority of these programs focus on producing pilots, aircraft mechanics, and to a lesser extent, Fixed-base Operator (FBO) or other aviation business professionals. While at least some of their graduates may ultimately pursue airport careers, it is unclear how many. However, graduates from these programs who pursue airport careers are likely only receiving general aeronautical knowledge or the pilot or controller's perspective on airfield operations rather than that of an airport employee. Despite the potential value of this perspective, it is insufficient unless paired with specific knowledge, skills, and experience unique to airport roles. Therefore, the subsequent review of airport T&E was limited to programs that included at least one course aimed at developing current or future airport personnel (though many also included courses on other aviation topics).

Step 2: Comprehensive Scan: With that scope in mind, the research team conducted a high level scan consisting of a web-search and literature review. This search yielded 35 programs that offer airport-related T&E. Descriptions of the programs and any other publically available information were collected for each program. Information available through public sources was typically limited to degrees/diplomas/certificates offered, course topics, and program costs.

Step 3: Program Questionnaire: Each of the 35 identified programs was then invited to provide information about their programs via a web-based questionnaire. This provided additional information on the programs that is not publically available, including the relevance of courses to airport mission critical occupations, program capacity and growth potential, and indicators of program quality. The tables in the next section of the report highlight the 23 training and education programs that responded to the questionnaire and provided summary information as well as a wide range of criteria supporting the assessment of the sufficiency of the airport training and education pipeline.

Step 4: Provider Profiles: Next, interviews were conducted with 5 T&E providers to validate the questionnaire results, provide additional context, and obtain more robust information about the programs' alignment to mission critical occupations, competencies, and future scenarios. The interviews also helped clarify what each program contributes to the broader airport T&E landscape, captured effective practices and lessons learned, and explored how providers are adapting to meet the future needs of the industry. The five providers were selected to provide broad coverage of the types of T&E programs identified.

Pre-flight Briefing: Programs at a Glance

This section provides a high level overview of airport education and training (T&E) programs based on data collected in the comprehensive scan and program questionnaire. Programs that completed the questionnaire are listed first, followed by those included in the scan that did not complete the questionnaire. For each program that completed the questionnaire, the following information is provided:

- Program title
- The providing organization
- Type of degree or certificate offered
- Program summary
- Proportion of the program that focuses specifically on airports
- Current program enrollment
- Current enrollment growth rate in most recent year
- Average cost per course and degree/certificate (if applicable)
- Number of courses relevant to each mission critical occupation

* *Note:* Bolded items are also provided for programs that did not complete the questionnaire.

The data provided in the tables, along with the remainder of the program information provided in Appendix D, provide the foundation for the evaluation of T&E sufficiency with respect to the needs of the airport workforce. One of the most relevant criteria captured is the number of courses these programs provide related to airport mission critical occupations. As previously discussed, mission critical occupations are those that are essential to meeting the airports primary function, as well as those that are difficult to fill or have a high risk of vacancy. Thus, if airport education and training programs are not placing an adequate emphasis on preparing workers for these roles, airports may find it difficult to find sufficient numbers of qualified applicants or to develop existing employees to sufficient levels of proficiency in these vital roles. To call attention to this critical factor in the tables below, table cells have been shaded red if an occupation is not addressed by any course, light green if covered by one course, and dark green if covered by multiple courses. The airports focus cell is also color coded with dark green for 50% or more airport focus and light green for less than 50% airport focus.

Note that several of these programs are discussed further in the in-depth provider profiles presented later in this chapter (beginning on page 100). Those programs are marked with an asterisk. Also note that programs with no airport focus were not included in this review. Thus, many aviation management programs that focus on airline or other aviation businesses as well as aeronautical engineering programs were excluded if they did not include airport-specific coursework. Furthermore, the search focused primarily on programs in the United States, though two prominent international programs (BCIT in Canada and Cranfield University in the UK) were included as they were identified in previous research on airport training and education programs.

A quick review of these tables reveals a few noteworthy findings. Most of the programs have a significant focus (i.e. more than 50% of courses) focused on airport careers and the airport environment. Nevertheless, most programs also incorporate other aviation-related and general business courses. Furthermore, most of the programs cover more than one of the mission critical occupations, though some programs are more highly specialized in airport operations or security topics. However, coverage of topics pertaining to Engineering and Electrical work were virtually non-existent among airport training and education programs, and IT related content was also fairly rate considering its growing importance for the industry. The size of the programs tended to vary significantly with annual participants totaling more than 10,000 for some of the larger training programs, while the education programs tended to be smaller (20-50 students). Cost for most training programs ranged from a few hundred to a few thousand dollars, but of course collegiate degree programs had annual tuition that exceed $40,000 in some cases.

Accredited Airport Executive	AAAE	Certificate/Credential

The AAAE Accredited Airport Executive (A.A.E.) Program is a self-study program to develop executive-level airport professionals that grants the A.A.E. designation to those individuals who demonstrate the ability to handle the responsibilities of airport management. This program requires an affiliate membership in AAAE and full-time work of at least one year in a public-use airport. The two (non-required) courses in this program cover finance and administration; construction and environmental planning; airport operations, security and maintenance; and communications and community relations. Candidates may complete the courses at their own pace.

Airport Focus: 100% focus on airports

Enrollment: N/A Growth Rate: N/A Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
1	1	1	1	1	0	0	1

Certified Member	AAAE	Certificate/Credential

The Certified Member (C.M.) Program is a self-study program similar to the A.A.E. Program for employees who have less than three years of airport experience or do not wish to pursue full accreditation with AAAE. Course material covers finance and administration; construction and environmental planning; airport operations, security and maintenance; and communications and community relations. Though a course is available, students are not required to take it. Candidates may study for and complete the multiple-choice exam at their own pace.

Airport Focus: 100% focus on airports

Enrollment: N/A Growth Rate: N/A Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
1	1	1	1	1	0	0	1

Airport Certified Employee	AAAE	Certificate/Credential

The ACE program offers specialized training for full-time employees (including: public-use, military personnel, and others involved in the industry) that provides certification in five disciplines: Airfield Operations, Airfield Lighting Maintenance, Airport Security, Airport Communications, and Airport Trusted Agent. This program can also provide college credits toward an Associates or Bachelor's degree offered by the University of Phoenix.

Airport Focus: 100% focus on airports

Enrollment: 1200 Growth Rate: 30% Average Cost: $490

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	0	1	0	0	1	2

Airport Safety and Operations Specialists (ASOS) School	AAAE	Certificate/Credential

ASOS is an instructor-led training for Airport/Airfield Operations and Maintenance Departments personnel, taught by airport industry professionals. The Basic ASOS School is designed for individuals new to airport operations, while the Advanced ASOS School is designed for individuals who have attended Basic ASOS School or have at least three years of airport operations experience. Courses are typically 3 days long and cover 8 topics, including 14 CFR Part 139 Requirements, Records, and ARFF among others.

Airport Focus: 100% focus on airports

Enrollment: 390 Growth Rate: 30% Average Cost: $495

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	0	0	0	0	0	2

ANTN Digicast	AAAE	Certificate

The ANTN Digicast is a collection of web-accessible digital videos covering current events, regulations, technologies, and management and operation strategies relevant to the airport industry. Materials cover multiple aspects of airport training, including: Part 139 elements, security topics, airfield safety and maintenance, customer service, etc.

Airport Focus: 100% focus on airports

Enrollment: 16,000 Growth Rate: N/A Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	48	0	0	0	1	85

Interactive Employee Training (IET)	AAAE	Certificate

IET is a computer-based series of COTS training programs designed to provide onsite training to airport staff. It is available 24/7 and can be customized or enhanced with custom-created digital video from the specific airport where the program will be installed. The scenario-based training content tests application as well as knowledge and works on multiple platforms (e.g., mobile). The programs also contain a Training Data System, which writes scoring back to a central server.

Airport Focus: 95% focus on airports

Enrollment: 197,436 users Growth Rate: 12,000 users Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	13	0	0	0	0	12

Onsite Training	AAAE	Certificate/Credential

AAAE offers onsite training programs at customer airports covering all aspects of airport management, operations, and administration. The programs are customized to fit each airport's needs and are taught by experienced aviation management professionals, including airport directors and aviation consultants.

Airport Focus: 100% focus on airports

Enrollment: N/A Growth Rate: N/A Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	4	1	0	0	1	7

Airport Executive Leadership Programme*	ACI	Certificate/Credential

This programme focuses on further developing the leadership and strategic management skills of airport industry leaders. It provides participants with advice on strategies to effectively handle leadership responsibilities; provides global, regional and cultural perspectives on airport management; and discusses new professional opportunities. Participants will also be able to access a global forum to network with peers and other future leaders. Successful participants are awarded an ACI/JMSB-Concordia University Diploma; others will receive a certificate of attendance. This course can also be taken as an Airport Management Professional Accreditation Programme (AMPAP) elective course.

Airport Focus: 30% focus on airport leadership, 70% focus on general leadership

Enrollment: 24 Growth Rate: 10% Average Cost: $6,200

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	0	0	0	0	0	0

ACI Online Learning Centre*	ACI	Certificate/Credential

The Online Learning Centre (OLC) was established by Airports Council International to provide online training services to the global airport industry. ACI provides a broad range of industry standard online training courses designed to help airports deliver training through a fully managed e-learning solution. Non-certificate, certificate, and diploma programs are available through ACI.

Airport Focus: 100% focus on airports

Enrollment: 5000+ | Growth Rate: 20% | Average Cost: $50-$1,795/course

Course Coverage of Mission Critical Occupations

IT	Finance	Security	IT	Finance	Security	IT	Finance
0	2	2	0	2	2	0	2

ACI-ICAO Airport Management Professional Accreditation Program (AMPAP)*	ACI	ACI-ICAO Diploma/International Airport Professional (IAP) or AMPAP Associate designation

This program provides global professional accreditation for airport personnel. Completion results in an International Airport Professional accreditation. Courses include Air Transport System and Air Operations, Safety, and Security among others.

Airport Focus: 90% focus on airports, 10% focus on broader aviation experience

Enrollment: 1100 | Growth Rate: 13% | Average Cost: $1680-$6000/course; $15,000/diploma

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	1	1	1	0	0	1

ACI Professional Certificate Courses*	ACI	Certificate/Credential

ACI Professional Certificate Courses are available in six major categories: safety, security, facilitation, economics, environment, and management and technical. They consist of a full range of professional classroom courses covering a multitude of airport-related topics, and are designed to enhance the competencies of airport personnel from entry through to management levels. They can be taken in both classroom and e-learning formats

Airport Focus: 100% focus on airports

Enrollment: 5,716 | Growth Rate: 18% | Average Cost: Varies by course/diploma ($50 - $6,200)

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	9	3	7	3	0	0	23

Airport Operations Diploma*	ACI	Certificate/Credential

The Airport Operations Diploma Programme is designed to expose participants to all the facets of activities associated with an airport from airside and landside operations to terminal operations, and equip them with key knowledge and tools necessary to proactively address the essential operational and business needs of 21st century airports. Completion of all three courses included in this programme results in the ACI Airport Operations Diploma. Completion of individual courses results in a stand-alone certificate for the course.

Airport Focus: 100% focus on airports

Enrollment: 500+ | Growth Rate: 59% | Average Cost: $1,795

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	0	0	1	0	0	1

BCIT Airport Operations Diploma Program	British Columbia Institute of Technology	Diploma

The 16-month BCIT diploma program in Airport Operations, supported and approved by the aviation industry, provides students with an interdisciplinary program of study. It is the only program of its type in Western Canada. To maintain standards, the program has an industry Advisory Committee made up of airport and airline managers, airport field staff from Canada's local regional and national airports, and Transport Canada representatives.

Airport Focus: 90% focus on airports, 10% focus on other

Enrollment: 24 | Growth Rate: 0% | Average Cost: $300/course; $15,000/diploma

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	2	2	4	4	0	0	0

MSc in Airport Planning and Management	Cranfield University, UK	Master's Degree

The MSc in Airport Planning and Management was created to meet a demand for graduates skilled and qualified in airport business development, planning, design, operations, and environmental management. It consists of ten modules, a group project, and an individual research project. Modules include: Introduction to the Air Transport Industry, Regulatory Policy and Air Law, Research Methods and Statistics, Air Transport Market Analysis and Forecasting, Airport Strategic Planning, Airport Environmental Planning, Airport Operations, and Airport Design.

Airport Focus: 67% focus on airports, 33% focus on general aviation

Enrollment: 23 | Growth Rate: 5% | Average Cost: £9,000

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
1	3	1	3	5	1	0	1

Airport Management Degree Program	Florida Institute of Technology, College of Aeronautics	Master's Degree

The Airport Management Degree Program is a master's level aviation program that addresses airport technology and management strategies, as well as industry trends and challenges. The program provides management degree students with a comprehensive background in aviation studies, management, and business to provide expertise on issues such as airport operations, vendor management, personnel training, aircraft taxi zones, sound barrier creation and more.

Airport Focus: 50-90% focus on airports, 10-50% other (economics, financial & personnel management)

Enrollment: N/A | Growth Rate: N/A | Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	1	1	1	0	0	1

Airport Management Degree*	Kansas State University	Bachelor's Degree

This degree track prepares students for careers in airport management. Coursework includes a study of airport environmental regulations, airport law, aviation/airport funding structures, an airport planning overview, airport management and airport field (lab) experience. Students also have an opportunity to graduate with the Certified Manager designation from the American Association of Airport Executives.

Airport Focus: 25% focus on airports, 75% focus on other

Enrollment: 27 | Growth Rate: Not enough data | Average Cost: $342/course; $35,000/degree

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
3	5	1	2	2	0	0	2

Aviation Management Specialization	Ohio State University Center for Aviation Studies	Bachelor's Degree

The Center for Aviation Studies incorporates engineering, business, and behavioral philosophies into a multidisciplinary approach to the many components of the aviation industry, supporting flight education programs, academic degree programs, research initiatives, and outreach activities on local, regional, national, and international levels. The Aviation Management specialization is designed to prepare students for professional positions in aviation. The degree program includes business foundation, aviation, and general education courses.

Airport Focus: 20% focus on airports, 80% focus on other

Enrollment: 170 | Growth Rate: 40% | Average Cost: $40,000/degree

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	0	1	1	0	0	2

Airport University*	Port Jobs - Seattle	Certificate/Credential

Port Jobs operates a high volume employment center at Sea-Tac Airport called Airport Jobs where they serve approximately 6,000 job seekers each year and post jobs for about 100 airport companies. Their Airport University program partners with Highline College and South Seattle College to offer credit-bearing courses onsite at Sea-Tac Airport that allow airport workers and job seekers to pursue certificates and degrees at those community colleges.

Airport Focus: 100% focus on airports

Enrollment: 183 | Growth Rate: 100% in one year | Average Cost: $100-$400

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	5	0	0	0	0	0

Safety Security Instruction (SSI)*	SSi, Inc.	Certificate/Credential

SSI provides safety and security training, and regulatory compliance consulting services to the aviation industry. Over 35 large, medium, and small hub airports utilize SSI's cloud-based, or on-premises, turn-key iLS™ systems to deliver more than 1,000,000 computer-based training sessions to employees and tenants annually. The iLS™ provides reporting, tracking, and data security. In addition, SSI has an interactive courseware catalog with courses ranging from AARF, airport security, airport driver, fueling, safety and communications and general aviation.

Airport Focus: 95% focus on airports, 5% focus on broader aviation expertise

Enrollment: 1 million + | Growth Rate: 20% | Average Cost: $395+/workshop; $10 per person/course

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
1	0	70	0	11	0	0	60

Airport Systems Planning and Design (short course)	University of California at Berkeley	Certificate of completion & Continuing Education Credits

This four-day short course covers airport systems planning, airport master planning, airfield layout planning and design, and more. It is typically attended by airport employees, government employees, and private consulting firms.

Airport Focus: 100% focus on airports

Enrollment: 30-35 | Growth Rate: Stable | Average Cost: $2,000

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	0	0	0	1	0	0	0

Aviation Management - Airport Management Option	University of Central Missouri	Bachelor's Degree

This program provides students the education and experience needed to be part of an airport management team. The eight airport-related courses emphasize the business, planning, and personnel management background needed to be successful in airport management.

Airport Focus: 5% focus on airports, 95% focus on other (finance, CAD, public relations, etc.)

Enrollment: N/A | Growth Rate: N/A | Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	1	2	0	0	0	1

B.B.A w/major in Airport Management*	University of North Dakota	Bachelor's Degree

The Airport Management curriculum is offered to students seeking employment in administrative positions with companies in and related to the groundside activities of the aviation industry. All aspects of general aviation, air carrier, and the total aviation industry are studied. Students can concentrate in a particular area of the industry such as general aviation operations, airline management, airport administration, or corporate aviation management.

Airport Focus: 20% focus on airports, 20% other aviation, 30% general, 30% business/political science

Enrollment: 50 | Growth Rate: Stable | Average Cost: N/A

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
2	4	0	1	2	0	0	2

M.S. in Aviation*	University of North Dakota	Master's Degree

The M.S. in Aviation degree provides the educational background for aviation industry professionals to solve problems within the field of aviation including airlines, corporate aviation, general aviation, and airport management. Graduates are exposed to the various complexities facing the industry through a variety of aviation industry related courses. Graduates also complete classes in statistics and research methods, and learn how these topics may be applied to researching and solving problems within the aviation industry.

Airport Focus: 10% focus on airports, 90% other aviation related (safety, labor, SMS, air traffic, etc.)

Enrollment: 40 | Growth Rate: 10% | Average Cost: $15,000 (in-state)/ $45,000 (out of state)

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airside Ops
0	1	0	0	1	0	0	1

Airport Operations Management Technical Certificate	Broward College	Certificate	
The Airport Management Certificate is a concentration consisting of specific aviation operations and airport management courses along with one business course, to prepare students seeking employment in the airport operations field. This certificate provides insight into the day-to-day operational and managerial aspects of the airport environment and expands upon several topics including: investigation of incidents and accidents, aviation safety on the ground, human factors in aviation, hazardous materials and the identification of hazards, passenger safety, land use, wildlife control, airport security, and an overall working knowledge of airports.			
Embry-Riddle Aeronautical University: The Teaching Airport	Embry-Riddle Aeronautical University	Masters	
This program integrates course curricula with internships and other part-time employment opportunities at partnering airports, such as the Daytona Beach Intl Airport. Degree programs in Aviation Business Administration and Aviation Management, including some airport-specific courses, are available at three campuses and online.			
Airport Management Degree Program	Florida Institute of Technology	Masters	
This master's level aviation program addresses airport technology and management strategies, preparing students to recognize industry trends and challenges. Florida Tech provides airport management degree students with a comprehensive background in aviation studies, management, and business to provide expertise on such issues as airport operations, vendor management, personnel training, aircraft taxi zones, sound barrier creation and more.			
IATA Training Programs, IATA Training and Development Institute	IATA	Certificate	
The IATA Training and Development Institute contains courses on over 200 topics of interest to management level professionals in the aviation industry. Examples include Airport Operations, Airports and Runways, and Airport Terminal Planning and Design.			
Professional Line Service Training	NATA	None	
Online initial and recurring safety training for professionals who perform duties on the airport ramp, including such tasks as fueling, marshalling, and aircraft line servicing, of general aviation and commercial aircraft. The program is comprised of eight modules that have been authorized by the Federal Aviation Administration.			
Line Service Supervision & Training Management	NATA	Certificate	
This online training is comprised of eight modules which, when completed, fulfill the FAA 139.321 supervisory requirements. Training certificates meet both the 14 CFR Part 139 Section (e)1 supervisor fire safety training requirements and the Line Service Supervisor training.			
Online Safety and Health Training for Aviation Facilities	NATA	None	
Detailed training on an array of topics to keep airports operation safe, secure and fully compliant with OSHA. There are 18 different online modules, including back safety, hearing conservation, blood borne pathogens, heat stress, and other safety training.			

Aerospace Administration Program	Polk State College	Associates	

This program is designed to provide students with a holistic, operational study of the U.S. and international aerospace systems. It prepares students for careers in commercial aviation and aerospace administration. The degree incorporates Safety Management Systems (SMS) concepts into each course, allowing for the development and application of information regarding safety factors and risks that are naturally present in the aerospace environment. All students participate in a common program core before specializing in either a Professional Pilot or Aerospace Administration concentration. Both concentrations culminate in a capstone course, which encourages students to implement their theoretical mastery of the degree content in an operational context.

Airport Management and Operations Program	Purdue Polytechnic Institute	Bachelors	

This program at Purdue University allows students to gain the expertise necessary to navigate the many aspects of operating an airport. Students gain broad exposure to aviation management with a strong focus on airport operations. Courses provide insight into how the world's airports make daily business decisions.

Airport Management Bachelor Degree Program	Vaughn College	Bachelors	

Vaughn College, located adjacent to New York's LaGuardia Airport, provides an airport management degree program structured around the premise that managing an airport is similar to running a small city. Students investigate subjects including wildlife hazards, ecosystem management, airfield safety and emergency planning and control. The program requires two semesters of a foreign language. Students may also choose to complete the air traffic control program while obtaining a degree in airport management.

Airport Management Master of Science Degree Program	Vaughn College	Masters	

The Vaughn graduate level degree applies modern management concepts to the aviation environment to provide mid- or junior-level professionals with the skills and knowledge to advance in airports and airport-related businesses. Students must complete 33 to 34 credits, as well as a master project or thesis.

Airport Management Associate Degree Program	Vaughn College	Associates	

Designed to prepare students to work in airports and related businesses, this two-year program combines liberal arts, math and science with general management and airport management courses. It provides a foundation in English and math while building general management skills and applying them to the functions of an airport environment. The degree also can include the air traffic control program, thereby giving students additional career options.

Intersections: Meeting the Need for Mission Critical Occupations

Beyond the question of whether airport T&E programs align to mission critical occupations overall, further analysis is needed to determine where airport T&E gaps might exist *within* mission critical occupations. For example, there may be training and education programs that focus on airport security in general but neglect the issue of cyber security, which is increasingly a critical focus in the industry. In such a case, it could appear that an occupation is adequately addressed because there are a number of programs that focus on it, but they may be lacking in content relevant to critical competencies that are emerging in the field.

In order to more thoroughly explore airport training and education programs at the competency level, program providers were asked to list courses that related to each mission critical occupation. These courses were then aligned with competencies derived from the required knowledge, skills, and abilities as reported by several airports that participated in this research. The matrix on the following pages presents the percentage of total providers responding and percentage of total courses identified that align to each competency within each mission critical occupation. The chart is color coded based on the proportion of courses covering each competency using the following scales:

- Proportion of Providers:
  - No providers
  - More than 0% but less than to 30% of providers
  - More than 30% of providers
- Proportion of Courses:
  - No courses
  - More than 0% but less than 6% of courses
  - 6% or more of courses

While this data may not provide a complete picture of every airport T&E program available, it offers a representative look at occupation and competency-level coverage among a variety of prominent programs and providers in the airport industry. The data reveal that certain core competencies are covered heavily across a number of different T&E providers while others are not addressed at all. For example, at least half of the providers offer courses related to applying airport legislation and regulations, airport planning, airport operations, safety and security procedures. “Softer” skills like communication, personnel management, stakeholder coordination, financial management, and crisis management are covered by about a third of programs. Finally, considering the low numbers of courses focusing on IT, Electrical, and Engineering fields in general, it is unsurprising to see that coverage of the related competencies is quite sparse. Some of the programs include courses in basic computer skills as part of an undergraduate curriculum or computer-aided design as part of an airport development program, but these courses are not geared toward IT professionals or the technical trades critical to an airport’s success. Even topics like cybersecurity and IT risk management that would seem crucial for modern airport leaders have not been addressed by the vast majority of programs.

Alignment of Training and Education Programs to Mission Critical Occupations and Competencies			
Occupational Category	Competencies / Training Needs	% of Providers	% of Courses
Airport Development	Interpreting and applying legislation and regulation for airports property management, real estate, construction, and leasing (incl. FAA regulation and grant assurances)	57%	6%
	Financial reporting, budgeting and proposal development	29%	3%
	Airport and airfield planning	57%	7%
	Computer skills	14%	2%
	Record management		
	Resource allocation	14%	1%
	Environmental assessment	21%	3%
	Real estate negotiations	7%	0.6%
	Communication	29%	6%
	Relationship building	21%	2%
	Personnel management	36%	6%
Airport Operations	Runway and lighting systems and regulations	14%	2%
	Interpreting and applying rules and regulations of FAR-139, FAA, and other regulatory agencies	29%	7%
	Airline/airport ground and flight operations	71%	12%
	Airport safety and security procedures	57%	16%
	Complex problem solving	21%	3%
	Airport communications	14%	2%
	Operational analysis and decision making	43%	5%
	Airfield stakeholder coordination	21%	2%
	Emergency management and coordination	64%	9%
Airport Security	Interpreting and applying FAA and TSA security regulations	50%	5%
	Interpreting and applying international accords, laws, rules and regulations governing airport operation and security	29%	5%
	Public safety methods and standards	29%	6%
	Crisis management	29%	3%
	Rapid decision making	7%	0.6%
	Written and oral communication	36%	9%
	Personnel management	29%	5%
	Policy and procedure development	21%	2%
	Rapport building	21%	2%
Electrician	FAA regulations and recommendations for airport lighting systems	Note: Most Airport Electricians and other maintenance personnel receive the majority of their training through non-aviation specific programs, and the research team did not identify	
	Electrical terminology		
	Function of electrically controlled equipment		
	International Building Codes (IBCs) and/or NFPA		

Alignment of Training and Education Programs to Mission Critical Occupations and Competencies			
Occupational Category	Competencies / Training Needs	% of Providers	% of Courses
	Machines and tools, including their designs, uses, repair, and maintenance	training or education programs that focused specifically on developing Electricians for airport careers. Strategies to attract Electricians to airport careers and develop their airport-specific competencies could be developed as part of the Guidebook in Phase 2.	
	Troubleshooting operating and electrical errors		
	Repairing machines, power equipment, or systems using tools		
	Handling and operating high voltage equipment		
	Customer service	7%	0.6%
	Emergency assistance		
	Cost estimation		
Engineer	Engineering principles and practices	Note: Most Airport Engineers receive the majority of their training through non-aviation specific programs and the research team did not identify training or education programs that focused specifically on developing engineers for airport careers. Strategies to attract engineers to airport careers and develop their airport-specific competencies could be developed as part of the Guidebook in Phase 2.	
	Maintenance and construction of airport buildings and equipment		
	Laws, rules, regulations, and guidelines relating to engineering, construction, facilities, building codes, and airport operations		
	Aircraft operational characteristics		
	Application of traffic data and forecasts		
	Runway, taxiway and apron characteristics and drainage		
	Soil and materials analysis		
	Computer-aided design (CAD)	14%	2%
	Quality control and monitoring		
	Estimate and design document review		
	Written and oral communication		
	Negotiation and influence		
	Project management and oversight		
Financial Analysis and Planning	Public finance administration		
	FAA grant assurances and regulations	7%	1%
	Theories, principles, and practices of organizational structure, management, and administration	43%	10%
	Investment strategy	7%	0.6%
	Sale and issuance of public revenue bonds		
	Airport operation and management	36%	6%
	Financial management systems	29%	3%
	Financial management best practices	29%	3%
	Written and oral communication	21%	3%
	Public speaking and engagement	14%	3%
	Personnel management	29%	4%

Alignment of Training and Education Programs to Mission Critical Occupations and Competencies			
Occupational Category	Competencies / Training Needs	% of Providers	% of Courses
Information Technology	CRM business-to-consumer technologies		
	Business administration	14%	3%
	Information systems design, development, and implementation	14%	2%
	Network and wireless communication systems		
	Phone and dispatch equipment and cabling		
	Information technology platforms and developments		
	Cyber security and associated threats	7%	0.6%
	Cross-functional collaboration		
	Mobile technology		
	IT risk management	7%	0.6%
	Data analysis and reporting		
	Written and oral communication	21%	3%
	Negotiation and influence	14%	2%
	Project management	14%	3%
Project Planning	FAA regulations, advisory circulars, and other federal laws pertaining to airport planning and design	50%	10%
	Interpreting and developing airport master plans, layout plans, design standards, safety and security analysis, emergency plans, and other relevant planning documents	50%	8%
	Strategic planning	21%	3%
	Complex project management	7%	1%
	Procurement programs and related regulation	7%	0.6%
	Facility development costs	21%	3%
	Written and oral communication	29%	4%
	Simulation modeling for airside or terminals	7%	0.6%
	Resource allocation	14%	2%
	Developing requests for proposals	7%	0.6%
	Contract administration and consultant management	21%	2%

Performance-based Navigation: Profiling Programs In-Depth

Information on current alignment to mission critical occupations and competencies is helpful for assessing airport T&E sufficiency in a broad sense, but there is more to developing the future airport workforce than covering the right topics. It is also about developing understanding and skills that will help future airport employees adapt to major trends and challenges in the airport industry such as increasing technological integration and navigating complex regulatory, financial, and political pressures. It is about having qualified instructors and course developers who can make the content engaging and incorporate lessons from their real world airport experience. And it is about having the flexibility to grow or adapt to changes in demand while maintaining high quality standards. By taking a closer look at different types of programs, it is easier to explore these dimensions and assess whether the training and education landscape that exists today is likely to sustain the industry through the challenges ahead.

The following tables provide profiles of five distinct T&E providers that each offer a unique perspective on the types of T&E programs identified in the initial scan. They include:

- Airports Council International Global Training – A broad suite of online and in-person airport-oriented training, certification, and leadership development programs provided by the global trade representative of airports.
- University of North Dakota Bachelor of Business Administration (Airport Management) – A longstanding academic degree program with a core business curriculum and airport and aviation coursework.
- Kansas State Polytechnic Bachelor of Science (Airport Management) – A newer academic degree program with broad coverage of airport management topics and a focus on hands on labs.
- Safety & Security Instruction, Inc. – A small business specializing in safety and security training and regulatory compliance that provides more than 1,000,000 online training sessions annually as well as instructor-led classroom training on demand.
- Port Jobs – Airport University – A partnership between a non-profit organization, SeaTac Airport, and local community colleges to provide educational opportunities to airport employees and aspiring employees with credit-bearing courses tailored to the airport environment.

These profiles reveal that airport training and education providers, while limited in number, are fairly diverse in their offerings and business models. For example, ACI Global Training is an international trade organization that represents airports and primarily operates through national affiliates around the world. Although they operate through a decentralized structure, their global reach and resources have supported development of a broad range of professional training for current airport managers at various stages of their careers in a wide range of technical specialties. Although their international approach and relationship with ICAO may imply that some of the courses are not as customized to the specifics regulations of the US, their courses would seem to provide both the technical foundations for mid-career employees looking to advance, while also developing the leadership skills of more senior managers with an eye on the C-suite.

At the collegiate level, airport management oriented Bachelor of Science and Business Administration degrees exist, and the University of North Dakota and Kansas State Polytechnic programs illustrate two compelling approaches to train future airport managers. UND, one of the nation's largest sources of airline pilots, requires that all undergraduate airport management majors obtain a private pilot certificate, thereby ensuring that they have a strong grasp of aviation fundamentals in addition to business and airport-related coursework. At the same time, it emphasizes development of personal/workplace effectiveness skills, as these are perceived as lacking among recent graduates by many employers. The more recently developed Kansas State Poly Airport Management degree program is being revised for fall 2016, and it demonstrates the value of involving airport leaders in that process. Not only is the classroom curriculum informed by real world examples, but students have labs in virtually every class that allow them to experience the challenges of airport management first hand.

Safety & Security Instruction, Inc. is an example of how specialized training and education needs of airports can be met on a large scale. SSI specializes in providing safety and security training that is required for most airport employees on a large scale. They offer a computer-based training platform that is customizable to the needs of different airports. The scalability of such programs will play an important role in meeting airport training capacity needs as the industry grows.

Airport University takes a different approach to building the talent pipeline by partnering with local community colleges to provide education in commonly needed topics to employees at the airport. While the course topics are not highly advanced, the focus on supporting a diverse range of employees with flexible hours and support for those with limited English proficiency or learning disabilities sets it apart. Models such as this that build on educational capacity within the community, focus on developing the pipeline among nontraditional sources of talent, and adapt to the needs of a busy workforce will be increasingly valuable in meeting the workforce capacity needs of the future.

Program: Provider:	Global Training (various programs) ACI
PROGRAM OVERVIEW	
Program Type:	Certificate/credential
Overview:	The Airport Executive Leadership Programme (AELP), administered in conjunction with the Concordia University John Molson School of Business, is geared toward future C-suite leaders in the airport realm, and covers standard leadership courses with an airport flavor, including topics such as: leadership style, awareness of self, and strategic planning. It consists of a 4-week online segment, followed by five face-to-face sessions, a strategic review of one's own airport, and a group assignment focused on the future of airports. The Airport Management Professional Accreditation Programme (AMPAP) is a professional accreditation program for airport managers and leaders. Participants are eligible to pursue a professional designation after completing six courses (4 mandatory courses and two electives). Successful course completion leads to the issuance of the International Airport Professional (IAP) designation, recognized by ACI and ICAO. Participants graduate from the program at a major ICAO international meeting. The Global Safety Network (GSN) Diploma Programme contains six specialized courses that are developed based on global needs of the world's airports and airside operations and safety managers, including developing, implementing, and operating effective Safety Management Systems (SMS). To obtain a GSN Initial (Silver) Diploma, participants must complete the first three specialized courses within three years. The GSN Advanced (Gold) Diploma is earned through the completion of three additional specialized courses within three years. Each course can also be taken as a stand-alone professional certificate course. ACI's Professional Certificate Courses consist of a full range of professional classroom courses covering a multitude of airport-related topics, and are designed to enhance the competencies of airport personnel from entry through to management levels. Related topics include: safety, security, facilitation, environment, economics, and management and technical. The Airport Operations Diploma Programme is designed to expose participants to all the facets of activities associated with an airport, from airside operations and landside to terminal operations, and equip them with the key knowledge and tools necessary to address the essential operational and business needs of 21st century airports. The program consists of three self-paced online courses that must be completed with a three-year time frame.
Key Courses:	AELP: Presentations on Global Strategic Outlook, Systems Theory, Leadership, Management of Change, Ethics, High-Performance Work Organizations, Teamwork, Innovation, Conflict Resolution, and Communicating Across Cultural Diversity. AMPAP: Mandatory courses include Air Transport System, Airport Operations, Safety and Security, Airport Planning, Development and Environmental Management, and Airport Commercial and Financial Management; Electives include Airline Management for Airport Professionals and Airport User Charges. GSN: Safety Management Systems (SMS), Airside Safety and Operations, Emergency Planning and Crisis Management, Working with Annex 14, Advanced Safety Management Systems, Aerodrome Auditing and Compliance Airport Ops: Airside Operations, Terminal and Landside Operations, Airports Business Operations
Competencies:	AELP: Understanding your leadership style; doing metric scans, including how to lead under pressure and how to be seen as a leader; working in multicultural multidisciplinary teams; strategic planning; working with stakeholders AMPAP: Technical and managerial skills; management focused on a customer-centric airport; strategic planning; international safety standards and practices GSN: Crisis management, safety methods and standards, interpreting and applying international

Program: Provider:		Global Training (various programs) ACI
		accords, laws, rules and regulations governing airport operations and security
Noted Gaps:		GSN: Cybersecurity; security awareness for the airport community; passenger profiling; security management (long-term strategic plans for the security workforce); greater language offerings so there is a common standard for security and SMS.
COURSE ALIGNMENT TO MISSION CRITICAL OCCUPATIONS		
Occupation	# Courses	Details
a. Airside/Airfield Operations	28	AMPAP: Airport Operations, Safety and Security online course strives to improve the knowledge of airport executives with regard to contemporary best practices in the areas of safe, secure and efficient movement of aircraft, passengers, baggage and cargo/mail. A 5-day elective on safety management system implementation is also available. GSN: Includes a 5-day classroom based course on Airside Safety and Operations. It provides guidance on best practices, latest technology, new equipment and procedures and regulations for safe and efficient operation of the airside environment. Also includes two 5-day courses on Safety Management Systems. Airport Ops: Airside Operations course provides a broad understanding of the various components of airside operations and how these components interact with each other to form an operational system. Modules include: Airside Infrastructure, Facilities and People, Safety Management, Airside Operations, Emergency Management, Airside Security, Airside Operations and the Environment, and Industry Safety Performance Indicators.
b. Information Technology	0	The program does not offer courses in Information Technology.
c. Financial Analysis and Planning	10	AMPAP: Airport Commercial and Financial Management course addresses airport financial management, including airline charges based on international standards. It emphasizes ways of optimizing airport revenues, controlling costs, and aligning to strategic business planning.
d. Airport Security/ Police	6	AMPAP: Airport Operations, Safety and Security online course focuses on planning and managing security as a customer-centric business, including managing resources and setting budgets. A 5-day elective on safety management system implementation is also available. GSN: Two 5-day classroom based courses (SMS and Advanced SMS) that provide comprehensive overviews of SMS and SMS implementation, planning and managing emergency situations, standards and recommended practices contained in ICAO Annex 14, and auditing.
e. Airport/ Property Development	8	AMPAP: Airport Planning, Development and Environmental Management course focuses on contemporary best practices in the area of airport infrastructure planning and development. The course outlines ways of optimizing airport facilities, of providing the required capacity on a timely basis and of providing airport users with levels of service.
f. Airport/ Project Planning	5	AMPAP: Airport Planning, Development and Environmental Management course focuses on contemporary best practices in the area of airport infrastructure planning and development. The course outlines ways of optimizing airport facilities, of providing the required capacity on a timely basis and of providing airport users with levels of service. Airport Ops: Airports Business Operations course provides an understanding of airport business operations including economic regulatory principles, how airports are organized, and the process of strategic, master, and operations planning. Modules include: Complex and Dynamic Business, Airport Economics, Regulatory Framework, Airport Organization, Airport Strategic Planning, Airport Master Planning, and Airport Operations Planning.
g. Engineer	0	The program does not offer courses in Engineering.
h. Electrician	0	The program does not offer courses for Electricians.

Program: Provider:	Global Training (various programs) ACI
ALIGNMENT TO FUTURE REQUIREMENTS	
a. Technological advancements	This program helps participants get up to speed in the best and leading airport practices, such as the use of GIS.
b. Improving the passenger experience	AMPAP Participants may take an elective course focused on customer service and documenting the customer experience.
c. Increased financial, market, and political pressures	AELP participants have the opportunity to gain experience in the role of an airport CEO working with local politicians AMPAP participants engage in an exercise with a mock board that wants to move an airport to a new location. Participants must convince three local representatives of the political reasons behind moving or leaving the airport in the same place.
FACULTY AND PROGRAM QUALITY	
Faculty	All faculty are practitioners who have worked in the areas they are teaching. Faculty for business-related ACI programs have PhD's. Airport CEOs are also brought in as guest lecturers.
Measures of Program Quality	There are three key performance indicators that each participant rates at the end of the course: competency of instructor (knowledge to meet objectives), relevance of material, and quality of training center and registrar experiences (payment, details, visa letters, and classroom). The ACI governing board also evaluates the program twice a year on a scale of 1 to 5.
CAPACITY, ADAPTATION, AND LESSONS LEARNED	
Program Capacity	AELP: 24 (current enrollment), Global Training (classroom & online): 5716, AMPAP: 1100 participants, Professional Certificate Course (online): 5000+, Airport Ops: 500+
Anticipated Changes in Program Demand	Overall growth in this program is anticipated, due to the upcoming retirement wave. GSN: Changes in the industry with regards to safety, such as SMS requirements from ICAO (for non-U.S. airports) and the FAA, will affect program demand and increase the necessity for training. All airside personnel must have training in SMS or training to understand airside safety. Airports also need a non-punitive reporting system. Airport security is also becoming more professionalized, and airports are investing more work into security training. Airport Ops: Program has experienced 59% growth in past two years.
Anticipated Program Changes to Meet Emerging Skill Demands	N/A
Best Practices	This program tries to take into account both the current and future needs of different airport types.

Program: Provider:	B.B.A. with a major in Airport Management University of North Dakota
PROGRAM OVERVIEW	
Program Type:	Bachelor's Degree/Master's Degree
Overview:	Note: This profile focuses on the Bachelor's Degree program as it is more explicitly aligned to airport management. However, information on the Aviation Master's program is included in some places. Bachelor's: The Airport Management curriculum is offered to those students seeking employment in administrative positions with companies in and related to the groundside activities of the aviation industry. All aspects of general aviation, air carrier and the total aviation industry are studied in-depth with sufficient flexibility in courses to allow the student to concentrate in a particular area of the industry such as general aviation operations, airline management, airport administration, or corporate aviation management. Overarching goals of the program include the following: *Goal 1:* Students will be able to understand the elements of airport operation, management, and administration at an advanced level, including single-engine VFR flight environment; Federal Aviation Regulations (FAR's), Transportation Security Regulations (TSAR's), airport system planning, and airport financial requirements; and the airport's role in relation to operations, tenant relations, the community, and the airport patrons. *Goal 2:* Students will develop written and oral communication skills, including clear, concise, comprehensive, and convincing oral communication skills; and fundamental business writing skills, including the preparations of business plans, case studies, marketing plans, research reports, or quantitative analysis reports. *Goal 3:* Students will be able to analyze economic and financial information that will enable them to reach sensible business decisions, including methodology to address a business environment or problem; and recommendations for management action regarding business problems. Master's: The M.S. in Aviation degree provides graduates with the knowledge and skills that prepare them for aviation industry, aviation related government jobs, and for further research and development in the field of aviation. Graduates gain an understanding of the various complexities facing the industry through a breadth of aviation industry related courses. The UND graduate degree in aviation is one of the few aviation-related graduate programs in the United States, and offers an interactive distance learning component.
Airport Focus:	Bachelor's:20% focus on airports, 20% other aviation, 30% general, 30% business/political science Master's: 10% focus on airports, 90% other aviation related (safety, labor, SMS, air traffic, UAS, ethics, human factors)
Key Courses:	Bachelor's: Aviation Orientation, Introduction to Aviation, Introduction to Air Traffic Control, Aviation Safety, Human Factors, Airport Planning and Administration, Aerospace Law, Airport Operations & Administration, Aviation Senior Capstone, Intro to Environmental Issues, and either Airline Operations and Management or General Aviation Operations and Management, in addition to a range of foundational and business courses that are not specific to airports or aviation. Master's: General Issues in Aviation/Aerospace, Aviation Economics, Statistics, Research Methods, Capstone Course
Occupations:	Airport Operations, Airport Planning positions in consulting firms, airlines (less common), airport management (after 5-7 years of experience at smaller airports)
Competencies:	Written and verbal communication, including skill in presenting; interpersonal skills and teamwork,

Program: Provider:		B.B.A. with a major in Airport Management University of North Dakota
		including networking and relationship building
Noted Gaps:		Project management – airport managers have difficulty communicating with engineers about project management
COURSE ALIGNMENT TO MISSION CRITICAL OCCUPATIONS		
Occupation	# Courses	Details
a. Airside/Airfield Operations	2	Addresses topics such as FAA regulatory guidance, emergency operations, emergency response, and public administration.
b. Information Technology	2	Courses include Information Systems and End User Applications (e.g., Microsoft Excel and Access).
c. Financial Analysis and Planning	4	Students take business core including accounting, finance, and money and banking. These are general business courses, not airport-specific.
d. Airport Security/ Police	0	Although these issues (e.g., TSA regulations) may be addressed at a high level in some classes, there are no courses dedicated to these topics.
e. Airport/ Property Development	1	The program addresses developing, emphasizing non-aeronautical revenue and noting the importance of land use planning.
f. Airport/ Project Planning	3	There are courses on airport planning, including a course and lab focusing on GIS.
g. Engineer	0	There are no engineering courses as part of the program. There is some collaborative learning with the College of Engineering, but this is primarily with electrical engineers rather than civil engineers.
h. Electrician	0	The program does not offer courses for Electricians.
ALIGNMENT TO FUTURE REQUIREMENTS		
a. Technological advancements		The program calls attention to the importance of keeping up with the latest technology and addresses some issues to consider (e.g., who will handle social media accounts?), but this is not a large focus within the program.
b. Improving the passenger experience		Customer service is emphasized, as there has been a recent shift within the industry to view passengers as airport customers rather than only airline customers.
c. Increased financial, market, and political pressures		The program teaches students how to articulate their position so they are prepared for issues that may arise (e.g., calling a congressional delegation).
FACULTY AND PROGRAM QUALITY		
Faculty		All faculty have industry experience. At minimum, they must have a Masters and 5-10 years industry experience. Professional development is encouraged (e.g., involvement in ACRP, TRB, AAAE).
Measures of Program Quality		Every course has an evaluation. Performance reviews include peer reviews from other faculty members. Airport partners provide frequent informal feedback and indicate students are well prepared for the workforce.
CAPACITY, ADAPTATION, AND LESSONS LEARNED		
Program Capacity		Bachelor's: There are 50 students enrolled, and there is currently capacity for about 1.2 airport-focused teachers. The program seems to be right sized, with ample job opportunities and most students being placed in relevant jobs after graduation. Master's: There are 40 students enrolled, with annual growth varying depending on the current employment rate in the aviation/aerospace industry
Anticipated Changes in		Student demand is projected to remain the same. Although there may be in increase in industry

Program: Provider:	B.B.A. with a major in Airport Management University of North Dakota
Program Demand	demand, this demand will not translate to additional demand for the program because of lack of awareness about airport management from potential students.
Anticipated Program Changes to Meet Emerging Skill Demands	SMS was recently added. There may be an expansion of environmental courses (e.g., sustainability).
Best Practices	The program requires a private pilot certificate, which provides useful background knowledge and credibility for airport managers.

Program: Provider:	Airport Management Bachelor's Degree Kansas State Polytechnic
PROGRAM OVERVIEW	
Program Type:	Bachelor's Degree
Overview:	The Airport Management Bachelor's degree program prepares students for rewarding careers in airport management. The College of Technology and Aviation at Kansas State Polytechnic sits on an airport, immersing students in an airport environment and providing the on-the-field experience alongside classroom instruction. The program will be updated with new curriculum beginning Fall 2016. This curriculum was developed in collaboration with industry experts, to ensure it aligns with the needs of the airport workforce and bridges the gap between the industry and academia. It will provide students with a strong business background during their first two years in the program. During the last two years of the program, students will take a deeper dive into airport-specific courses. Airport-specific courses will also include embedded labs, led by industry experts. Students will spend up to 50% of their time working with experts in the field. These labs will provide students the opportunity to gain hands on industry experience, while also gaining knowledge firsthand from an expert. Students will then have 2-3 years of field experience by graduation. This will adequately prepare them to begin their careers in the industry.
Airport Focus:	25% focus on airports, 75% focus on broader business and aviation expertise
Key Courses:	Introduction to Aviation, Expository Writing, Introduction to Business, Public Speaking, Principles of Macroeconomics, Plane Trigonometry, General Psychology, Human Factors in Aviation, Introduction to Critical Thinking, General Physics, Introduction to Statistics, Safety & Security of Airport Ground Operations, Airport Operations, Financial Accounting, Supervisory Management, Technical Writing, Business Law, Business Ethics, Information Technology for Business, Airport Management, Airport Global Issues, Introduction to Marketing, Airport Law, Airport Environmental Studies, Airport Planning, Aviation Ethics & Leadership, Airport Certified Manager, Airport Master Planning and Design, Human Resources Management
Occupations:	Airport Operations (entry-level)
Competencies:	Written and verbal communication, including skill in presenting; interpersonal skills and teamwork, including networking and relationship building, financial acumen, and technology
Noted Gaps:	N/A
COURSE ALIGNMENT TO MISSION CRITICAL OCCUPATIONS	
Occupation # Courses	Details
a. Airside/Airfield Operations 2	Focus on daily operations of an airfield, including compliance with regulatory agencies, the role of liaison to airport staff regarding operations, development of department budgets, effective supervisory practices and principles, and planning and implementing airport operations and

Program: Provider:		Airport Management Bachelor's Degree Kansas State Polytechnic
		development programs. Also address rules, policies, procedures, and potential hazards that affect individuals working in and around the airport operations environment.
b. Information Technology	1	Addresses the role of information technology in satisfying organizations' information requirements. This includes problems, techniques, and the use of information systems and outputs.
c. Financial Analysis and Planning	1	Includes topics such as alternative forms of business organizations, typical business practices, legal instruments such as notes, bonds, and stocks, and financial statements and analysis. Students learn how to provide information to stockholders, creditors, and others who are outside an organization.
d. Airport Security/ Police	1	Focuses on increasing awareness of airport operations, with special attention given to improving airport safety. Topics include aircraft marshalling procedures, airfield security issues, ground vehicle operations, and security and accident/incident response.
e. Airport/ Property Development	0	This program does not offer courses in airport/property development, though the topic is addressed in airport planning courses and labs.
f. Airport/ Project Planning	2	Focuses on airport planning and practices to understand FAR Regulation part 139 airport design standard and landside/airside planning issues using the American Association of Airport Executives' Body of Knowledge. Also addresses requirements and resources used to plan, fund, and construct an Airport Master Plan and Airport Layout Plan, including understanding FAR Part 77 and AC 150/5300-13 requirements.
g. Engineer	0	The program does not offer courses in engineering.
h. Electrician	0	The program does not offer courses for Electricians.
ALIGNMENT TO FUTURE REQUIREMENTS		
a. Technological advancements		The program provides students the opportunity to learn to use relevant technologies, such as AutoCAD and GIS. It also addresses the use, administration, and management of information technology.
b. Improving the passenger experience		A customer-centric focus is emphasized in airport planning labs. Students have the opportunity to work with local airports to develop and implement solutions that improve passenger expectations and experience.
c. Increased financial, market, and political pressures		All labs in this program address aspects of political and financial pressures. Students have the opportunity to work with local airports and airport managers on projects that incorporate marketing techniques, economic development, and local and state politics.
FACULTY AND PROGRAM QUALITY		
Faculty		At minimum, all professors and adjuncts must have at least a Master's degree and industry experience. Some faculty have doctorate degrees and a majority are certified by AAAE. There is one full-time faculty member and six full-time adjuncts. There are also several industry adjuncts involved in the program serving as lab providers.
Measures of Program Quality		An internal assessment is currently under development with input from industry experts. The program also tracks job placement of graduates, and participates in a university-wide online evaluation.
CAPACITY, ADAPTATION, AND LESSONS LEARNED		
Program Capacity		There are 27 students currently enrolled.
Anticipated Changes in Program Demand		Student demand may grow, depending on the effectiveness of marketing and outreach efforts in gaining prospective students' interests. Additionally, many students in the university's pilot program switch to the airport management program. This increases demand of the airport management program.
Anticipated Program Changes to Meet		There is a growing need to focus on soft skills, professionalism, and business etiquette.

Program: Provider:	Airport Management Bachelor's Degree Kansas State Polytechnic
Emerging Skill Demands	
Best Practices	The program's new curriculum was designed and developed with heavy involvement and input from industry experts. The main goal in developing the new curriculum is to ensure new graduates are equipped with the knowledge and skills needed by the airport industry today and in the future. The program's labs also provide students with hands on experience, and keep the program aligned with the industry's evolving needs and trends.

Program: Provider:	Safety Security Instruction (SSI) SSI, Inc.
PROGRAM OVERVIEW	
Program Type:	Certificate/Credential
Overview:	SSI has been providing safety and security training, and regulatory compliance consulting services to the aviation industry since 2004. Today more than 35 large, medium and small hub airports utilize the cloud-based, or on-premises, turn-key iLS™ systems to deliver more than 1,000,000 computer-based training sessions to employees and tenants annually. The iLS™ provides reporting, tracking, and data security that meet or exceed airport and government requirements. In addition, SSI has developed an interactive courseware catalog with more than 50 courses ranging from AARF, airport security, airport driver, fueling, safety and communications and general aviation. SSI Instructor-led classroom workshops are widely offered and attended by professionals across the world.
Airport Focus:	95% focus on airports, 5% focus on broader aviation expertise
Key Courses:	SSI offers a wide range of courses in programs including Aircraft Rescue and Firefighting (ARFF) Programs; Aviation Security; Airfield Driver/Fueler; Safety & Communication; and General Aviation. Courses can be tailored to the airport's needs.
Occupations:	All airport occupations – any employee issued a badge may receive training (e.g., Security Coordinators, Airport Managers, Drivers, Law Enforcement, Food Service Employees)
Competencies:	Safety/Security
Noted Gaps:	Offerings are always evolving, often driven by TSA or FAA regulations or by the needs of airport customers

COURSE ALIGNMENT TO MISSION CRITICAL OCCUPATIONS		
Occupation	# Courses	Details
a. Airside/Airfield Operations	60	This is a central component of SSI's offerings, including issues such as safe driving, communicating with the tower, proper badge use, installation and maintenance of bagging belts, etc.
b. Information Technology	1	Information technology is not a major focus.
c. Financial Analysis and Planning	0	SSI does not provide courses on Financial Analysis and Planning.
d. Airport Security/ Police	70	Airport safety and security is a primary focus, particularly for badging and credentialing airport staff. There is a module for law enforcement, but law enforcement is not a major component of their offerings.
e. Airport/ Property Development	0	SSI does not provide courses on airport/property development.

Program: Provider:		Safety Security Instruction (SSI) SSI, Inc.
f. Airport/ Project Planning	11	Although not a focus, through the online training students are exposed to some information on airport planning.
g. Engineer	0	SSI does not provide courses on engineering.
h. Electrician	0	SSI does not provide courses on electrical work.
ALIGNMENT TO FUTURE REQUIREMENTS		
a. Technological advancements		SSI delivers courses with technology and has done some courses related to technology (e.g., introductory course on cybersecurity awareness).
b. Improving the passenger experience		Although some elements of customer service have been incorporated into training upon specific airport requests, this is not a focus of SSI's courses.
c. Increased financial, market, and political pressures		SSI assists airports in meeting training requirements by providing a mix of offerings (e.g., standardized courses available when customized training is not cost efficient for an airport).
FACULTY AND PROGRAM QUALITY		
Faculty		Airport Security Coordinator training is instructor-led by an instructor with significant experience and a relevant degree. For safety courses, the instructor has at least a safety certificate from Embry-Riddle.
Measures of Program Quality		SSI conducts a lot of peer reviews (e.g., 100 people in a test group are conducting a peer review of new content and will complete a survey and email or phone feedback). For instructor-led training, feedback forms are always collected after each course.
CAPACITY, ADAPTATION, AND LESSONS LEARNED		
Program Capacity		SSI's enrollment is over 1 million. There is capacity to grow as the market demands. For example, additional curriculum designers or instructors can be hired as needed.
Anticipated Changes in Program Demand		Program demand is anticipated to grow, as there will always be a need for skills training and retraining is often necessary to meet new demands (e.g., new equipment or regulations).
Anticipated Program Changes to Meet Emerging Skill Demands		Cybersecurity is projected to be an emerging trend.
Best Practices		SSI uses "bite-sized" information that is divided up to be engaging and creative. Learner engagement is a key focus.

Program: Provider:	Airport University Port Jobs
PROGRAM OVERVIEW	
Program Type:	Certificate
Overview:	Airport University is a college credit-bearing program designed by Port Jobs to help the airport workforce at Seattle-Tacoma International Airport further develop their careers. The program is a partnership among Sea-Tac Airport, Highline College, and South Seattle College that allows airport workers and job seekers to work toward certificates and degrees at the partnering community colleges. Courses are available in the following areas: Workplace Safety and Security, Customer Service, Business Technology, and Leadership and Supervision. All airport workers, including those who are not Port of Seattle employees, as well as job seekers are eligible to take courses at Airport University. Based on emerging needs and transferable skills identified by airport employers, courses rotate each quarter. This ensures employees are able to meet those needs and close potential skill gaps. Courses are also designed to embed practical information as well as soft skills, to accelerate well-rounded learning and career advancement. Additionally, courses are foundational, allowing employees to take 1-2 courses at a time in between shifts. This program provides airport employees the opportunity to work toward certificates and degrees while continuing to gain hands on experience through job duties. It also provides job seekers with the necessary skills and knowledge to obtain employment with the Port of Seattle or other airport employer. Students may be eligible to receive financial support for through either scholarships or free tuition. Course completion results in short-term college certificates from Highline College or South Seattle College. Finally, students have access to a career navigator, to help map their education and career advancement.
Airport Focus:	
Key Courses:	N/A
Occupations:	Various airport/airline occupations, with the majority being front-line workers such as customer service agents, baristas, or wheelchair agents
Competencies:	Safety and security, technology, customer service, and leadership
Noted Gaps:	Courses focus on basic workplace skills needed for a wide range of airport jobs rather than technical knowledge or skills needed to advance in individual careers.

COURSE ALIGNMENT TO MISSION CRITICAL OCCUPATIONS		
Occupation	# Courses	Details
a. Airside/Airfield Operations	Varies by quarter	Courses vary but generally focus on airfield operations and secure flight operations, communications, relevant technology, modes of transport and air cargo, and leadership and supervision. Some courses also address maintenance and repair functions.
b. Information Technology	Varies by quarter	Courses generally focus on basic computer skills, including Microsoft Office products and keyboarding.
c. Financial Analysis and Planning	Varies by quarter	
d. Airport Security/ Police	5	Students have the option of taking a homeland security course in which they can obtain a TSA certification.
e. Airport/ Property Development	Varies by quarter	

Program: Provider:		Airport University Port Jobs
f. Airport/ Project Planning	Varies by quarter	
g. Engineer	0	The program does not offer courses in engineering.
h. Electrician	1	Employees and apprentices newly entering the field may take Financial Tools for the Trade. This course prepares employees in trade occupations for apprenticeships, managing money, understanding and building credit, and handling debt.
ALIGNMENT TO FUTURE REQUIREMENTS		
a. Technological advancements		N/A
b. Improving the passenger experience		Customer service is typically a topic embedded into most courses. This allows students to gain the practical and technical experience necessary to advance, as well as soft skills and a customer-centric focus.
c. Increased financial, market, and political pressures		N/A
FACULTY AND PROGRAM QUALITY		
Faculty		All faculty are from Highline College and South Seattle College. These faculty members teach content for the courses, while Airport University program staff provide in-class language assistance and tutoring. Additionally, Airport University staff coordinate recruitment and registration for the program.
Measures of Program Quality		Quarterly performance reports and performance target data are submitted to the Port of Seattle.
CAPACITY, ADAPTATION, AND LESSONS LEARNED		
Program Capacity		There are 183 students currently enrolled.
Anticipated Changes in Program Demand		Sea-Tac Airport is currently the fastest growing airport in the U.S. Renovations and growth at the airport will result in additional employers. This, in turn, will result in a greater number of employees seeking training and career advancement. As such, it is likely that demand for the program will grow in accordance with the airport's overall growth.
Anticipated Program Changes to Meet Emerging Skill Demands		Rapid growth at Sea-Tac Airport can make it difficult for employees to fit classes into their work schedules. It may be necessary to expand the program to offer evening, weekend, and/or online courses.
Best Practices		Port Jobs partners with area colleges through the Airport University program to offer credit-bearing college courses onsite at Sea-Tac Airport. Classes are foundational so that workers can take them between shifts, 1 or 2 at a time and focus on key transferrable skills identified by airport employers that are needed by the workforce and can help workers advance. Students also have access to a career and education navigator who works with them to plan next-steps education and career advancement. With funding from Alaska Airlines, students can also receive scholarships to their continued college education at area colleges.

Post-flight Inspection: Evaluating the Education, Training, and Development Pipeline

Each of the above sections in this chapter provides a unique perspective on the sufficiency of the airport training and education pipeline. In this section, the threads from each section have been aligned to the sufficiency criteria to provide a more comprehensive assessment of airport education and training. The assessment against each set of criteria ultimately informs the conclusions and workforce implications discussed in Chapter 5.

Program Types

At the highest level of analysis, it appears there are two primary types of providers that dominate airport training and education landscape, while a handful of other providers offer programs to fit various niches. The first major type of provider is a university or college typically offering either a Bachelor's or a Master's degree in fields such as airport management, airport development, or aviation management (with an airport focus). The second major type of provider is the national or international trade organization such as ACI, AAAE, or NATA that offers training and certification for its member airports or individuals in a variety of technical and management topics. Other types of niche programs include small businesses that provide training in a particular field (e.g., security training) or partnerships between airports and education providers.

Number of T&E Programs by Type of Organization and Degree/Certificate Offered				
Type of Organization	Trade Association	University/College	Other Private Company	Partnership
Number of Programs	16	17	1	1
Degree/Certificate Type	Bachelor's	Master's	Certificate	Credits/CEUs
Number of Programs	6	6	18	1

The centralization of airport training and education programs among a few major trade associations and universities has both positive and negative consequences for the industry. On one hand, organizations like ACI and AAAE provide an efficient way for members of a relatively small subset of the aviation industry to access high quality technical content provided by experts in that field. Similarly, the economics of airport management degree programs mean that it is not practical for most universities, even those with large aviation degree programs, to have robust airport-focused curricula. Thus, only a few universities have airport-specific degree programs, and most of them rely heavily on other aviation and business courses to round out their airport degree programs.

However, the question of what makes economic sense for T&E providers may be different from the question of what best meets the needs of the airport industry. Concentrating airport training within two major professional organizations carries the same risks as any oligopoly: potential for higher prices (than in a competitive market), high barriers to entry for new firms, and limited alternatives for customers. The limited number of academic degree providers has consequences as well, in that students are less likely to find a program near them (or near their preferred location) and there is less chance for a student to be exposed to airport careers during their early college years. Fortunately, such concerns were not raised in the focus groups, interviews, or surveys conducted during this research. Nevertheless, the limited number of firms engaged in airport training and education could become more of a factor as the industry grows and changes, since firms in less competitive markets may feel less pressure to innovate.

Alignment to Mission Critical Occupations

Perhaps the greatest test of whether airport training and education programs are capable of meeting the needs of the industry is how they are aligned to those occupations the industry will need most. The mission critical occupations identified for this study were identified by a wide range of airport professionals as critical to achieving the airport

mission and/or difficult to fill with qualified personnel. The table below shows the number of currently offered courses across all of the programs surveyed that apply to each mission critical occupation.

Course Coverage of Mission Critical Occupations							
Airport Development	Airside Ops	Airport Planning	Electrician	Engineer	Financial Analysis	IT	Airport Security
25	209	34	3	1	30	7	150

The most obvious trend from this data is that the preponderance of courses focus on jobs with a distinct airport emphasis. The greatest coverage is on Airport Operations and Airport Security, but most of those courses are offered by just two providers (AAAE and SSI, Inc.), and many are instructional videos rather than interactive or classroom training. It is also unclear how many of the Airport Security courses specifically prepare people for security related occupations vs. general security training that all airport employees must take.

An executive at a large commercially-operated airport expressed concern that academia is not keeping up with business needs, particularly with regards to Financial Analysis and Planning occupations. Recent college graduates seem to lack the skills needed for adequate performance in this area.

When looking more closely at the table (provided earlier in this chapter) that aligns courses to the relevant occupations and competencies, there are few noteworthy competency gaps among these occupations. Thus, for the airport-related aspect of operations, development, planning, security, and financial analysis, it should be possible to find at least one training or education program offering content relevant to the competencies needed for that occupation, and airside/airfield operations staff have numerous options. Finding a single degree or certificate program to cover other occupations in-depth could be more challenging, and even the occupations with the best coverage are dominated by a small number of T&E providers. Moreover, the quality of the content related to each occupation is also difficult to evaluate in the absence of external review by an accrediting body.

A small airport leader mentioned that Electricians at this airport typically do not come in with airport experience. Instead, they must complete a certification training course, paid for by the airport, after being hired. Additionally, the airport uses external training resources to ensure these individuals are gaining airport-specific knowledge and skills.

Of greater concern is the lack of coverage of certain critical occupations with a focus much broader than airport applications such as Engineers, Electricians, and IT professionals. Only a handful of courses across all providers dealt with these occupations. Only SSI, Inc. provides professional training related to airport IT, with a limited focus on safety and security. Universities that provide courses related to airport IT include Kansas State University, University of North Dakota, and Cranfield University Centre for Air Transport Management. AAAE addresses Airport Engineering or Electrician occupations in a few of their courses and only the Cranfield University Centre for Air Transport Management provides a course related to airport engineering. No universities were found to provide courses related to Airport Electrician occupations.

An airport education provider recognized that as IT and cybersecurity are becoming increasingly important, airports need to have a robust IT plan and cybersecurity measures. Recognizing this gap, new courses are being developed to teach how to create an airport master IT plan and cyber threat mitigation/contingency plans.

It is clear that airport employees in these fields do not come from airport-oriented training and education programs and must pursue relevant degrees or certifications in their respective field before acquiring training relevant to their airport jobs. The results presented in Appendix E: Education Pipeline Information suggest that if recent trends hold, no great shortages are expected in any of these fields across the broader economy, with the possible exception of IT. However, without specific training and educational opportunities to train professionals from these fields to apply their skills within airports, the industry is likely to struggle to find experienced applicants. Moreover, airport leaders reported that the

ability to leverage technology is a critical need for nearly all positions, not just IT professionals. Without greater emphasis on such topics from airport education and training programs, airports will struggle to leverage technology to transform operations and improve the passenger experience.

Program Capacity

If they are to meet the current and future needs of the airport workforce, training and education programs must have both the capacity to satisfy demand today and the potential to expand as the industry grows and develops. To assess both current capacity and growth potential, programs were asked to provide their current enrollment and number of degrees/certificates awarded annually, as well as their annual growth rate. They were also asked to estimate the maximum amount they could grow in one year if demand surged suddenly. Responses provided by each program are available in Appendix D.

Current enrollment varied extensively depending on the type of organization, and the programs within those organizations. For example, ACI's online learning and professional certificate programs served over 5,000 individuals annually, while their Airport Executive Leadership Program with a much narrower focus on senior leaders had 24 participants in the past year. AAAE's digital offerings (IET-LS and ANTN Digicast) serve over 200,000 users annually. Interestingly, the program with the largest number of individuals served was one of the smaller businesses: Safety & Security Instruction, Inc. (SSI). SSI provided training to more than a million participants at over 40 airports in the past year. In contrast, academic degree programs tended to be small, with most programs having between 25 and 50 students currently enrolled, with a smaller fraction receiving degrees in any given year.

The degree bearing programs also tended to be relatively stable in size with minimal growth rates. The exception was Kansas State's degree program, which, being quite newly developed, has grown more than 50% in two years. Those with more of a broad aviation focus (e.g., Ohio State) have also seen substantial growth. Most also said that the most they could conceivably grow in a year is about 20-25%, which seems sufficient to cover any real world spike in demand. Growth rates for professional training programs tended to be fairly modest (5-15%) as well, though AAAE reported 10-30% growth across various programs. Potential for future growth ranged from 10% for "high touch" programs like ACI's AELP to "unlimited" for online training from ACI, AAAE, and SSI.

Drawing conclusions regarding the sufficiency of this capacity can be complicated, however. With respect to professional training and certification programs, providers unanimously indicated that the size of their programs was dependent on the demand from industry. For online offerings, there was no obvious limit to how many individuals could be served in a given period. And for instructor-led training, providers indicated that they had an adequate supply of instructors and resources, were not overly limited by scheduling pressures, and could expand to provide additional sessions with relative ease. Thus, we can likely conclude that such training programs have sufficient capacity today, and can grow and adapt as needed.

> A representative of a university department of aviation suggested that although there may be an increase in demand for airport management in the field, there will be no increased demand for capacity at schools due to the fact that students lack knowledge regarding careers in airport management. **Overall, student demand, rather than industry demand, will drive growth, or lack thereof, at collegiate airport programs.**

The situation may be more complicated with the academic degree programs as there may be a disconnect between what industry needs and program demand. Since degree programs are pursued by individuals rather than airports, it is incumbent on the universities to market their programs effectively to meet industry demand, but they often have limited resources available to do so, especially when compared to pilot or aeronautical engineering programs. Focus group results suggest that airport leaders highly prize airport expertise when hiring and they are concerned about whether there will be enough qualified individuals to address gaps due to retirement and attrition. It appears likely that airports have the potential to add qualified staff and capacity if demand

from students for airport degrees grows, but without the funding to market their programs aggressively, it may be difficult to stimulate that growth in program capacity.

Quality

Although conducting a formal evaluation of individual programs was beyond the scope of this research, several indicators of program quality were requested from programs in the survey, and programs were asked to describe any additional evaluation methods or performance indicators that they track. Supplementary information related to the quality indicators was also collected as part of the more detailed organizational profiles. The specific indicators requested included accreditation, graduation/completion rates, faculty qualifications, and post-graduation employment rates. The following themes emerged from a review of participant responses to these items:

- **Most universities are accredited by state or regional accrediting bodies, though the programs themselves may not have any specific accreditation.** Only one program mentioned being a candidate for accreditation by the Aviation Accreditation Board. The professional training programs were not typically accredited, though ACI's training programs were backed by ICAO and the AELP program is jointly offered with the business school at Concordia University.
- **Both professional training programs and academic degree programs have high completion/ graduation rates.** All professional training programs have a completion rate of 95-100%. Similarly, all academic degree programs have a graduation rate of 80% or more.
- **Most faculty and training instructors have at least a Bachelor's degree and/or industry experience.** All universities require faculty to have at least a Bachelor's degree, while some, such as Kansas State University and Ohio State University require advanced degrees and/or technical certifications. Additionally, academic degree programs require faculty to have industry experience. A majority of professional training programs require instructors to have industry expertise. Some programs, such as the ACI Executive Leadership Programme, Global ACI-ICAO AMPAP, and SSI, Inc. require instructors to have a Bachelor's degree or advanced degree. AAAE requires instructors to have at least 10 years of industry experience.

  One airport training provider ensures that all faculty have worked in the areas they are teaching and complete a mentorship program with senior instructors before teaching on their own. Courses are also measured based on three performance indicators (competency of the instructor, relevance of material, and quality of training center) which are reviewed twice a year by a governing board.

- **Students in both professional training programs and academic degree programs experience a high degree of exposure to industry experts.** Many ACI programs involve industry experts throughout the entire duration of the programs and courses. Other training programs supplement courses with guest lectures. Many academic degree programs also supplement courses with guest lectures. Additionally, the Kansas State University Airport Management Program provides students the opportunity to collaborate with industry experts in virtually every airport-related course.
- **Most academic degree programs provide some form of lab and/or field work opportunities for students, but internships are not a focus of the airports themselves.** A majority of lab and/or field work opportunities focus on Financial Analysis and Planning, Airport/Property Development, and Airport/Project Planning. Kansas State's new program has taken this concept one step further and made labs a core element of its airport

  Examples of lab activities included in KSU's degree program include working with an airport architect on airport development projects, conducting inspections of airfield equipment, working with AARF and airport police, and contracting and procurement activities.

curriculum by providing real world experience on the local airport throughout the curriculum. Some programs like UND's airport management degree also require students to obtain a private pilot certificate to gain a broader perspective on aviation and airport operations. Internships are a common way to gain real world experience as well, but the universities are typically in a support role and the student is responsible for identifying and pursuing internship opportunities.

- **Course and instructor evaluations were the most common means of evaluating performance.** Most academic programs relied on student input to improve their courses, though there seemed to be some skepticism about their value for this purpose due to their subjective nature. Evaluations of student performance were also commonly used measures. Some academic programs also use external expert evaluations or capstone activities to assess whether students can "put it all together" to successfully tackle airport-related management challenges.

While these findings do not present overwhelming concerns for quality, there is certainly room for improvement. For example, there seems to be very little external oversight or focus on accreditation of airport T&E programs specifically. Opinions on the value of AABI accreditation seemed mixed, but the alternative of having the programs only be accountable to their own leadership, who may or may not have the technical knowledge to evaluate them, is not a desirable situation for the industry. Furthermore, more stringent requirements for faculty qualifications (i.e. at least a Master's degree) would likely be beneficial. While most faculty had industry experience, it was not always clear whether they were specifically experienced with the relevant subject matter or if they had training in teaching or best practices in T&E. Finally, performance evaluation and measurement were typically limited to course evaluations, though some providers had periodic reviews by faculty or external boards or experts to improve courses over time. In order to better assess gaps in T&E going forward, providers may need to strengthen their own internal evaluation methods.

To address gaps in training offerings, one airport management and operations education provider analyzes existing courses twice a year and has standing committees in six functional trade areas that provide input regarding the needs of the airport workforce.

Talent Pipeline

Indicators related to the students entering training and education programs were also collected to provide an additional perspective on the sufficiency of the training and education pipeline. Indicators collected included required qualifications and experience, acceptance rates, and enrollment rates. The following themes emerged regarding these measures.

- **Professional training programs have an acceptance rate of 95% or more, and most enrollment qualifications are minimal.** For example, the ACI Airport Operations Diploma Program, ACI Online Learning Center, and U.C. Berkeley Airport Systems Planning and Design Short Course have no minimum enrollment requirements. Others, such as the ACI Airport Executive Leadership Program and Global ACI-ICAO Airport Management Professional Accreditation Programme (AMPAP), require participants to hold an upper management position, receive sponsorship from the CEO, or be currently employed or seeking employment at an airport. All applicants who meet these minimal qualifications can typically enroll in the programs. The AELP program had an acceptance rate of 25% due to its limited capacity.

One academic degree program provider stressed that students need strong soft skills, including writing, speaking, and asking appropriate questions. Due to social media, the new generation of students is perceived as more introverted and less articulate than in the past. Emphasis is placed on group projects to stress the importance of personal interactions, networking, and relationship building.

- **Academic programs adopt the admissions standards of the broader university.** Academic programs did not report distinct admission requirements for student pursuing an airport management degree; however, there may be some differences

based on the college within a university that houses the program (e.g., College of Business may have tougher standards than a Continuing Education Program). Typically, students would have to be admitted by the university through the standard process and then would choose to major in airport management. This usually involves completing core education and business school requirements, as well as the airport/aviation curriculum. Master's level programs typically required a Bachelor's degree and some relevant industry experience.

In short, airport T&E programs are rarely turning people away, and most applicants who meet the qualifications are able to take any professional training course. Academic programs are typically at large state universities, so their standards are likely to be attainable by the average student (though this may not always be the case as many state schools become more competitive). Overall, the pipeline is unlikely to be limited by the selectiveness or capacity of T&E programs, but if anyone can take these courses and completion rates are very high, it is not clear that successfully completing them says much, if anything at all, about the quality of the graduate emerging from such programs and whether they are fully prepared for airport careers. Anecdotal evidence (like that presented in the box above) suggests that there may be significant competency gaps among recent graduates, particularly in terms of personal effectiveness (e.g., communication, time management, performance under pressure, teamwork), that airports may need to account for and that T&E programs should reinforce.

Cost

All of the criteria above would be irrelevant if airport T&E cannot be obtained at a reasonable cost to students and airport employees. To inform this assessment, T&E providers were asked to provide average cost per course, cost per degree or certificate, and any indicators of return on investment. The following themes emerged on this subject.

- **Costs for academic programs varied widely, especially when accounting for in vs. out of state tuition.** On the low end, some cost less than $1,000 per credit for in-state tuition, while out of state tuition at some universities was more than triple that rate. On a per-degree basis, costs ranged from $15,000 in-state to $40,000 out of state. Port Jobs' Airport University program was noteworthy as it provided credit-bearing community college courses for free or at low cost to low income individuals.
- **Professional training courses were typically under $2,000 per course/certificate, but could be more costly for management level programs.** For example, ACI's courses were usually several hundred to a few thousand dollars per course, but a full AMPAP program could reach $15,000. In contrast, the high volume online security training courses provided to airports by SSI, Inc. may only cost $10 per trainee.
- **Data on post-graduation employment rates were very limited.** Most programs did not track this, had questionable data, or were unwilling to share it. One university reported average annual salaries after graduation were $36,000.

Overall, cost is unlikely to be a major determinant of the airport T&E pipeline given that the costs are not significantly different from other academic degree programs or professional training. Certainly the costs could be prohibitive for some students who cannot afford a college education, but such concerns apply to all degree programs, and costs are more affordable for those who live in the same state as a relevant education program. However, given that there are relatively few of these programs in only a handful of states, the high penalty for out of state tuition could be a significant detraction for some students.

As for professional training programs, the impact likely varies depending on who is paying for the course. Programs funded or reimbursed by the airport are likely less impacted by the costs. However, for certificate programs and training programs paid for by the individuals, several thousand dollars may or may not be a worthwhile investment. This calculation is made more difficult by

One training provider developed a set of standardized training on topics relevant within small airports. This training program provides airports who cannot afford customized training with a cost-effective way to deliver more basic, generic content.

the limited data on post-graduation/completion outcomes. In order for students and airports to assess whether the courses, degrees, and certificates they are obtaining are worth the investment, T&E providers should be expected to collect and report post-graduation/completion outcomes to their customers and/or an accrediting body.

5. Conclusions and Recommendations

Chapter 5 Executive Overview

Major Sections of Chapter

1. Workforce capacity challenge areas- There are 3 major workforce capacity challenges facing airports, including external labor market considerations, internal staff development, and workforce planning.
2. Workforce capacity needs – There are 7 workforce capacity needs that are summarized within the 3 challenge areas. These needs point to potential deficits the industry should address through workforce development and planning strategies.
3. Supporting evidence – For each workforce capacity need, the data presented throughout this report are summarized according to the need they support. The supporting evidence is organized according to whether it relates to mission-critical occupations, workforce capabilities and building of the talent pipeline, or current airport training and education.
4. Next steps and recommendations– This section describes the considerations that emerge as a result of the workforce capacity needs identified. This section also emphasizes the importance of conducting solution-oriented research to provide airports with practical guidance to address workforce gaps identified in this report.

Value of Chapter to Airports Industry

- Informs airports about likely threats to workforce capacity and competence so they can better prioritize their workforce initiatives.
- Recaps the evidence and data gathered across this study to support the business case for implementing strategies to address identified needs.
- Delineates how the airport industry and individual airports will need to think about the workforce capacity needs and areas where they should start planning better for the future (e.g., Phase II research).

Key Summary Points from Chapter

- Heavy competition with other industries to fill many airport MCOs.
- Airports' recruitment strategies are often constrained by local labor markets.
- Municipality systems and processes challenge airports' ability to respond quickly to workforce gaps.
- Increased awareness of airport career opportunities is needed.
- Airport-specific knowledge, IT expertise, and personal effectiveness skills will be critical for future workforce.
- Succession management, workforce planning and development, and targeted talent management strategies are needed.

How Leaders Can Make Use of Chapter

- Identify which workforce capacity needs are likely to have the greatest impact in light of current circumstances within the leader's airport.
- Determine where the airport might need to increase workforce development emphasis. For example, the leader should consider whether additional efforts should be made with local programs to increase awareness of job opportunities.
- Work with T&E providers to incorporate more emphasis on the skills and knowledge identified as important herein.
- Use this chapter as a collaboration and discussion tool as the leader seeks out industry partnerships.
- Provide the supporting evidence to industry research entities and membership organizations to stimulate research on capacity building strategies.

This chapter highlights the major workforce challenges, key themes, and conclusions that have emerged from an analysis of mission critical occupations, market research on labor projections, industry trends, and the airport education and training landscape. The conclusions summarize what is known about the airport industry's workforce

capacity needs based on availability of future talent, job-specific considerations, projected future airport workforce requirements and skill needs, and airport education and training resource sufficiency.

Further, this chapter highlights valuable recommendations and next steps that airports could pursue to prepare for impending workforce challenges. While development of practical strategies and best practices is reserved for Phase II of this project (pending approval), this chapter promotes awareness of the challenges, opportunities for improvement, and planning considerations for maintaining the airport personnel required for operational continuity and improvements. Both national and localized, airport-specific implications are provided.

Key Themes

Workforce capacity, as defined in the first chapter of this report, reflect the potential of U.S. airports to respond effectively and efficiently to emerging job demands in the face of industry changes and trends. The research provided in this report points to several areas where emphasis on workforce replenishment and development along with outsourcing, succession planning, and renewed emphasis on training and education will be needed to ensure the airport workforce has the necessary skills and competencies to effectively perform future job requirements.

As a result of this research, seven workforce capacity needs emerged as issues the airport industry will need to confront to ensure continued success over the next 5-10 years. The seven needs can be grouped into three major challenge areas as shown:

- Challenge Area 1: Attracting New Talent
  - Workforce Capacity Need A. Increasing awareness of airport career opportunities
  - Workforce Capacity Need B. Investing in early development of the talent pipeline
  - Workforce Capacity Need C. Embracing a far-reaching strategy for new talent

- Challenge Area 2: Building Internal Staff Capacity
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  - Workforce Capacity Need E. Increasing airport-specific knowledge
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- Challenge Area 3: Planning for Future Workforce Needs
  - Workforce Capacity Need G. Implementing succession planning

In the following text, the seven workforce capacity needs are presented in the boxes. Following each box, the supporting evidence for that theme is provided. Next, implications of this research at a local and national level are briefly discussed. Finally, the potential impact of practical strategies and best practice guidance for industry and airport leaders is presented.

Challenge Area 1: Attracting New Talent

This section presents three airport workforce capacity needs related to growing the external talent pipeline.

Workforce Capacity Need A. Increasing awareness of airport career opportunities.
New entrants into the labor market lack awareness of varied career opportunities available in airports.

At the National Transportation Workforce Summit held in April 2012[2], building awareness of transportation careers was identified as one of the greatest challenges impacting the transportation workforce, illustrating that this concern goes far beyond airports. The Summit acknowledged that career technical education (CTE) and science, technology, engineering and mathematics (STEM) education provide foundational knowledge and skills for transportation jobs, but such programs are not specifically tailored to the industry. Likewise, the Summit identified that children and young adults rarely consider transportation career opportunities. Such consideration requires vocational counselors, parents, community leaders, municipal governments, military, private institutions, parochial and alterative school systems to be aware of and include more examples of transportation illustrations or practice opportunities in their curricula or extracurricular programs. As advocates for the airports industry, airport leaders and industry organizations have a role to play in reaching out to community organizations that impact career decisions (especially among young people) to promote awareness of airport careers.

Highlights:

- Public lack of awareness of airport careers is one of greatest capacity challenges.
- All transportation fields are challenged by lack of awareness.
- CTE and STEM does not focus on airport or transportation specific education.
- Marketing budgets for airports too small to promote airport jobs.
- Heavy competition with other industries to fill many airport MCOs.
- Airport T&E could expand but there is a lack of student demand for more T&E.

Jobs considerations. There are many airport occupations, including many of the identified MCOs that span countless other industries, increasing the competitiveness of the jobs (e.g., Electricians, Engineers). Given the wide array of potential career options for individuals with expertise in these highly needed fields, the relatively small size of the airport industry means that few are aware of the career possibilities at airports. Considering that many of these careers have been deemed mission critical to the future of the industry, this deficit should be concerning for airport leaders. Strategies are needed to implement marketing campaigns, outreach programs or other activities that will spread awareness of industry opportunities and bring more potential employees into airports. One industry leader in this study also pointed out that airports need to focus attention on career mapping and competitive wages analysis to ensure career opportunities are accurately portrayed to the public.

Supporting data: 5 of the 8 MCOs identified by industry stakeholders include jobs frequently sourced outside of airports. Further, 3 of these MCOs (*) receive little attention in airport T&E, suggesting exposure to airport jobs is likely weak for talent in these fields.

- Project Planning
- Electricians*
- Engineers*
- IT Professional*
- Financial Analysis & Planning

Workforce pipeline. Most airports do not currently have the marketing capacity or capabilities to adequately promote airport career opportunities, which limits the talent pipeline for most of the airport MCOs. Airports tend to place little marketing emphasis on becoming an *employer of choice* or featuring the specific jobs that exist so job candidates may not be aware of the opportunities within airports.

One educator commented that most new hires do not enter airport management education programs due to a longstanding interest in an airport career. Instead, many students transition to an airport-focused degree after first pursuing flight training or other high-profile aviation degrees. Upon realizing some of the limitations of certain aviation

[2] Council of University Transportation Centers (CUTCworkforce.com). National Transportation Workforce Summit Summary of Results. Framework for Action.
April 24-26, 2012

careers, some students then branch over into an airport-specific track. As a further example, there are many airport directors who began in the airport industry in the 1970s following flight training or military service where pilot jobs were scarce, and then then ended up gravitating toward airport jobs.

Further, referral programs and outreach efforts could help airports leverage the current workforce to extend information about airport careers to their peers. While the number of retirement-eligible employees in MCOs is growing, the community connections these individuals have developed are underappreciated as a means to grow the talent pipeline.

Sufficiency of airport T&E. The capacity of training and education programs does not appear to be the limiting factor for growing a deeper talent pipeline in airports. Rather, airport T&E providers would like to see more participation in airport-related degrees and courses. Based on small sample sizes, which airport leaders state as a major concern for all jobs, the rate of expansion in airport T&E does not appear to be meeting the growing workforce needs for airports. Airport T&E providers also explained that there may be little they can do about potential shortages in new graduates for airport careers as their marketing budgets are limited and current marketing tends to be focused on other aviation degrees and careers such as pilot training programs. Furthermore, because many critical occupations and skilled trades are not addressed in airport-specific curriculum, airports will need to attract talent from outside airport T&E programs.

Supporting data: All of the T&E providers interviewed agreed there is opportunity to expand their programs if demand was greater.

One industry stakeholder agreed that there has been little to no engagement from the airport industry in K-12 education up through collegiate education. This expert expressed that the industry must take responsibility for increasing awareness. This could be achieved by pushing the public and educators to "look outward" and "see the needs impacting the airport world" and subsequently how those needs can translate into job opportunities. Without a stronger push to increase awareness of airport careers and generate interest in mission critical occupations, airports risk having an insufficient talent pool as demand grows.

Workforce Capacity Need B. Investing in early and full-spectrum development of the talent pipeline. Educating young people and non-traditional candidates about airport jobs can help generate interest and awareness of airport careers to expand the future talent pipeline.

To build workforce capacity that is able to fully meet all of an airport's needs, airports should consider outreach initiatives to engage the community, potential employees, and other stakeholders. For example, encouraging employees to discuss their airport careers at school career days, funding airport-related classroom activities, or allowing students to experience the airport first hand through enrichment activities are all examples of methods to increase awareness and promote early pipeline development. A pipeline of future talent could also be cultivated by targeting new or different types of applicants not traditionally considered by most airports. Examples include retirees, veterans, low income and unemployed individuals, those employed across industries or within airport affiliates (e.g., airlines). To attract non-traditional candidates, airports also need to consider the work-life needs and unique interests that may influence the employment decisions of this potential talent. For example, shift work for Airport Operations jobs may enable alterative work schedules that are appealing to two-income families. Further, airports need to adopt broader outreach campaigns that will engage the public and increase awareness of career opportunities. Such

Highlights:

- Building early (K-12) awareness of jobs is key to growing the airport pipeline.
- Small applicant pools continue to challenge airport recruitment.
- Many mission-critical jobs are at a high risk for vacancy.
- Airport stakeholders acknowledge the airport workforce is experiencing significant demographic shifts (e.g., generational; ethnic).

campaigns may include partnerships with local membership or other government organizations (e.g., Chamber of Commerce).

Job considerations. To address a systemic concern for airports of a "small applicant pool" across critical jobs, airports must begin to see outreach and talent development as a "cradle-to-grave" initiative and strive to cultivate interest in airport jobs early in life. Airports may miss a critical opportunity to guide individuals toward airport careers if they are not made aware of airport jobs until long after high school graduation, when many have already made significant decisions about their career trajectory. As an example of early pipeline development, construction career days have been effective in growing awareness of careers in highway transportation to high school students through hands on experiences and interesting events. One airport indicated they work with local schools during a yearly event to help students gain interview skills. This is valuable because it begins to build important career skills in students, but also brings awareness of airport jobs.

A small municipally-operated airport has opened a charter school, grades 9-12, focusing specifically on aviation careers. The school engages airport staff directly at the school. A leader at this airport mentioned that the goal is to begin workforce development at very young ages.

Supporting data: Of the 6 MCOs identified as having the challenge of "small applicant pool" by more than 50% of participants, 5 of those 6 MCOs also were identified as having a high risk for vacancy.

A full spectrum pipeline development strategy would also consider how to reach individuals who might not be suited for higher education but could thrive in technical trade jobs (e.g., Electricians) which are particularly difficult for airports to fill. One airport leader indicated that they are often unable to fill lower-level positions in areas such as maintenance because it is hard to find employees with required experience; even when the individual has the relevant experience, he/she is often drawn to higher paying jobs in the local economy. Thus, airports need to reach potential talent early and emphasize the benefits of airport employment that help to offset wage challenges.

Workforce pipeline. The current airport workforce is beginning to change as younger employees are replacing retirees. Further, some new employees come from different demographic backgrounds or unique experiences compared to seasoned airport employees. While a culture clash can occur, airports must learn how to leverage the positive value of such differences through programs that will help build shared capacity. For example, mentoring and job shadowing programs are often used to capitalize on the institutional knowledge older generations of workers bring and the technological savvy common to the younger generation.

Supporting data: Changing demographics of the workforce was identified as a major factor impacting 6 out of the 8 MCOs identified.

Project findings also indicate that airports may not be equipped to develop new entrants of different ethnic backgrounds such as non-English speakers or individuals for whom English is a second language. To ensure that airports are able to access a wide range of talent, airports may need to customize their recruitment and development efforts to address diverse perspectives and needs. As an example, Port Jobs' Airport University in Seattle provides translators during classes and individuals to help to students who have learning challenges. Airports could use similar strategies in training programs, perhaps by partnering with local organizations that offer interpreter support. Further, airports should consider the workplace benefits, work arrangements, and job features that will not only attract but also retain employees who may hold different values and perspectives than tenured airport personnel.

Sufficiency of airport T&E. Based on the comprehensive search of airport T&E programs, it was surprising to find virtually no programs focused on secondary school students or the vast number of workers at an airport who are not actually airport employees. Both of these populations could be key to attracting people to airport careers and developing the local talent pipeline.

Despite the absence of such programs, two models suggest a path forward for the airport industry. First, there are several examples of "aviation academies" that utilize a technical school approach and focus on developing STEM competencies in the context of aviation. Many also incorporate flight training or aeronautical engineering concepts, but none are oriented toward airports themselves (despite often being affiliated with airports), which seems like a significant missed opportunity for the industry. The second type of model is an educational or university program sponsored by an airport and often on the premises of the airport.

By adopting similar models, airports may be able to access previously untapped sources of talent at contractors, airlines, concessions, and other tenants that have both airport experience and a desire to grow in their careers.

The Airport Jobs program, operated by the Seattle-based non-profit *Port Jobs* focuses on job placement for companies that operate at SeaTac airport. Their Airport University program provides opportunities for employees to take credit-bearing courses through partnerships with local community colleges. To meet the needs of the predominantly low-income workforce, classes are held at the airport, and focus on topics that can help them take the next step in their careers (e.g., airport security, communication skills).

Workforce Capacity Need C. Embracing a far-reaching, boundary-spanning strategy for new talent. Airports should embrace regional and national strategies to identify new talent due to limited local labor markets. Further, municipally-run airports face frequent delays and obstacles in their hiring processes.

U.S. Commercial service airports are often isolated from one another. With the exception of major cities like New York and Washington, DC, many cities only have one major airport. This makes it difficult to find talent locally that has airport experience unlike for other industries (e.g., financial institutions; retail) where there is ample exposure to similar organizations within one city or region.

Smaller airports can find it particularly challenging to bring in new talent due to their relative isolation and limited resources for outreach and competitive hiring. One airport's human resource leader indicated that when recruiting for airport jobs, regardless of airport size, there is a need to recruit nationally because of the unique skills required for airport jobs, particularly since those airport-specific skills can rarely be found in the local workforce.

One executive from a small airport shared: "*There is also a brain-drain problem in smaller areas as younger people move out to bigger cities for college etc., leaving smaller communities.*"

Highlights:

- Airports are often isolated from one another making it difficult to hire experienced talent.
- Seven of the eight MCOs are not trade jobs so localized recruitment could be difficult; four of those jobs are airport specific.
- Airports need to strategize when recruiting across country by avoiding the highest and lowest concentration areas of a particular job.
- Airport T&E programs are located in more remote places, thereby impacting student recruitment.

Job considerations. According to survey results, five out of the eight airport MCOs required airports to recruit and hire individuals with specific skill sets that might not be available in the local workforce. Hiring for jobs with these airport-specific needs can bring about challenges for those airports that are in cities with low concentrations of airports or without nearby airport-related T&E programs. Further, leadership positions in airports often require industry-specific knowledge that may be difficult to obtain from local labor sources.

Supporting data: For 5 of the 8 MCOs, more than 58% of survey participants indicated that highly specialized skills were one of the major roadblocks to current recruitment.

Supporting data: Between 4.5-12.5% growth projected across the 8 MCOs between now and 2024, suggesting a robust widespread talent sourcing strategy will be needed. (Source: BLS)

Even with a robust cross-training and internal development strategy to fill most open positions, airports will likely need to find talent from other cities or regions. Thus, airports should consider developing a pipeline for management and technical positions that spans geographic

boundaries. One airport HR professional indicated that an effective way to begin recruiting talent from other areas is to offer internship programs that could attract college students from across the country.

In addition to geographic challenges, municipality-run airports expressed frustration with slow bureaucratic processes and restrictions on hiring. These airports suggest that municipality requirements can inhibit the flexibility and responsiveness needed to maintain workforce capacity. Airports also believe that municipal processes can inhibit the selection of talent with specialized skill sets. One airport leader stated that restrictive government civil service processes can make it difficult to attract talent that embodies the entrepreneurial spirit and technological knowhow that is needed to lead airports into the next decade and beyond. A municipal airport leader shared an example of a promising young employee the airport desperately wanted to keep, but they could not promote him beyond an entry-level role as the only relevant position classification in the civil service system required a specialized degree that he did not have. Despite the challenges airports may face with some civil service processes, the switch to an enterprise, for-profit structure is not necessarily a simple process. In fact, this change can be costly to airports as it requires a new benefits structure and more competitive wages, thus making it challenging to control the bottom line costs and revenue. Thus, airports need robust strategies that will allow them to recruit the best talent despite any obstacles that may exist due to their operating structure.

Workforce pipeline. When seeking talent across the country, airports should consider focusing their efforts in regional "sweet spots" where there is enough of a presence of similar job opportunities to attract workers to that area but not such a high concentration that airports would find it difficult to compete for talent with local businesses. For example, for Airport Development Occupations, an airport might consider hiring someone with property and real estate manager experience. In this example, airports might not wish to target the labor market in states like Nevada and Hawaii where BLS data indicates the job concentration is particularly high compared to the national average for that job type; this indicates that there would likely be high competition for employees and perhaps greater challenges in hiring qualified applicants. Conversely, for a state like Alabama, fewer similar employment opportunities are available and thus, qualified labor might be sparse due to low job concentration. If an occupation has a high concentration of employees in a certain area, it may behoove airports to consider similar occupations with overlapping skill sets from which to recruit, as other occupations may have a lower employment concentration and thus less competition for employees. Additionally, airports need to be continually aware of the economy, both locally and nationally, and its impact on jobs. Information on industries with tight labor markets, the unemployment rate, the number of job vacancies, and the average compensation of new hires can help determine when and where to target recruitment efforts (SHRM, 2016).

Supporting data: Appendix C provides BLS location quotients (LQ) by state for each of the MCOs. This LQ data provides insight into areas where airports may wish to target their recruitment strategy for specific jobs.

According to focus group participants, airports tend to focus their recruitment efforts on the local market. In areas with multiple airports, larger airports are often able to recruit experienced staff from smaller airports because this type of move is seen as an upgrade. However, this approach rarely works in the other direction, putting smaller airports at a disadvantage. Smaller airports may need to show more creativity in their hiring strategies by recruiting either from outside of the immediate geographic area or from different industries. Because airports are already struggling to compete with other industries for the best employees, they should consider how a national marketplace differs from localized marketplace (e.g., in terms of competition, cost of living, regional distinctions) and determine how to best appeal to workers in different areas.

An executive at a medium-sized airport expressed the benefit of generational diversity and technology by stating how the younger new workforce brings vibrancy and moves the technology aspect forward. They play a significant role in helping to adapt the aging workforce.

Sufficiency of airport T&E. Limited local labor markets are not only a problem for airports, but also for the airport T&E programs that support them. Given the relatively few educational programs dedicated to airports, the fact that most are in somewhat remote parts of the country (e.g., Grand Forks, ND; Salina, KS) mean that exposure to airport degrees tends to be localized, especially given the disparity between in-state and out-of-state

tuition at many academic institutions. Airport training programs are less affected by such issues as many of them have shifted online, but several still provide travel for either instructors or participants for in-person sessions.

Thus, just as airports would benefit from a regional and national perspective on recruitment, the industry would be well served if T&E providers spanned a broader geographic area, including areas of greater population density. The rural Midwest plains may provide ample room for flight training, but the future development of the airport workforce pipeline would benefit from more programs at larger universities across the country where airport careers can get more exposure and perhaps not be seen as a backup career for those abandoning flight training. Additionally, programs in urban centers near major hub airports could provide ample exposure to real world experiences and internships at some of the world's busiest airports.

Challenge Area 2: Building Internal Staff Capacity

This section presents three airport workforce capacity needs related to developing the current airport workforce.

Workforce Capacity Need D. Addressing new skill gaps from industry changes.
Industry advances and growing business demands (e.g., regulatory pressures) are resulting in skill requirements that have yet to be developed in the current airport workforce or embedded in curriculum to grow future talent.

Across the airport industry, there are a number of new technologies being introduced to enhance the passenger experience or improve safety and efficiency of airports operations. Technology is expected to permeate every functional area of the airport in the next 5-10 years. Examples of the various uses and types of new technologies include but are not limited to:

- Operational efficiency/capacity (e.g., NextGen)
- Innovation and connectivity of personnel (e.g., cloud computing, demand for mobile computing)
- Outreach and marketing (e.g., social media)
- Passenger experience (e.g., ticket kiosks, Bluetooth or beacon technology)
- Data management (e.g., analytics software for tracking/processing big data)
- Personnel tracking (e.g., biometric badging and access control; smartphone apps for clocking in)
- Job enhancement technologies (e.g., computer-aided design software (CAD)

Highlights:

- Airport industry lacks knowledge about functional requirements of new software and IT systems.
- Over 30% of 746 surveyed selected Airport IT professionals as top 5 mission-critical occupation.
- 12% national growth projected in IT jobs.
- Over 1 million IT postings across industry types means increased competition for airports.
- All airport jobs (beyond IT professionals) will demand some IT expertise in 5-10 years.
- Across a scan of 35 airport T&E programs, none offered airport-specific IT courses.

Both the types of roles performed and the requirements of current airport jobs are changing as a result of the introduction of these technologies. During focus groups with key airport stakeholders, one of the most common themes of discussion was the importance of skilled personnel to perform technology-related jobs. The focus group participants noted that all airport personnel will come to rely on IT professionals even more than they do today. Reluctantly, the focus group participants acknowledged airports do not seem equipped to deal with the brunt of the workforce needs arising because of new technology and associated process or operations changes.

Put simply, airports will need IT professionals who know how to make full use of the new technologies for airports to recognize the benefit of such technologies and minimize interruptions that could occur. The increased reliance of

technology can affect airports in sometimes contradictory ways. For example, new technology may be used to update and streamline processes with the goal of operational efficiency. However, with new technology and systems, employees who are not technology-savvy may struggle to accomplish their work using new methods and systems and thus, delays can occur until the workforce capacity catches up to the new job requirements. This points to the need for airports to recognize how technology will impact future job requirements and the competencies and skills required to operate new technology implemented in their facilities. The IT changes also suggest new training will be required for current employees and some airports may need to restructure how they select, hire and train all incoming personnel.

Jobs considerations. IT was identified as mission critical by more survey participants than any other airport occupation. This recognition of the growing importance of technology highlights that new employees will need up-to-date technology skills and related competencies to succeed.

Supporting data: Over 1/3 of the 746 survey respondents identified IT professional in the top 5 most mission-critical occupations for airports in the next 5-10 years.

Due to national emphasis on technological innovation, cloud computing, mobile devices, and data collection and storage, the number of IT jobs across the nation will be growing faster than the average job over the next 5-10 years. Across U.S. industries, a large number of IT job openings are anticipated due to new technological requirements and impending retirements. This growth in IT demand across all industries guarantees increased competition for IT employees for airports; many which already find it challenging to attract such talent.

Supporting data:
- IT professional expected national growth of over 12%
- 1 million+ national IT job openings from 2014-2024.

(Source: BLS)

The current study also identified that technology skill needs are not exclusive to IT professionals. Airport stakeholders indicated that Airport Operations staff are increasingly dependent on technology to complete their daily tasks, and one airport leader went as far as to suggest that every area of the airport will become highly dependent on technology to operate. As further evidence of this trend, many of MCOs studied required technology-related competencies, such as experience with financial analysis software for Financial Analysis and Planning professionals, computer-aided design (CAD) software for Electricians and Engineers, or new scanning or x-ray technology for Airport Security. Even airfield and leadership roles may require computer interfaces or mobile technologies to effectively complete the job. In sum, in each of the occupations projected to be most critical to airports in the next 5-10 years, technology will impact job requirements and skill needs, and airports need to ensure that these changing needs are adequately addressed for all jobs.

Workforce pipeline. One airport educator commented that airports are "frankly…overwhelmed by emerging technologies and understand little about how to prepare for them." While more IT professionals will be needed across all airports, the current workforce will also all need exposure to the new, revolutionary technology that airports are implementing. At some point in the near future, every single worker will need to receive exposure, training, and practice with new technologies. However, airport stakeholders acknowledge that many current employees are reluctant to embrace new technology. For example, according to case studies conducted with airport representatives, new technology can be difficult for older generations to accept and understand. This is partly due to their attachment to traditional approaches that would become obsolete once the technology is introduced. Younger generations of workers (e.g., Millennials) have received attention for their tech-savvy skills. However, some airport leaders have discovered that the social norms and customer service skills of individuals who are accustomed to interacting through digital media may be lacking since those individuals have typically received less opportunity to polish their verbal communication and customer-facing skills. While airport jobs will soon necessitate a technology-savvy workforce, communication and rapport building with passengers and the numerous customers that exist within the airport (e.g., concessions) and the community (e.g., local political leaders) will continue to be paramount. Thus, airports face a dual development dilemma of needing to increase technological capacity while simultaneously growing the workforce to be customer-focused.

Supporting data: All 27 focus group and interview participants agreed some IT expertise will be needed across all of the airport workforce (not just IT jobs).

Supporting data: Case study participants acknowledged generational differences in acceptance and knowledge of new technologies.

Sufficiency of airport T&E. Most airport education and training providers agreed that information technology and related occupations were growing in importance for airports. They also recognized that all roles within an airport were requiring more familiarity and comfort with digital media and interfaces. Some educational providers mentioned integrating technology across their programs. However, to date there is still a significant gap in information technology T&E in the airport environment. Among the T&E programs reviewed (see Chapter 4), the only IT-related content appeared in courses focused on basic office productivity and database software. Only seven total courses with some IT-related content were identified across all of the T&E providers that responded to the questionnaire. It is clear then that most talent for IT jobs comes from outside of airport training and education programs.

Supporting data: Among the 35 programs in the broader T&E scan, none offered courses on IT implementations in an airport environment.

This research has revealed two clear gaps in the T&E pipeline related to information technology:

1. Leaders are not being trained or educated on how to apply innovative technology and leverage it for success in the airport environment. They may also not have sufficient understanding to effectively manage IT professionals or make informed decisions about investments in information technology or systems.

2. Education and training for IT professionals does not prepare them for the specific implementation of that technology in an airport environment, and there is no widely available training to prepare them for this. Airport-specific experience must either be learned on the job or trained within individual airports.

These findings suggest that there are opportunities for both airport T&E providers and airports themselves to develop courses and lab experiences that education currently does not offer. Future airport leaders could be trained on how to leverage technology. There could also be courses developed that will help new or experienced IT professionals better understand the technology needs and systems at airports. Even if airports do not operate or perform IT services, they still need to have managers who can oversee and have sufficient technical competency to ensure that technology work within the airport is being done correctly and according to specifications.

Workforce Capacity Need E. Increasing airport-specific knowledge.
Across all scenarios and all jobs, airport workers will need increased airport knowledge in addition to technical, job-specific expertise. Knowing how one's job fits within the larger airport ecosystem will be critical as safety management grows in importance and technology systems become even more integrated into all aspects of airport operations.

In multiple focus groups and in the survey, airport stakeholders made it apparent that it is valuable for all airport employees to have an understanding of how airports function, how their individual role fits within the broader context of the organization. Airport personnel function within a complex ecosystem comprised of airport personnel, airline and other tenant staff, federal employees (e.g., TSA; FAA), and the general public. Shared understanding of roles and responsibilities among all of these different entities contributes to the safe movement of aircraft, passengers, and equipment throughout the airport. When onboarding employees from other industries or training programs, it is vital that they quickly get up to speed on the safety management expectations of all airport employees so they can recognize potential hazards and promote safe operations.

A large commercially-operated airport has implemented an undergraduate intern program to better develop the airport's competence to recruit millennials and build airport knowledge. Although these interns often begin their internships with little knowledge of careers available in the industry, a majority leave with increased interest to return to the industry. Interns spend about half their time completing work within their departments, while spending the other half of their time learning about the enterprise overall and how functions work together. Departments hiring interns are required to develop work plans, to ensure interns are engaged in meaningful and impactful work.

Highlights:

- Knowledge about airports is critical for all incoming personnel due to the unique business model and operational needs of airports.
- Many of the trade MCOs such as engineers, electricians, and IT professional require specialized training outside of airport industry which limits the airport-specific knowledge gained by these talent.
- Compliance and regulatory requirements are often very airport specific.
- General aviation (GA) airports and other businesses within an airport can serve as a talent source for airports.
- More onboarding and transition training needed to build airport knowledge for new hires.
- ACI, AAAE, and Kansas State are examples of airport T&E that are working to building airport-specific competence.

Jobs considerations. When people consider seeking work in an airport, they may have little familiarity with how airports themselves function. Often the public thinks of airport personnel as those who are employed by contractors or other aviation employers like airlines. Seldom is the general public aware of the unique jobs employed by airports. Further, new employees within highly specialized MCOs like Engineering, IT, and Electricians are often hired from outside of the airport industry and have not had exposure to the airport-specific aspects of their roles. Given that airport training and education programs do not cover the specialized skill sets needed for these highly technical jobs, these employees are unlikely to come in with airport knowledge unless they are directly sourced from another airport.

Supporting data: 4 of the 8 MCOs identified in this study require airport-specific knowledge and skills (i.e., Airport Development, Airport Operations, Airport Security, and Airport Project Planning).

There are business-related professions in airports that also will need to understand airport-specific operations and regulations to successfully perform their jobs. For example, the financial structures and pressures encountered by Financial Analysis and Planning employees may be unique to airports (e.g., cost recovery, AIP funding requirements). Contracts and procurement jobs could be unique in the airport industry due to the multiple customers

that airports serve (e.g., airlines, commercial lessees, vendors in terminals). The implementation of certain technologies could also be unique to the airport environment and require specific training and development for IT personnel to effectively leverage the technology for airport functioning.

Additionally, there are very specific requirements, rules, and regulations from the FAA and potentially local governments or municipalities to which airports must adhere. Airport employees need to be very familiar with these guidelines to ensure compliance with all rules. These are not topics that engineers or financial analysts will learn about in their education, but rather something that will need to be taught and assessed once they are brought into the airport setting. Even if new employees come from airport-specific training programs, they would likely benefit from an onboarding strategy focused on ensuring that all new employees know the requirements, rules, and regulations that apply to their job and the airport as a whole.

One industry expert noted how some airports offer an "Airports 101" type of course that introduces Board members and senior staff to the airport environment but currently, this type of course is not commonplace for staff positions generally.

Workforce pipeline. Stakeholders in this study identified airport-specific knowledge as critical to effective job performance particularly in the next 5-10 years. Given the importance of airport-specific knowledge, one way that some airports focus on building a talent pipeline is to search for employees with airport- and aviation specific experience but this often proves difficult due to the limited number of commercial service airports typically clustered within a city.

Supporting data: 85% of the 746 survey respondents agreed that the #1 most important requirement for the future workforce is: Industry-specific knowledge about airports.

Employees at general aviation (GA) airports is one example of a potential talent source because these workers have airport-related knowledge and experience and the skills learned at these jobs will be easily transferable to the context of a larger, commercial service airport. In addition to using GA airports as a potential source of talent, airports could also focus on talent sources that are already within the airport but working for other non-airport employers as these individuals will have some exposure to airport functioning. For example, contractors, vendors, or concessions may have employees who could bring their existing knowledge of airport needs to employment within the airport itself.

Sufficiency of airport T&E. Evidence suggests the airport T&E sector is beginning to realize the importance of developing "airport competence" or a general understanding of how the airports and the numerous businesses that operate on them interact to support safe and secure air travel. For example, ACI, AAAE, and some university programs are providing more exposure in their programs to airport operations.

Supporting data:

- ACI has an airport operations diploma program for new employees that emphasizes airside, landside, and terminal operations.
- AAAE has Certified Airport Employee programs for airport operations, safety, and other topics to help employees learn and demonstrate knowledge of Part 139 requirements.
- Kansas State's airport management degree program places heavy emphasis on hands-on experiences in an airport context.

Such trends would benefit from extension to other T&E providers and also alignment with needs related to a broader range of mission critical occupations. For example, in addition to general airport knowledge, specific courses could focus on what Engineers, Electricians, IT personnel, and others from other industries need to know about their roles on an airport. Such transition training would make it easier to expand the talent pipeline by recruiting from other industries and make airports less dependent on developing talent internally. Internships or temporary employment programs could also help to develop this experience and grow the talent pipeline.

Workforce Capacity Need F. Enhancing personal effectiveness skills.
Airport talent development strategy needs to focus on personal effectiveness skills to prepare employees. Employees who are flexible and able to adapt to new situations with strong interpersonal skills are in great demand across airports.

Technical skills are important for all airport occupations, but some focus group participants commented that airports or T&E providers may overemphasize technical expertise at the expense of developing personal effectiveness and professional skills. For example, one airport leader described that the writing and grammar skills of employees at all levels are poor, and it is a challenge when employees come in without these basic abilities. Another leader indicated that teamwork is vital to the success of the airport, but employees are often lacking the skills necessary to succeed in a highly collaborative environment. Finally, airport senior leaders indicated that all employees need to have critical thinking and problem solving skills to help the airport thrive in an increasingly dynamic and complex environment.

Highlights:

- Specialized technical skills are sought after and developed in the workforce while personal effectiveness may be neglected too often
- Stakeholders indicated personal effectiveness skills are one of the major training and development challenge areas
- Personal effectiveness skills help workers better engage with one another as well as manage themselves and their response to change.

Job considerations. For each of the MCOs, survey respondents were asked about the availability of training and development in personal effectiveness skills offered to employees. This was repeatedly identified as a weak point in airport training and development. In fact, for three of the MCOs, this was identified as one of the top two greatest training and development challenges experienced. Regardless of the occupation, airport employees could benefit from developing personal effectiveness skills in areas such as interpersonal, emotional intelligence, communication skills, time and stress management, organization, problem solving, and adaptability. These personal effectiveness skills help to build professional capacity and equip employees to respond better to the challenges of the work environment, workplace peers, and sudden changes.

Supporting data: Of the 746 airport stakeholders surveyed, over 50% indicated that personal effectiveness skills were a training and development challenge for 6 of the 8 MCOs. Similarly, 50% of respondents identified 3 of the 5 executive-level mission critical jobs as needing more development in personal effectiveness skills.

Workforce pipeline. During focus groups, airport leaders discussed the need to select employees based on adaptability, flexibility, and other personal effectiveness skills. While selecting new employees with personal effectiveness skills may be desirable, airports should also consider for each MCO whether the personal effectiveness skills are necessary at entry or could be easily trained once on the job. Focus group participants indicated that it is not just entry-level employees who struggle with personal effectiveness. As airport leaders face an increasingly complex operational, financial, commercial, and political landscape, the ability to communicate and build rapport with a broad range of stakeholders is essential to achieving an airport's strategic goals.

Sufficiency of airport T&E. According to the airport educational programs interviewed as part of this research, one of the concerns heard most often from airports hiring recent graduates is a need for greater focus on interpersonal skills, communication, public speaking, and other personal effectiveness skills. It is not simply a matter of providing the future workforce with the technical knowledge of airport management and planning, but also equipping them with the means to engage with the public, the airports' many tenants, and stakeholders in the community. It is also important that leadership development programs like those

One Airport T&E provider indicated that airports are demanding more "world class" professionals at all levels. This involves more certifications and credentialing of airport staff. The emphasis airports place on increasing the professionalism of staff can also have the secondary effect of attracting job seekers by presenting airports as an employer that values development of their workers.

offered by ACI and as well as academic degree programs focus on instilling these personal effectiveness skills in their leaders.

Challenge Area 3: Planning for Future Workforce Needs

This section presents an airport workforce capacity need related to planning for the future and ensuring sustainability of operations.

Workforce Capacity Need G. Implementing succession planning.
Airports are beginning to recognize the importance of succession management in light of new skill requirements, increased labor market competitiveness, retirements, and turnover. Airports will need strategies to replace current leaders in each MCO to avoid the impact of future capability gaps.

Succession planning and succession management are particularly important for airports given the changes the industry is facing. The threat of succession challenges is compounded by the growing number of airport personnel who are retirement-eligible. Ideally, airports would have 2-3 individuals identified for each MCO with relevant skills ready to step into a higher level job should an opening occur. A solid succession strategy also involves preparing to retain institutional knowledge by partnering prospective successors with current leaders whose shoes they may eventually fill. However, the stakeholders that participated in this study indicated many critical positions may not have even a single potential successor to step in when an employee leaves.

In addition to retaining valuable institutional knowledge about how the airport functions, new knowledge and skills will also be needed to respond to some of the changing demands on airports. For example, airports will benefit from talent who have skills in data analytics, global technology, social media, and business strategy. Thus, a robust succession strategy needs to consider how to address vacancies in MCOs through a balanced approach of internal development and external outreach.

Highlights:

- Airport retirements will present serious challenge to workforce capacity when partnered with high across-industry growth (and thus competition) for talent related to MCOs.
- Succession planning and knowledge management are critical for airport industry.
- Clash of expectations and cultures with hiring of younger workers needs to be addressed.
- Leadership programs must focus on building leadership capacity with junior and mid-level staff.
- Airport T&E like ACI and AAAE are focused on next generation of airport leaders.

Jobs considerations. A large number of airport jobs, particularly in operations and maintenance, are facing significant effects of retirement. Labor market data suggests continued workforce needs across industries in jobs that are critical to airports and many other industries. Thus, airports will need to place heavy emphasis on workforce development and succession planning strategies for these MCOs which will only grow in national demand.

Supporting data: Among the MCOs, the top 3 fastest growing occupations are jobs common across industries:

- Electricians: 13.7%
- IT Professional: 12.47%
- Financial Analysis & Planning: 10.55%

Workforce pipeline. It is imperative that airports develop future leaders with strong managerial and technical skills and a diverse set of experiences to ensure they have the broad perspective needed to lead airports into the future. In light of the high volume of impending retirements anticipated across the industry, airports need to focus their efforts on building professional capacity among emerging leaders in junior and mid-level positions. Someone moving into executive leadership needs to have knowledge of airport operations, how to successfully run the business, and how to navigate local politics. It can be difficult for mid-career employees to obtain the experience necessary to

develop these capabilities. At the same time, it can be very difficult to find qualified replacements for exiting leaders outside the airport, so targeted succession planning is all the more important.

Supporting data: Between 58-69% of survey participants indicated "lack of talent in existing workforce" is a top concern for 6 out of 8 MCOs; this challenge is likely to grow as labor market projections suggest increased competition for talent in those same occupations.

To ensure continuity of operations, knowledge management (KM) strategy should accompany any succession management effort. KM involves gathering, storing, and sharing information that is integral to business operations and the workplace culture. It is important to implement these KM activities before retirees leave to ensure that any of their tacit knowledge can be codified, stored, and shared with other employees. KM is important for all occupations, but especially leadership positions for which most of the job responsibilities are not captured in manuals or formal process documents. Interestingly, one airport on the west coast currently allows overlaps of employees when vacating is imminent to help promote knowledge transfer before the incumbent leaves. This and other similar strategies could help mitigate some of the knowledge loss that many airports are facing or at risk of experiencing in the near future.

One panelist for this study indicated, *"Succession planning is difficult in the constrained municipal civil service system – I cannot prepare a requisition to fill a vacancy until the position is actually vacant. Then the hiring process takes months, depending on the difficulty of recruiting for the position, how long my municipal personnel department posts the job opening, how long it takes them to process, two interview events, setting a starting date, processing of fingerprints/background checks, etc. It may take me 4-6 months to fill key positions. There is zero opportunity for the new person to learn from his/her successor."*

Airport leaders also expressed that typical characteristics among younger generations of employees have made succession management increasingly difficult. For example, some focus group participants indicated that while in the past one could expect most employees to stay with the airport for their entire career, younger employees have less interest in long-term employment with one organization and are more willing to switch organizations or careers than in the past. Similarly, airport leaders expressed that younger workers understand technology and technical requirements, but that they are not always prepared to address the operational demands and time commitments required by airport jobs. To exacerbate that, municipal systems with a closed civil service process are faced with a lengthy process for selecting new talent and thus, the best talent might be quickly whisked away into other organizations.

Sufficiency of airport T&E. Several airport T&E programs focus on developing the next generation of airport leaders. For example, ACI's Airport Management Professional Accreditation Programme and AAAE's Certified Member program target mid-career managers who may have aspirations of moving into senior leadership positions. Both organizations also have leadership development programs oriented toward senior leaders eager to improve themselves. In addition, academic degree programs that focus on airport management help to provide talent that could help replenish the entry-level workforce as mid-level employees move up.

Nevertheless, there are a number of opportunities for T&E and other workforce development programs to improve this process. One opportunity is to address cultural gaps between junior and senior employees to ensure that the experiences of senior leaders are passed on and that leaders can better utilize the strengths of their staff. For example, experienced professionals could help the younger generation to improve public speaking and networking skills, while younger employees may have ideas on how mobile

A leader at a medium-sized airport authority indicated that younger employees' expectations regarding their careers and employment is a major challenge in retaining them. Specifically, they are not interested in working at one organization forever. Instead, they view their role at the organization as a stepping stone. Therefore, the airport industry needs to develop a culture that retains high potential employees, or airports will be competing for diminishing potential candidates.

technology could improve terminal operations. Mentorship experiences, succession management programs, and other career development programs could help to bridge this gap.

The industry could also explore alternative sources of talent to replace employees lost to retirement. One example is retraining retirees from civil service and military jobs. An airport T&E provider interviewed for this study mentioned that the military is one of their biggest sources of students and these individuals tend to be highly disciplined. While this can cause friction with their less disciplined undergraduate peers, airports should consider how to develop these individuals as well as other pools of talent to replenish positions lost to retirements.

Future Directions

In light of the significant changes and challenges the airport industry is facing, airports must address the seven workforce capacity needs presented in this report to avoid potential gaps in workforce capacity and capability. Airports that do not heed the warning signs uncovered by this report may find themselves losing opportunities to their more capable peers. If airports are unable to adequately equip their workforce to respond swiftly to emerging technologies, political pressures, passenger demands, and financial challenges, they are placing themselves at risk of operational disruptions, lost routes and customers, and in the worst case, airport closures.

Highlights:

- If airports are unable to adequately equip their workforce to respond swiftly to emerging demands and challenges, they are placing themselves at risk of operational disruptions, lost routes and customers, and in the worst case, airport closures.
- Airports will need to prioritize investment in human resource expertise to help the airport understand the impact of MCOs, determine how to properly fill these positions, and support implementation of strategies across that will help meet the airport's strategic goals.
- To support airport leaders in growing and developing their workforce to meet the challenges ahead, the airport industry should identify, document, and share effective strategies and best practices that have proven successful in building workforce capacity and addressing the needs identified through this project.

Whether they are municipally managed or governed through an independent authority, airports are consistently focused on cost control and efficient operations. But staying "lean" in terms of staffing to manage costs can place an incredible burden on airports and their workforce and may limit the ability of the airport to grapple with sudden changes in workload. As more airports move toward an enterprise, revenue-generating focus, airports must not lose sight of how staffing directly impacts results and the bottom line. Airport management needs to be willing to invest in longer-term strategies regarding talent development, training, recruitment, retention, succession planning, and workforce capacity building and remain competitive in compensation and benefits offerings to ensure workforce sustainability over time. Further, airports will need to prioritize investment in human resource expertise to help the airport understand the impact of MCOs, determine how to properly fill these positions, and support implementation of various strategies across the airport that will help the airport meet its strategic goals.

Above all, airport leaders should shift their focus from reacting to today's workforce need to being ready for the workforce challenges of the weeks, months, and years to come. They must develop a strategy and begin allocating resources to workforce planning and development now if they hope to be able to confront impending workforce gaps. They must also begin to engage their internal and external stakeholders regarding these efforts, as this proactive approach to workforce capacity building is likely to require buy-in from managers and seasoned airport staff, as well as government officials, local communities, and airlines that may have budget approval power.

To support airport leaders in growing and developing their workforce to meet the challenges ahead, the airport industry should identify, document, and share effective strategies and best practices that have proven successful in building workforce capacity and addressing the needs identified through this project. When selecting capacity building strategies and implementation steps, the industry should consider both local, airport level and national, industry-wide solutions. Some implications and examples of both are discussed in the following sections.

Localized, Airport-Specific Implications

In terms of localized considerations, because this study was funded by ACRP, it is intentionally focused on industry-level considerations. However, data in this report provide some valuable localized, airport-specific guidance. For example, the data directs airport leaders toward which occupations will be mission critical in terms of addressing future work requirements related to technological, financial, political, and demographic trends. The report guides airports to consider which of those mission critical occupations will present the greatest challenges when sourcing new talent based on the projected nationwide job growth. The states with the highest and lowest demand within each mission critical occupation are also identified. Thus, airport leaders can assess whether their approach to recruiting and developing staff within those jobs should be altered in any way. The details of how to do so are not always intuitive, however, so individual airports will need a set of best practices and strategies to help them address their individualized workforce capacity needs.

Highlights:

- Airport leaders can assess whether their approach to recruiting and developing staff in MCOs needs to be altered based upon the information in this report.
- At a local level, the airports must consider regional and organizational-specific factors to help ensure they make sound, cost-effective staffing and workforce development decisions that sustain workforce capacity to meet emerging industry demands.
- Airports are also likely to find value in forming partnerships with local airports and community organizations to share resources and leverage relationships for the purpose of building workforce capacity.

At a local level, the airports must consider regional and organizational-specific factors. For example, assessing labor supply and demand for a specific occupation in a specific market requires careful analysis best performed at the local level. Such an assessment should consider multiple airport-specific factors such as current and anticipated service levels, workload, workflow and processes, competency proficiency levels of current personnel, airport planning efforts (e.g., a new terminal), implementation schedules, operating structure, and workforce development strategy. This type of organizational-specific analysis will provide airports with current, actionable data to support staffing decisions. For example, airports can use staffing analysis to project the number of full-time equivalent (FTE) personnel needed to fill a specific job type within the next 5-10 years. This information helps ensure airports make sound, cost-effective staffing and workforce development decisions that sustain workforce capacity to meet emerging industry demands.

Airports are also likely to find value in forming partnerships with other airports in their region to conduct and compare supply-demand analysis with respect to the local labor market. By partnering, airports can share the resources required to conduct such analysis as well as the knowledge of strategies to build success. Understandably, U.S. commercial service airports within a region compete to some extent for passengers and airline customers; however, by collaborating through partnerships, airports have the opportunity to collectively invest in building a regional talent pipeline. Further, airports could join forces with other airports in the region to promote early education about airport careers or to economically train and develop their current workforce through shared curriculum and facilities.

Airports should also leverage local community connections to promote interest in the MCOs. For example, outreach to local community organizations could be used to help raise awareness of airport careers. Airports may find benefit to partnering with the Chambers of Commerce or other local businesses to establish airport-support events. Other community outreach could include building rapport with unions, staffing firms, local leaders, and local job fair events. Outreach to local community and technical colleges could also be beneficial, especially when recruiting candidates for skilled trade jobs, such as electricians or facilities maintenance staff. Although many airports are adept at local community engagement, airport leaders could benefit from a resource containing best practices and strategies to help them build and leverage these relationships for the purpose of building workforce capacity.

National Implications

Airport stakeholders agree that there is not a sufficient coordinated effort at a national level to address some of the systemic workforce challenges airports face. As competition grows across industries for some of the specialized skills that airports also need, the U.S. airport industry is leaving itself exposed to potential operational and safety concerns resulting from workforce capacity gaps.

Highlights:

- There is not a sufficient coordinated effort at a national level to address some of the systemic workforce challenges airports face, leaving the industry exposed to potential operational and safety concerns resulting from workforce capacity gaps.
- Resources should be marshalled on a national scale to inform highly demanded professionals about career opportunities within airports.
- Airport training and education programs need to also ensure the talent they grow supports the industry needs moving forward by aligning their offerings to airport MCOs and capacity needs.

One clear opportunity for industry constituents including the Federal government, universities, airport associations, and state governments to improve the workforce capacity of airports is to raise awareness and build interest in airport careers. Airports will need to attract well-educated employees to serve as the business leaders, IT professionals, and engineers needed to support airport growth and modernization in the next decade. Given that this is an industry-wide challenge, it is logical that resources should be marshalled on a national scale to inform these highly demanded professionals about career opportunities within airports. Similarly, high rates of attendance at four-year colleges and universities means there are fewer students pursuing skilled trade jobs, further shrinking the potential labor pool for airport MCOs like Electricians and other Airport Operations staff. If high school, vocational and technical school, and community college students are made aware of airports and related career opportunities, airports will be better positioned to recruit employees within the skilled trades. By expanding federal grants such as those issued by the U.S. Department of Labor (e.g., T-TAC grants) to community colleges on behalf of airport education, programs specific to the airport MCOs could be developed to support awareness and interest in airport careers.

Airport training and education programs must also ensure the talent they grow supports the industry needs moving forward by aligning their offerings to airport MCOs and capacity needs. By integrating practical airport experience, field work, and internship opportunities into their curriculum, airport T&E programs can better prepare students for airport careers, improve job placement rates, and generate greater interest in their programs. Airport T&E programs also have a role to play in bridging the gap between professionals in commonly needed occupations like finance and engineering and the specific knowledge needed in the airport context. The lack of emphasis on airport-specific education could be influenced by funding availability as well as by an absence of dialogue between airport and education leaders. Industry associations like AAAE and ACI could help to address both of these issues by sponsoring "transition training" for new members and promoting collaboration between airports and T&E providers.

In summary, addressing the industry-wide challenges that plague both education programs and the airports they support will require a robust set of workforce development strategies. To be successful, these strategies must help break down walls between education providers, individual airports, research institutes, airport membership associations, Federal government, and employment/job training programs alike.

Finally, to achieve the types of strategies needed for the airport industry, a Phase II and practical Guidebook has been recommended. The ICF team has provided ACRP with a proposed work plan, rough order of magnitude (ROM) budget, and suggested Guidebook outline to respond to the industry-wide and airport-specific needs which have been carefully articulated throughout this report. The decision for funding this second phase is currently pending.

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Appendix B: Case Study Summaries

This appendix provides an overview of case study interviews that were conducted with executives and directors of three airports.

I. Austin Bergstrom International Airport

Participants

- Shane Harbinson
- Ghizlane Badawi
- Vivian Martin

Protocol Questions

1. What is the most significant workforce challenges your airport is currently facing? For example, what major challenges do you have with regard to recruitment, retention, training, staffing the appropriate amount of workers, etc., and how is your airport working to address this challenge?
    - Airport infrastructure and resources cannot keep up with rapid growth
    - Difficult to align growth with staffing
    - Using various strategies to ensure there are enough staff to support operations

2. What types of initiatives or strategic planning does your airport have underway to prepare your workforce for new demands and industry changes your airport will face in the next few years?
    - Anticipate trends and begin restructuring now to meet future demands
    - Temporary employees are hired, trained, and evaluated before applying for permanent positions
        - Cuts down onboarding time
        - Ensures permanent employees are proper fit for the position and organization as a whole
    - Current employees who meet desired competencies receive training to conduct interviews, so they can sit on interview panels and identify candidates who also have the desired competencies
    - Conducted workshops to assess organizational culture and characteristics of high and low performers

3. Where do you see the greatest gaps in your workforce in terms of skill sets?
    - Technical jobs, such as Operations or Engineering, which require airport-specific skills

Mission Critical Occupations

4. What challenges have you experienced with each of the following occupations and how big of an issue is it for your airport? Are there any specific knowledge, skills, or abilities that are missing or particularly hard to find for these occupations? Additionally, where or how does your airport find qualified individuals to fill open positions for these occupations?
    - Engineering
        - Difficult to get someone with airport experience
        - Have to train employees in-house and send them to airport-specific conferences and workshops
        - Electrical and Mechanical Engineering positions are typically contracted out
        - Two in-house civil engineers handle all utilities

- Airport Operations
  - Limited skillset; must attract someone from another airport or train someone new
  - Most airports attract someone with skills, but we're training employees instead
  - Technical skills and knowledge of regulations, airport layouts, and airport policies and procedures are important to have but difficult to find
  - Pool of candidates for these positions currently work for ground handlers or airlines that have airfield jobs at the airport, or we attract talent from other airports
  - Hire temporary employees and have them complete a 6-month boot camp before they can apply for permanent positions
- Airport Development
  - For capital project, project team is typically integration of engineering firm, architecture firm, and builders, but must have someone with airport experience to lead and guide the team
  - Difficult to get project manager from City of Austin Public Works Department who has airport experience; typically top project managers are put on the most political projects
  - Important to have someone leading capital projects who has been through the process and is thinking long-term
  - We advertise and compete with other airports to hire these employees
  - Must attract someone from another airport or dedicate 2-3 year development plan
  - Important to have employees of varying experience, so entry-level employees will move up; they must be able to see career path and potential for success
- Project Planning
  - Have to have someone who knows works with properties and is familiar with airport planning and design
  - Must be able to read and analyze proposals to determine impacts on adjacent properties and tenants
  - Must be able to read and apply federal regulations
  - Applicant pool is limited, typically comes from engineering firm
  - Have to find staff who have necessary skillsets or have to attract employee from another airport or firm
- Information Technology
  - Retention is an issue
  - We will train employees, but then they find other opportunities in private sector in Austin
  - Would be helpful if we were able to attract employee from another airport who is familiar with asset management system; instead, we hired database manager and sent them to technical training
  - Must hire for attitude but train for skillset
  - Very hard for government entity to compete with private sector for IT jobs, especially in Austin or Silicon Valley
  - We have too much work and not enough people, but IT manager is having trouble finding people with enough experience
  - Difficult to find employees with knowledge of common use or shared use technology; we hire staff and send them to technical training to learn about the system
  - If we have to train someone, learning curve might take longer, but sometimes we want to implement technology today
  - Find qualified individuals from other IT environments, such as manufacturing

- Airport Security
  - Using temporary employees strategy; we hire and train them before putting them into permanent positions
  - Qualified individuals come from law enforcement, military, or security jobs with other industries and companies in Austin
  - We train them on airport-specific processes, regulations, and programs
- Financial Analysis and Planning
  - Depends on Planners and Engineering staff to break down each project that fits their financial cost centers
  - Hard to make edits or comment on objective, justification, or impact of project when filling out grant applications
  - Relationships with banks and market is critical
  - Accuracy is important; investors are trusting that information and forecasting is correct
  - Time management skills are important; previously terminated two employees who had trouble meeting deadlines

5. Can you identify and describe any emerging roles or functions that are needed or will be needed due to these or other trends in the aviation industry? What roles or jobs didn't exist 5 or 10 years ago but are critical today to your airport. Do you foresee any specific new jobs or roles that do not currently exist, but you expect the need to exist in the next 5-10 years?
   - Must focus on more employee development; leaders need to be able to develop employees and get them trained in different areas
   - Leadership needs development
   - Increase in roles related to technology, such as sharing economy and developments for applications we didn't have five years ago
   - Strategic planning roles that integrate strategic planning with risk management and quality management systems may exist in future; with limited funding and increased growth, need to assess our risks and develop strategies to mitigate them

New Technologies

6. Could you describe 1 or 2 specific technologies that are greatly impacting your airport? What impacts has it had on your workforce, including their ability to be productive, your ability to recruit, train, or keep qualified staff?
   - Uber, Lyft, and Hitch
     - How to collect revenue off this? How do you education general public on fair and reasonable charge? If you collect revenue, who maintains and defends the platform?
     - Have to have technology and financial component to pay for infrastructure
     - San Francisco developed application they're using on mobile devices to track these transactions
   - Food and beverage are moving toward technology platform
   - Need skillsets for collecting and analyzing business intelligence with technology to offer passengers what they need to generate non-airline revenue
   - With common use system we had to beef up staff and get contracts to support the staff
   - Baggage handling system has become very complex different vendors and agencies (TSA, airport, and airlines)

  - Requires SCADA analysis, which is a program logic controller
  - Rare skillset but is as important as any other position in airport
  - Must be able to bring new technology on mechanical system and have it work through programming and software
  - Currently have three employees who can do this (senior level, mid-level, and entry-level)

Financial Pressure/Increased Commercialization

7. Could you describe 1 or 2 examples of how your airport is feeling and has dealt with cost pressures and using more commercial practices? What has your airport done to be more financially self-sufficient or to diversify its revenues?
   - Use airport property to create non-airline revenue by creating partnerships with hotels, retail, and restaurants; make airport property a destination with access to surrounding neighborhoods
   - Pushing more revenue with advertising, such as dynamic signage and smartphones
   - Maximize existing facilities with technologies
   - Conduct passenger surveys and focus groups to learn what they need and offer those services, so they spend more time in airports
     - Reduce time spent in security, check-in, etc. so more time and money is spent in terminal
     - Offer different services, such ordering food or reserving parking prior to arriving at the airport
   - Airport is engaged and has a culture focused on passenger experience

8. Lastly, do you have any other thoughts you'd like to mention about workforce challenges, the future of the airport workforce, or other workforce needs which we have not yet discussed?
   - New municipal civil service rules make hiring a challenge
   - Would like to know what percent of airports' budgets go to workforce development

II. San Diego County Regional Airport Authority

Participant(s)

- Jeff Lindeman

Protocol Questions

1. What is the most significant workforce challenges your airport is currently facing? For example, what major challenges do you have with regard to recruitment, retention, training, staffing the appropriate amount of workers, etc., and how is your airport working to address this challenge?
   - Making sure we have access to the talent either internally or externally that can do what we need in the future.
   - Finding skills is confounded by people not thinking ahead. Challenge is getting organization to think about the future.

2. What types of initiatives or strategic planning does your airport have underway to prepare your workforce for new demands and industry changes your airport will face in the next few years? How does your airport work to build its talent pipeline for key jobs?
   - Anticipate trends and begin restructuring now to meet future demands
   - Strategic workforce planning
     - Sit down with unit leader and discuss what function will have to do in future and what skills will be needed

        - Review current skills and conduct gap analysis
        - Determine how to build capabilities of current staff and how many people need to be hired
        - Currently on track to have plan in place for 50% of our departments
    - Lot of internal development
        - Leading at All Levels (leadership training) – 100 employees applied, need supervisor's endorsement, build skills to meet a business-related goal
    - Undergraduate internship program
        - Redesigned recruitment page to attract younger employees
        - Graduates aren't hired right away, but program builds a pipeline of talent for the airport
        - Last I looked, at beginning of a cohort a small amount of interns know about careers at airport. Afterwards, 100% know about careers at airports and 75% are interested
        - Program is one summer long. 50% of time is spent in one department, and 50% is spent on learning about the enterprise and how functions work together. Other part is group project
        - Last year we had 1200 candidates for 12 intern positions. Nationwide recruitment
        - Departments are required to provide work plan for intern
    - Veteran program
        - 6-month assignments
        - We pay salary and benefits minus pension
        - Similar to internship but is for people transitioning or within a year from having transitioned from military
        - Provide civilian experience for resume
        - IT benefitted greatly from this

3. What are the most common sources your airport uses to identify new talent for airport jobs?
    - Both internal and external
    - After developing workforce plans, we develop action plans to determine what can be done to ensure function's existing staff retains relevant skills and capabilities, and identify how and when we can source that externally
    - Varies by department and is customized to the current state of that function, what they have to execute, and what their demographics are

4. Where do you see the greatest gaps in your workforce in terms of skill sets?
    - Infrastructure (engineering, construction) – great demand and competition
    - IT, specifically cybersecurity – tough, tight market
    - Finance professionals who are technically proficient and can demonstrate competence at leading (difficult to find both)

Mission Critical Occupations

5. What challenges have you experienced with each of the following occupations and how big of an issue is it for your airport? Are there any specific knowledge, skills, or abilities that are missing or particularly hard to find for these occupations? Additionally, where or how does your airport find qualified individuals to fill open positions for these occupations?
    - Engineering
        - Risk from retirements
        - Wages going up faster than general market; creates challenges on the wage structure and how we can compete

    - Pension reformat is challenge unique to CA – requires employees to pay half the cost of their pension plan, makes us uncompetitive in the market
    - Benefits package isn't designed around flexibility that market needs for us to attract diverse pool of candidates
    - Want to find employees committed to sustainability and with LEAD certification
    - Airport experience difficult to find
- Airport Operations
    - Revamped recruitment process few years ago
    - Difficult to attract people from other cities due to cost of living (e.g., candidate from Chicago turned down offer because of cost and compensation of relocating to San Diego)
    - Airport experience difficult to find
    - Most employees have narrow view of career; view themselves as functional professionals rather than airport professionals, which limits their value to organization
- Airport Development
    - Engineering is challenge
    - Lack of diversity in candidates, in terms of race and gender
- Information Technology
    - Cybersecurity – couldn't afford to hire externally, so we're training someone internally
    - Priced out of the market for external candidates
    - Demand is high but supply has not kept up
    - Airport experience difficult to find
- Electrician
    - Pool is narrowed by airport experience
    - Lead Electrician gave us advance notice of retirement so we were going to bring someone in to work with him, but pension system announced change that would be effective in 2 weeks so he left in 2 weeks
- Airport Security
    - TSA mandates cause stress among these employees
    - Airport experience difficult to find
- Financial Analysis and Planning
    - At analyst level, market is not producing quality candidates
    - Academia has not kept up with business needs; disconnect between supply
    - First we market nationally, then specifically for airport skillsets, then locally for other skillsets
    - Disconnect between organizations developing supply and what demand is
- Others
    - Risk management – moving toward holistic look at risk, enterprise-wide, currently undetermined what the availability of talent for this is

6. Can you identify and describe any emerging roles or functions that are needed or will be needed due to these or other trends in the aviation industry? What roles or jobs didn't exist 5 or 10 years ago but are critical today to your airport. Do you foresee any specific new jobs or roles that do not currently exist, but you expect the need to exist in the next 5-10 years?
    - Enterprise risk management
    - CEO articulated that if organization has the right financial business model and right human capital to execute that model, the organization will be successful, also make decisions today as if they matter tomorrow

- Increased focus on sustainability, need to make decisions today that make organization enduring

New Technologies

7. Could you describe 1 or 2 specific technologies that are greatly impacting your airport? What impacts has it had on your workforce, including their ability to be productive, your ability to recruit, train, or keep qualified staff?
    - Migrated to enterprise management system (ECMS)
        - One enterprise system that contains all content
        - Requires workforce to work differently
        - Learning curve for change readiness is a challenge
        - Departments implemented the system in waves with proficient users (first adopters) who completed training on ECMS
    - Cybersecurity
        - Need to build physical infrastructure and everyone in organization is attentive to social engineering, fishing
        - Make sure everyone is thinking security when working with technology
8. Are there other technology challenges you may not have yet experienced, but think are likely to cause workforce challenges in the future for airports?
    - Innovation lab
        - Converted a decommissioned terminal
        - Kept baggage claim and ticket counters to reflect a real terminal (mini airport)
        - Technology providers can test programs and collaborate with airport employees to build resiliency and change enthusiasm

Financial Pressure/Increased Commercialization

9. Could you describe 1 or 2 examples of how your airport is feeling and has dealt with cost pressures and using more commercial practices? What has your airport done to be more financially self-sufficient or to diversify its revenues?
    - Determined how to drive revenue through marketing and concessions
    - Innovation lab may become incubator for a business
    - Real estate development (660 acres in middle of downtown San Diego can make this a challenge)
10. Please describe an example of how your airport has experienced demographic changes in its workforce and its impacts on workforce processes, such as recruitment, retention, training, and development? This can include the impacts of impeding retirements, shifts to nontraditional or more diverse workers, or the impacts of the younger generations of workers.
    - It is still acceptable to discriminate against millennials (e.g., “that’s just how millennials work”); currently learning how to handle this
    - Diminishing to a millennial to be spoken of this way
11. Lastly, do you have any other thoughts you’d like to mention about workforce challenges, the future of the airport workforce, or other workforce needs which we have not yet discussed?
    - Biggest challenge is getting leaders to think about the future

III. Greenville-Spartanburg International Airport

Participant(s)

- Kevin Howell

Protocol Questions

1. What is the most significant workforce challenges your airport is currently facing? For example, what major challenges do you have with regard to recruitment, retention, training, staffing the appropriate amount of workers, etc., and how is your airport working to address this challenge?
    - Large amount of retirements
    - Currently trying to train and prepare younger staff with fewer years in the field to see who can step up into leadership and management roles; piecemeal approach

2. What types of initiatives or strategic planning does your airport have underway to prepare your workforce for new demands and industry changes your airport will face in the next few years? How does your airport work to build its talent pipeline for key jobs?
    - Through HR Director we're doing different management-specific training events quarterly
    - Pulling different groups of people together for training either onsite or third party
    - Trying to account for eminent retirements in supervisory/management positions

3. What are the most common sources your airport uses to identify new talent for airport jobs?
    - Both internal and external, depending on position and what we're looking for
    - Identify people locally in community for departments like maintenance and IT, types of department that are not airport specific
    - When in upper level positons, we look for airport-specific background
    - Recruit through organizations like ACI
    - Jobs like police and fire and local and go through airport-specific training

Mission Critical Occupations

4. What challenges have you experienced with each of the following occupations and how big of an issue is it for your airport? Are there any specific knowledge, skills, or abilities that are missing or particularly hard to find for these occupations? Additionally, where or how does your airport find qualified individuals to fill open positions for these occupations?
    - Airport Operations
        - High turnover
        - It's entry-level for someone out of college and looking to enter airport management field, but we're lucky if we get three years out of them
        - In small airport, less opportunity to move up so they may move to bigger airport for career progression
    - Airport Development
        - We're not getting sufficient exposure
        - Local market has people with real estate background, but not applicable to airports
        - Would like to recruit someone from another airport, but difficult because airport is small; bigger airport sometimes pick up our employees
    - Information Technology
        - Airport experience difficult to find

    - Important to have knowledge of shared tenant system environment, especially at director or management level
    - Lower jobs don't necessarily need airport experience
- Airport Security
    - Have had some turnover in lower age category
    - Young officers may be bored at airport; not like municipal or city police work
    - We pay competitively, but our officers don't get the city environment or take home car

5. Can you identify and describe any emerging roles or functions that are needed or will be needed due to these or other trends in the aviation industry? What roles or jobs didn't exist 5 or 10 years ago but are critical today to your airport. Do you foresee any specific new jobs or roles that do not currently exist, but you expect the need to exist in the next 5-10 years?
    - May start insourcing things like parking lot management, financially driven change
    - New employees will need stronger computer capability and knowledge base

New Technologies

6. Could you describe 1 or 2 specific technologies that are greatly impacting your airport? What impacts has it had on your workforce, including their ability to be productive, your ability to recruit, train, or keep qualified staff?
    - Shared tenant environment
        - Will driver larger IT staff
        - Challenge was getting airlines to let go of reigns
        - Airport maintains all equipment at gate counters now; airlines were hesitant to give up that control
        - Must have right amount of staff to maintain it

Financial Pressure/Increased Commercialization

7. Could you describe 1 or 2 examples of how your airport is feeling and has dealt with cost pressures and using more commercial practices? Where is the pressure coming from? What has your airport done to be more financially self-sufficient or to diversify its revenues? Finally, what more distal impacts do you foresee this having on the airport or its workforce?
    - Got more aggressive with land and property development
    - Later this year we're taking over FBO (fixed-base operator)
        - All buildings on airport property will revert to us and we'll rehire the majority of the current staff
        - Lines are getting blurred between FBOs and airports
    - Pressure has always been there
    - Currently have 40% operating margin, which has become gold standard for our airport
    - Advertising is done in-house to bring in more revenue to the airport
    - Increased land development
    - Need to be aware of staffing levels as airport grows

Appendix C: Location Quotients (LQs) for Mission Critical Occupations, by State

This appendix provides the location quotients (LQs) for each of the MCOs by state. The LQ for a state shows the concentration of an occupation in that state compared to the national concentration of that occupation. As such, an LQ greater than 1.0 means that the state has a concentration of employees within that occupation that is higher than the national average. On the other hand, when a state has an LQ that is less than 1.0, that state has a smaller concentration of occupational employment than the national average. In the tables in this appendix, when there is a blank cell in the occupation column for a state, there are no data available in that state for the specific occupation.

As a reminder, the following occupations are included within Airport Development and Airports Operations:

- Airport Development
  - 11-9141: Property, Real Estate, and Community Association Managers
  - 13-2021: Appraisers and Assessors of Real Estate
  - 17-1011: Architects
  - 41-9022: Real Estate Sales Agents
- Airport Operations
  - 15-2031: Operations Research Analysts
  - 43-5011: Cargo and Freight Agents
  - 53-1011: Aircraft Cargo Handling Supervisors
  - 53-2022: Airfield Operations Specialists
  - 53-7062: Laborers and Freight, Stock, and Material Movers, Hand

LQs for Mission Critical Occupations, by State									
	Airport Development				Airport Operations				
SOC # and Name	11-9141: Property, Real Estate, and Community Association Managers	13-2021: Appraisers and Assessors of Real Estate	17-2021: Architects	41-9022: Real Estate Sales Agents	15-2031: Operations Research Analysts	43-5011: Cargo and Freight Agents	53-1011: Aircraft Cargo Handling Supervisors	53-2022: Airfield Operations Specialists	53-7062: Laborers and Freight, Stock, and Material Movers, Hand
Alabama	0.22	0.91	0.79	0.54		0.55		0.59	1.13
Alaska	1.05	1.13	0.77	0.44	0.66	6.65	7.81	4.73	0.84
Arizona	1.52	1.07	1.04	1.10	1.86	0.28	1.12	0.85	0.80
Arkansas	1.09	1.44	0.72	0.73	0.57	0.73			1.21
California	1.40	0.70	1.03	0.78	1.11	1.32	1.11	0.62	1.07
Colorado	0.66	1.58	1.74	1.17	0.56	0.46	1.49	0.77	0.69
Connecticut	0.99	0.87	1.09	0.34	1.05	0.68	0.83		0.78
Delaware	0.74	0.74	0.58	1.47	2.02	0.44			0.97
District of Columbia	1.53	0.50	4.61	0.96	3.09	0.21			0.09
Florida	1.94	1.23	0.74	2.75	1.23	1.74	0.97	0.97	0.95
Georgia	1.22	1.35	0.71	1.70	0.79	1.10	1.14		1.45
Hawaii	3.59	1.11	1.16	0.43	0.60	1.37	2.75	2.66	0.68
Idaho	1.69	1.44	0.56	1.07	1.03	0.37		1.29	0.77
Illinois	0.86	0.85	1.18	0.85	1.51	1.66	1.67	0.22	1.51
Indiana	0.82	1.18	0.57	0.44	0.76	0.83	0.52	0.41	1.16

LQs for Mission Critical Occupations, by State									
	Airport Development				Airport Operations				
SOC # and Name	11-9141: Property, Real Estate, and Community Association Managers	13-2021: Appraisers and Assessors of Real Estate	17-2021: Architects	41-9022: Real Estate Sales Agents	15-2031: Operations Research Analysts	43-5011: Cargo and Freight Agents	53-1011: Aircraft Cargo Handling Supervisors	53-2022: Airfield Operations Specialists	53-7062: Laborers and Freight, Stock, and Material Movers, Hand
Iowa	0.83	1.11	0.61	0.59	0.46	0.64		0.58	1.04
Kansas	0.76	1.48	0.87	0.40	1.26	0.79		0.69	0.89
Kentucky	0.79	0.50	0.46	0.78	0.74	1.22		0.96	1.38
Louisiana	1.19	0.68	0.72	0.49	0.85	0.23	1.08	1.00	1.16
Maine	0.67	1.30	0.79	0.24	0.65	0.27			0.58
Maryland	0.94	0.94	1.26	1.00	1.88	0.26	1.02		0.82
Massachusetts	1.01	0.98	1.58	0.67	1.49	0.36	0.60	0.64	0.56
Michigan	0.91	1.11	0.64	0.57	0.72	0.69	1.21	1.84	0.91
Minnesota	1.14	1.58	0.90	0.54	1.06	0.89	0.41	1.34	0.70
Mississippi	0.95	1.04	0.36	0.78	0.31	0.49			1.26
Missouri	0.99	1.27	1.14	0.66	0.55	1.30	1.08	0.61	0.86
Montana	1.31	1.38	1.73	0.51	0.29	1.24			0.65
Nebraska	0.35	0.89	0.85	0.54	0.55	1.05	0.93		1.06
Nevada	2.19	1.15	0.46	1.19	0.27	1.47	1.51	0.96	1.01
New Hampshire	0.80	0.86	0.64	0.23	0.91	0.18			0.59
New Jersey	0.72	1.04	0.71	0.53	0.86	0.96	0.47	1.34	1.22
New Mexico	0.68	1.22	0.98	0.70	0.80	0.25			0.61
New York	0.53	0.92	1.91		0.92	1.09	0.53	0.68	0.63
North Carolina	0.55	0.77	0.74	1.02	0.67	0.91	0.30	0.59	1.07
North Dakota	0.60	0.59	0.63	0.89	0.44	0.54		3.12	1.01
Ohio	0.85	0.75	0.75	0.83	0.61	0.64	0.39	1.44	1.14
Oklahoma	1.33	0.87	0.66	1.69	0.78	0.16	2.20	1.85	0.99
Oregon	1.05	0.78	1.41	0.52	0.74	1.08	0.85	0.58	0.77
Pennsylvania	0.44	0.56	0.79	1.06	0.74	0.52		1.13	1.15
Rhode Island	1.15	0.62		0.53	1.29	0.43			0.70
South Carolina	0.78	1.19	0.76	1.64	0.70	0.93		0.60	1.29
South Dakota	1.55	1.64	0.40	0.61		1.21			0.96
Tennessee	1.21	0.85	0.48	0.47	0.98	1.45	2.40		1.82
Texas	0.93	1.03	1.08	1.21	0.97	1.52	0.97	1.37	0.96
Utah	1.33	1.38	0.80	1.64	0.83	0.66	1.46	1.82	0.74
Vermont	0.99	0.86	1.00	0.46	0.32	0.62		2.08	0.42
Virginia	0.58	0.80	1.10	1.71	2.34	0.82	0.73	1.53	0.74
Washington	0.93		1.53		1.17	1.10	1.47	1.83	0.89
West Virginia	0.73	1.74	0.24	0.21	0.29	0.08		0.84	0.97
Wisconsin	0.47	0.73	0.66	0.35	0.88	0.43	0.78	0.90	1.10

LQs for Mission Critical Occupations, by State									
	Airport Development				Airport Operations				
SOC # and Name	11-9141: Property, Real Estate, and Community Association Managers	13-2021: Appraisers and Assessors of Real Estate	17-2021: Architects	41-9022: Real Estate Sales Agents	15-2031: Operations Research Analysts	43-5011: Cargo and Freight Agents	53-1011: Aircraft Cargo Handling Supervisors	53-2022: Airfield Operations Specialists	53-7062: Laborers and Freight, Stock, and Material Movers, Hand
Wyoming	0.93	1.97	0.72	0.68		0.23			0.67

MCOs in the next table include Airport Security, Electricians, Engineering, and Financial Analysis and Planning. These include the following BLS occupations:

- Airport Security
  - 33-9032: Security Guards
  - 33-9093: Transportation Security Screeners
- Electricians
  - 47-2111: Electricians
- Engineering
  - 17-2051: Civil Engineers
  - 17-2071: Electrical Engineers
  - 17-2141: Mechanical Engineers
- Financial Analysis and Planning
  - 13-2011: Accountants and Auditors
  - 13-2031: Budget Analysts
  - 13-2051: Financial Analysts

LQs for Mission Critical Occupations, by State									
	Airport Security		Electricians	Engineering			Financial Analysis & Planning		
SOC # and Name	33-9032: Security Guards	33-9093: Transportation Security Screeners	47-2111: Electricians	17-2051: Civil Engineers	17-2071: Electrical Engineers	17-2141: Mechanical Engineers	13-2011: Accountants and Auditors	13-2031: Budget Analysts	13-2051: Financial Analysts
Alabama	0.88	0.46	1.16	0.91	2.16	0.88	0.86	1.47	0.36
Alaska	0.76	3.37	1.67	1.84	1.07	0.74	0.83	2.08	0.44
Arizona	1.11	1.39	1.23	1.11	1.12	0.77	0.85	0.91	
Arkansas	0.61	0.49	1.03	0.53	0.56	0.55	0.57	0.95	0.37
California	1.23	1.01	0.79	1.29	1.21	0.79	1.09	1.28	1.08
Colorado	0.73	1.33	1.40	1.51	1.21	1.31	1.53	0.97	0.77
Connecticut	0.89	0.48	0.88	1.15	0.94	1.83	1.04	1.53	2.03
Delaware	1.10		1.17	1.07	0.84	0.84	1.26	0.74	3.31
District of Columbia	2.37		0.33	0.80	0.43	0.50	1.78	6.69	3.08
Florida	1.33	2.14	0.94	0.85	0.64	0.35	1.08	0.76	0.65
Georgia	0.90	1.03	0.96	0.78	0.80	0.62	1.03	0.97	0.85
Hawaii	2.01	6.81	1.16	1.56	1.04	0.48	0.86	1.12	0.23
Idaho	0.49	0.89	1.16	1.07	1.56	0.87	0.63	0.68	0.26
Illinois	1.08		0.94	0.88	0.65	1.02	0.94	0.60	1.09

LQs for Mission Critical Occupations, by State									
	Airport Security		Electricians	Engineering			Financial Analysis & Planning		
SOC # and Name	33-9032: Security Guards	33-9093: Transportation Security Screeners	47-2111: Electricians	17-2051: Civil Engineers	17-2071: Electrical Engineers	17-2141: Mechanical Engineers	13-2011: Accountants and Auditors	13-2031: Budget Analysts	13-2051: Financial Analysts
Indiana	0.80	0.37	1.31	0.49	0.91	1.78	0.80	0.38	0.48
Iowa	0.51	0.36	1.18	0.67	0.66	0.92	0.73	0.42	0.75
Kansas	0.55	0.37	0.97	0.58	0.93	0.82	0.95		0.50
Kentucky	0.72	0.63	0.99	0.70	0.63	0.77	0.70	1.57	0.34
Louisiana	1.07	0.77	1.54	1.04	0.66	0.69	0.71	0.55	0.19
Maine	0.42	0.77	0.90	0.90	0.66	0.66	0.84	0.71	0.30
Maryland	1.45	0.77	1.12	1.44	1.37	1.00	1.15	2.14	1.19
Massachusetts	0.79	1.03	1.03	0.96	1.78	1.40	1.24	1.27	2.58
Michigan	0.74	0.65	1.03	0.73	1.63	4.74	0.75	1.09	0.75
Minnesota	0.50	0.83	0.91	0.72	0.97	1.23	1.02		1.13
Mississippi	1.16	0.56	1.33	0.79	0.53	0.40	0.54	0.84	0.28
Missouri	0.75	0.58	0.90	0.70	1.03	0.67	0.98	0.99	0.67
Montana	0.55		1.28	1.56	0.83	0.39	0.78	1.17	0.15
Nebraska	0.59	0.70	1.12	0.71	0.59	0.52	1.04	0.68	0.86
Nevada	2.15	2.94	0.94	0.78	0.29	0.23	0.73	0.60	0.41
New Hampshire	0.51	0.80	0.82	0.89	1.37	1.33	0.80	0.51	
New Jersey	1.20	1.05	0.77	0.91	0.88	0.81	1.06	1.19	1.15
New Mexico	1.01	0.69	1.05	0.69	1.24	0.67	0.95	1.95	0.33
New York	1.50		1.00	0.79	0.98	0.58	1.26	0.78	2.18
North Carolina	0.83		0.83	0.87	0.94	0.70	0.85	0.58	0.97
North Dakota	0.48	1.16	2.25	1.22	0.62	0.57	0.93	0.56	0.32
Ohio	0.75		0.98	0.74	0.72	1.17	0.82	0.63	0.97
Oklahoma	0.87	0.72	0.91	0.82	0.61	0.78	1.06	1.29	0.39
Oregon	0.53	1.03	1.12	1.32	0.69	0.79	0.75	1.08	0.66
Pennsylvania	0.96	0.70	0.93	1.15	0.90	0.93	1.09	0.83	1.06
Rhode Island	0.74		1.03	0.75	0.59	1.08	1.00	2.21	1.45
South Carolina	0.93	0.59	0.87	1.43	0.77	1.51	0.84	0.85	0.34
South Dakota	0.41	0.49	1.03	1.33	0.52	0.58	1.14	0.66	0.69
Tennessee	1.00		0.82	0.98	0.74	0.74	0.77	0.53	0.51
Texas	0.99	0.98	1.07	1.08	1.02	0.90	1.08	0.92	1.00
Utah	0.49	1.13	1.23	1.29	0.97	1.37	0.87	0.73	0.67
Vermont	0.52	0.91	0.88	0.99	1.55	0.86	1.05	0.62	0.39
Virginia	1.11	1.46	1.09	1.13	1.44	1.12	1.23	2.26	1.18
Washington	0.77	1.17	1.06	2.01	1.52	1.11	0.98	1.39	
West Virginia	1.05	0.38	1.60	0.94	0.54	0.25	0.72	0.63	0.22
Wisconsin	0.48	0.51	0.94	0.84	1.19	1.52	0.79	0.51	0.79

LQs for Mission Critical Occupations, by State									
	Airport Security		Electricians	Engineering			Financial Analysis & Planning		
SOC # and Name	33-9032: Security Guards	33-9093: Transportation Security Screeners	47-2111: Electricians	17-2051: Civil Engineers	17-2071: Electrical Engineers	17-2141: Mechanical Engineers	13-2011: Accountants and Auditors	13-2031: Budget Analysts	13-2051: Financial Analysts
Wyoming	0.48		2.20	1.63	0.93	0.46	0.72	0.77	0.23

The Airport IT MCO includes multiple BLS Occupations. These are as follows:

- Information Technology (IT)
  - 15-1111: Computer and Information Research Scientists
  - 15-1121: Computer Systems Analysts
  - 15-1122: Information Security Analysts
  - 15-1131: Computer Programmers
  - 15-1132: Software Developers, Applications
  - 15-1133: Software Developers, Systems Software
  - 15-1134: Web Developers
  - 15-1141: Database Administrators
  - 15-1142: Network and Computer Systems Administrators
  - 15-1143: Computer Network Architects
  - 15-1151: Computer User Support Specialists
  - 15-1152: Computer Network Support Specialists
  - 15-1199: Computer Occupations, All Other

LQs for Mission Critical Occupations, by State									
	Information Technology (IT)								
SOC # and Name	15-1111: Computer and Information Research Scientists	15-1121: Computer Systems Analysts	15-1122: Information Security Analysts	15-1131: Computer Programmers	15-1132: Software Developers, Applications	15-1133: Software Developers, Systems Software	15-1134: Web Developers	15-1141: Database Admin-istrators	15-1142: Network and Computer Systems Admin-istrators
Alabama	1.13	0.84	1.15	1.34	0.41	0.86	0.39	1.03	0.91
Alaska	0.98	0.25	0.28	0.80	0.15	0.18	0.32	0.64	1.39
Arizona	0.34	1.37	1.44	0.79	1.02	1.16	1.10	1.53	0.99
Arkansas		0.58	2.09	1.27	0.35	0.32	0.48	1.06	0.84
California	2.21	1.15	0.86	1.12	1.39	1.93	1.40	0.87	1.03
Colorado	0.40	1.05	1.05	0.79	1.89	1.67	1.37	1.27	1.61
Connecticut	1.25	1.20	0.79	1.05	0.98	0.91	0.90	1.07	0.82
Delaware	1.15	1.90	0.94	1.28	1.16		1.02	1.29	0.96
District of Columbia	4.57	1.10	1.72	0.97	0.96	1.25	2.06	1.72	1.85
Florida	0.35	0.66	0.83	0.83	0.71	0.51	1.10	1.06	0.71
Georgia	0.82	1.12	0.95	1.23	1.01	1.06	0.83	1.55	0.97
Hawaii	0.78	0.46	0.56	0.36	0.32	0.37	0.62	0.37	0.78
Idaho		0.43	0.92	0.49	0.55		1.39	0.60	0.98
Illinois	0.69	1.02	0.84	1.50	0.97	0.68	0.80	0.91	0.94

LQs for Mission Critical Occupations, by State									
	Information Technology (IT)								
SOC # and Name	15-1111: Computer and Information Research Scientists	15-1121: Computer Systems Analysts	15-1122: Information Security Analysts	15-1131: Computer Programmers	15-1132: Software Developers, Applications	15-1133: Software Developers, Systems Software	15-1134: Web Developers	15-1141: Database Admin-istrators	15-1142: Network and Computer Systems Admin-istrators
Indiana		0.66	0.45	0.69	0.56	0.39	0.74	0.70	0.87
Iowa		0.91	0.44	0.49	0.98	0.50	0.64	0.81	0.94
Kansas	0.42	0.63	0.67	0.88	0.52	0.72	0.77	0.82	1.37
Kentucky		0.46	0.50	0.29	0.60	0.35	0.55	0.89	0.70
Louisiana	0.13	0.27	0.60	0.47	0.12	0.18	0.38	0.30	0.61
Maine		0.64	0.45	0.61	0.48	0.21	0.71	0.65	0.85
Maryland	5.95	1.34	1.99	1.03	1.00	2.01	1.73	1.63	1.75
Massachusetts	1.37	1.22	1.33	1.14	1.59	2.86	1.33	1.35	1.08
Michigan	0.48	0.85	0.76	0.64	0.72	1.04	0.59	0.80	0.87
Minnesota	0.87	1.28	1.05	1.15	0.86	1.16	1.28	1.10	1.16
Mississippi	1.10	0.35	0.52	0.38	0.14	0.19	0.31	0.35	0.41
Missouri	0.27	1.05	1.34	1.32	0.88	0.40	0.64	1.19	1.11
Montana		0.37	0.63	0.84	0.29	0.45	1.33	0.59	0.49
Nebraska		0.82	1.02	1.48	0.92	0.61	1.14	1.18	1.24
Nevada		0.40	0.40	0.53	0.43	0.23	0.63	0.58	0.50
New Hampshire	2.46	0.87	0.59	1.14	1.35	0.77	1.40	0.95	1.07
New Jersey	1.40	0.97	0.90	1.89	1.90	0.88	0.68	0.99	0.93
New Mexico	3.40	0.34	1.22	0.78	0.31	0.73	0.49	0.71	0.82
New York	0.55	0.98	0.91	1.02	0.98	0.65	1.14	0.91	0.97
North Carolina	0.42	1.06	1.27	0.82	1.03	0.92	0.79	0.79	0.94
North Dakota		0.31	0.50	0.26	0.55	0.40	0.55	0.42	0.41
Ohio	0.20	1.31	0.66	0.56	1.01	0.36	0.90	0.95	0.96
Oklahoma	0.61	0.46	0.59	0.64	0.50	0.40	0.50	0.59	0.59
Oregon	0.86	0.71	0.38	0.76	0.86	0.98	1.91	0.78	0.82
Pennsylvania	0.28	1.05	0.73	1.13	0.74	0.64	0.77	1.16	0.95
Rhode Island	4.52	0.91	0.67	1.10	0.66	1.37	0.83	1.12	1.34
South Carolina	0.83	0.77	0.92	0.84	0.33	0.40	0.50	0.68	0.79
South Dakota		0.33	0.60	0.59	0.40	0.20	0.74	0.34	1.47
Tennessee	0.66	0.84	0.62	0.62	0.34	0.33	0.56	0.60	0.71
Texas	0.49	1.18	0.93	0.92	0.80	1.20	0.95	1.18	1.11
Utah	2.97	0.73	0.60	1.42	1.19	0.87	1.74	0.84	0.99
Vermont		0.30	0.60	0.50	0.54	0.62	1.76	1.10	1.89
Virginia	2.67	1.90	4.75	1.08	1.99	2.55	1.38	1.80	2.00
Washington	1.84	1.40	1.16	2.11	3.32	1.19	1.85	0.93	0.94
West Virginia	0.29	0.23	0.36	0.33	0.16	0.66	0.41	0.77	0.46

LQs for Mission Critical Occupations, by State									
	Information Technology (IT)								
SOC # and Name	15-1111: Computer and Information Research Scientists	15-1121: Computer Systems Analysts	15-1122: Information Security Analysts	15-1131: Computer Programmers	15-1132: Software Developers, Applications	15-1133: Software Developers, Systems Software	15-1134: Web Developers	15-1141: Database Admin-istrators	15-1142: Network and Computer Systems Admin-istrators
Wisconsin		1.15	0.89	1.18	0.75	0.37	0.85	0.84	0.98
Wyoming		0.26		0.32	0.22		0.50	0.68	0.62

Finally, Project Planning comprises the following occupations:

- Project Planning
  - 13-1051: Cost Estimators
  - 19-3051: Urban and Regional Planners

LQs for Mission Critical Occupations, by State						
	Information Technology (IT) – cont.				Project Planning	
SOC # and Name	15-1143: Computer Network Architects	15-1151: Computer User Support Specialists	15-1152: Computer Network Support Specialists	15-1199: Computer Occupations, All Other	13-1051: Cost Estimators	19-3051: Urban and Regional Planners
Alabama	0.39	0.78	0.51	0.55	0.72	0.69
Alaska	0.18	0.70	0.83	0.96	0.63	2.11
Arizona	1.29	1.27	1.60	0.60	1.14	1.23
Arkansas	1.10	0.72	0.58	0.28	0.58	0.37
California	0.89	0.99	1.01	0.92	1.10	1.85
Colorado	1.71	1.34	1.28	2.08	1.44	1.30
Connecticut	0.66	1.15	0.64	0.58	0.91	0.74
Delaware	1.34	0.71	0.88	0.26	1.81	1.90
District of Columbia	1.63	1.61	1.21	10.23	0.49	0.72
Florida	1.99	0.88	0.90	0.50	1.12	0.95
Georgia	1.10	1.20	1.28	0.84	0.81	0.48
Hawaii	0.32	0.46	0.65	1.43	0.95	2.53
Idaho	0.51	0.86		0.69	1.06	1.54
Illinois	0.78	0.91	0.87	1.89	0.80	0.43
Indiana	0.73	0.66	0.44	0.57	1.03	0.71
Iowa	0.59	0.51	1.21	0.48	0.90	0.58
Kansas	0.85	1.20	0.42	0.71	0.99	1.04
Kentucky	0.77	0.70	0.72	0.93	0.63	0.62
Louisiana	0.17	0.44	0.62	0.86	0.88	0.16
Maine	0.71	0.77	1.00	0.53	0.75	0.77
Maryland	2.05	1.12	2.19	3.35	1.30	1.41
Massachusetts	1.27	1.19	0.82	0.90	1.05	1.48
Michigan	0.50	1.23	1.00	1.11	1.05	0.66

LQs for Mission Critical Occupations, by State						
	Information Technology (IT) – cont.				Project Planning	
SOC # and Name	15-1143: Computer Network Architects	15-1151: Computer User Support Specialists	15-1152: Computer Network Support Specialists	15-1199: Computer Occupations, All Other	13-1051: Cost Estimators	19-3051: Urban and Regional Planners
Minnesota	1.69	1.14	0.94	2.13	0.96	1.43
Mississippi	0.68	0.48		0.37	0.55	0.49
Missouri	1.19	1.22	1.11	0.82	1.23	0.54
Montana	0.42	0.94	0.64	0.97	1.38	2.15
Nebraska	0.95	0.95	0.78	0.50	0.92	0.89
Nevada	0.36	0.41	0.51	1.47	1.00	0.61
New Hampshire	0.53	0.93	0.62	0.71	0.72	1.17
New Jersey	1.38	0.89	0.91	1.57	0.76	0.43
New Mexico	0.49	0.88	1.07	0.83	0.64	1.72
New York	0.74	0.99	0.78	0.29	0.73	0.61
North Carolina	0.95	1.15	1.22	0.56	0.90	1.07
North Dakota	0.34	0.85	0.63	0.79	0.90	0.76
Ohio	0.85	0.75	1.28	0.82	1.26	0.44
Oklahoma	0.39	1.07	0.62	0.85	0.71	0.39
Oregon	0.67	1.09	0.79	2.06	1.40	2.08
Pennsylvania	0.62	1.08	0.74	0.78	1.13	1.12
Rhode Island	0.63	0.86	1.42	1.10	0.65	1.26
South Carolina	0.62	0.83	0.84	0.53	0.89	0.67
South Dakota	0.41	0.78	1.44	0.26	0.83	1.63
Tennessee	0.47	0.70	0.81	0.52	0.80	0.51
Texas	0.96	1.25	1.37	0.79	0.93	0.60
Utah	0.56	1.29	0.94	1.12	1.17	1.46
Vermont	0.55	1.02	0.82	0.37	0.88	2.94
Virginia	2.37	1.35	1.49	1.87	1.50	1.31
Washington	1.62	1.15	1.00	1.00	1.24	2.84
West Virginia	0.43	0.55	0.74	1.89	0.53	0.72
Wisconsin	0.91	0.83	1.21	0.43	1.22	0.83
Wyoming		0.44	0.65	0.41	0.69	1.14

Appendix D: Airport Training and Education Program Information

Accredited Airport Executive Program	AAAE	Certificate/Credential

The AAAE Accredited Airport Executive (A.A.E.) Program is a self-study program to develop executive-level airport professionals by granting the A.A.E. designation to those who have demonstrated the ability to handle the responsibilities of airport management. This program requires affiliate membership in AAAE and experience working in a public airport. Program courses cover finance and administration; construction and environmental planning; airport operations, security and maintenance; and communications and community relations. Candidates are not required to take the courses, and may complete the course requirements at their own pace.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
1	1	1	1	1	0	0	1

Capacity

Annual Enrollment: 105

Participating airports: 8

Degrees/Certs per year: 32

Growth Rate: N/A (stable)

Max 1 year growth: 50-100%

Max 5 year growth: 50-100%

Quality

Accreditation: None

Completion rate: 67%

Evaluation sources: Feedback from candidates, input from industry professionals, two Board evaluations per year

Exposure to industry experts: Frequent interaction with esteemed aviation executives, instructors have extensive aviation backgrounds, seasoned industry professionals as guests and peers

Min Quals (faculty): Varies by course; Board member (season airport executive), other course requires instructor to be current aviation professor with airport experience and relevant certifications

Faculty w/airport experience: 100%

Hands on experiences: N/A

Best practices: Instructor for primary course must have background in adult learning and be an industry expert, use of various media techniques, 89% exam pass rate with course (vs. 42% pass rate without course), some employers require or prefer A.A.E. designation, and monetary and other incentives offered for earning A.A.E.

Talent Pipeline and Selection

Min Quals (students): Active Affiliate membership in AAAE, 4-year college degree (or 8 years public airport management experience), 21+ years old, and 1 consecutive year of public airport management experience

Acceptance rate: 96%

Enrollment rate: 96%

General barriers: Cost, employer support, lack of airport experience, time to complete the certification

Occupations specific barriers: Few to no participants in technical, law, marketing/PR, or admin positions

Cost/ROI

Avg cost per course: Two courses, $1895 and $295

Avg cost per diploma/cert: Varies by course; $580 without courses

ROI Indicators: 33.5% of those with accreditation are CEOs/Directors

Certified Member Program	AAAE	Certificate/Credential

The Certified Member (C.M.) Program is a self-study program similar to the Accredited Airport Executive Program for employees who have under three years of airport experience or do not wish to pursue full accreditation with AAAE. Course material covers finance and administration; construction and environmental planning; airport operations, security and maintenance; and communications and community relations. Though the course is available, students are not required to take it. Candidates may study for and complete the multiple-choice exam at their own pace.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
1	1	1	1	1	0	0	1

Capacity

Annual Enrollment: 400

Participating airports: 8

Degrees/Certs per year: 161

Growth Rate: 30% (5 years)

Max 1 year growth: 25-100%

Max 5 year growth: 25-100%

Quality

Accreditation: None

Completion rate: 20%

Evaluation sources: Feedback from candidates, feedback from industry experts, Board evaluation, and comparisons to other similar programs/exams

Exposure to industry experts: Instructor is industry expert and experienced airport professionals as guests and as peers in the course

Min Quals (faculty): Current professor and industry expert with has airport management experience

Faculty w/airport experience: 100%

Hands on experiences: None

Best practices: Expertise of instructor in aviation and adult learning, instructor is author of study materials and exam, 89% exam pass rate with course (vs. 42% pass rate without course), and some employers require or prefer C.M. certification/designation

Talent Pipeline and Selection

Min Quals (students): Membership in AAAE at Academic graduate level or above

Acceptance rate: 96%

Enrollment rate: 96%

General barriers: Cost, time, portraying the certification as useful in the industry, employer support

Occupations specific barriers: Employees in technical or trade occupations, police/fire/security officials, and entry-level workers don't see a need, perception that certification is for executive-level airport professional

Cost

Avg cost per course: $1895

Avg cost per diploma/cert: Varies depending on course; $535 without course

Airport Safety and Operations Specialists (ASOS) School	AAAE	Certificate/Credential

ASOS is an instructor-led training for Airport/Airfield Operations and Maintenance Departments personnel, taught by airport industry professionals. The Basic ASOS School is designed for individuals new to airport operations, while the Advanced ASOS School is designed for individuals who have attended Basic ASOS School or have at least three years of airport operations experience. Courses are typically 3 days long and cover 8 topics, including 14 CFR Part 139 Requirements, Records, and ARFF among others.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	0	0	0	0	0	2

Capacity

Annual Enrollment: 390

Participating airports: 33

Degrees/Certs per year: 390

Growth Rate: 30%

Max 1 year growth: 100%

Max 5 year growth: 100%

Quality

Accreditation: N/A

Completion rate: 100%

Evaluation sources: Participant surveys

Exposure to industry experts: 100%. 1) Jeff Price, Aviation Professor, Author; 2) Dr. Daniel Prather, Aviation Professor, Author

Min Quals (faculty): Must have ten or more years of experience in the subject matter; Must possess prior public speaking and presentation experience.

Faculty w/airport experience: 95%

Hands on experiences: An Airport tour is part of most courses

Best practices: Changing and updating content in unison with industry changes; candidates work on case studies of real world problems.

Talent Pipeline and Selection

Min Quals (students): N/A

Acceptance rate: 100%

Enrollment rate: 100%

General barriers: Program awareness

Occupations specific barriers: None

Cost/ROI

Avg cost per course: $495

Avg cost per diploma/cert: $495

ROI Indicators: Courses and certifications have been prerequisites for some companies, and candidates possessing our accreditations have expressed an increase in employment marketability.

Onsite Training	AAAE	Certificate/Credential

AAAE offers onsite training programs at customer airports covering all aspects of airport management, operations, and administration. The programs are customized to fit each airport's needs and are taught by experienced aviation management professionals, including airport directors and aviation consultants.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	5	1	0	0	1	7

Capacity

Annual Enrollment: 1200

Participating airports: 33

Degrees/Certs per year: 1020

Growth Rate: 30%

Max 1 year growth: 100%

Max 5 year growth: 100%

Quality

Accreditation: N/A

Completion rate: 100%

Evaluation sources: Participant surveys

Exposure to industry experts: 100%. 1) Jeff Price, Aviation Professor, Author; 2) Capt. LaPonda Fitchpatrick (Ret.), Former captain of Los Angeles Airport Police Department; 3) Dr. Daniel Prather, Aviation Professor, Author

Min Quals (faculty): Must have ten or more years of experience in the subject matter; Must possess prior public speaking and presentation experience.

Faculty w/airport experience: 95%

Hands on experiences: An Airport tour is part of most courses

Best practices: Changing and updating content in unison with industry changes; candidates work on case studies of real world problems.

Talent Pipeline and Selection

Min Quals (students): N/A

Acceptance rate: 100%

Enrollment rate: 100%

General barriers: Program awareness

Occupations specific barriers: None

Cost/ROI

Avg cost per course: $495

Avg cost per diploma/cert: $495

ROI Indicators: Courses and certifications have been prerequisites for some companies, and candidates possessing our accreditations have expressed an increase in employment marketability.

Airport Certified Employee (ACE)	AAAE	Certificate/Credential

The ACE program offers specialized training for full-time employees (including: public-use, military personnel, and others involved in the industry) that provides certification in five disciplines: Airfield Operations, Airfield Lighting Maintenance, Airport Security, Airport Communications, and Airport Trusted Agent. This program can also provide college credits toward an Associates or Bachelor's degree offered by the University of Phoenix.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	0	1	0	0	1	2

Capacity		
Annual Enrollment: 1200	**Participating airports**: 33	**Degrees/Certs per year**: 1020
Growth Rate: 30%	**Max 1 year growth**: 100%	**Max 5 year growth**: 100%
Quality		
Accreditation: N/A	**Completion rate**: 85%	**Evaluation sources**: Participant surveys and pass/fail rates
Exposure to industry experts: 100%. 1) Jeff Price, Aviation Professor, Author; 2) Capt. LaPonda Fitchpatrick (Ret.), Former captain of Los Angeles Airport Police Department; 3) Dr. Daniel Prather, Aviation Professor, Author	**Min Quals (faculty)**: Must have ten or more years of experience in the subject matter; Must possess prior public speaking and presentation experience.	**Faculty w/airport experience**: 95%
Hands on experiences: An Airport tour is part of most courses	**Best practices**: Changing and updating content in unison with industry changes; candidates work on case studies of real world problems.	
Talent Pipeline and Selection		
Min Quals (students): N/A	**Acceptance rate**: 100%	**Enrollment rate**: 100%
General barriers: Program awareness	**Occupations specific barriers**: None	
Cost/ROI		
Avg cost per course: $490	**Avg cost per diploma/cert**: $490	**ROI Indicators**: Our courses and certifications have been prerequisites for some companies, and candidates possessing our accreditations have expressed an increase in employment marketability.

Interactive Employee Training (IET)	AAAE	N/A

IET is a computer-based series of COTS training programs designed to provide onsite training to airport staff. It is available 24/7 and can be customized or enhanced with custom-created digital video from the specific airport where the program will be installed. The scenario-based training content tests application as well as knowledge and works on multiple platforms (e.g., mobile). The programs also contain a Training Data System, which writes scoring back to a central server.

Airport Focus: 95% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	13	0	0	0	0	12

Capacity

Annual Enrollment: 197,436 users

Participating airports: 109

Degrees/Certs per year: N/A

Growth Rate: 12,000 users

Max 1 year growth: Infinite

Max 5 year growth: Infinite

Quality

Accreditation: No

Completion rate: N/A

Evaluation sources: IET User's Group Forum, User surveys, Student response data analysis, course pass percentages

Exposure to industry experts: N/A

Min Quals (faculty): N/A

Faculty w/airport experience: N/A

Hands on experiences: N/A

Best practices: AAAE regulatory team works closely with government agencies on new and changing policies and keeps the IET content team abreast of any changes that may affect training content. This allows for quick and proactive deployment of updated content.

Talent Pipeline and Selection

Min Quals (students): N/A

Acceptance rate: N/A

Enrollment rate: N/A

General barriers: N/A

Occupations specific barriers: N/A

Cost

Avg cost per course: N/A

Avg cost per diploma/cert: N/A

ANTN Digicast	AAAE	Certificate

The ANTN Digicast is a collection of web-accessible digital videos covering current events, regulations, technologies, and management and operation strategies relevant to the airport industry. Materials cover multiple aspects of airport training, including: Part 139 elements, security topics, airfield safety and maintenance, customer service, etc.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	1	48	0	0	0	1	85

Capacity

Annual Enrollment: 16,000

Participating airports: 216

Degrees/Certs per year: 279

Growth Rate: 20 new airports in 2016

Max 1 year growth: 100%

Max 5 year growth: 100%

Quality

Accreditation: No

Completion rate: N/A

Evaluation sources: All videos are produced directly from FAA regulations and industry experts.

Exposure to industry experts: Videos of conferences with industry experts are available to Digicast subscribers.

Min Quals (faculty): Faculty have been producing training videos for airports for over 20 years.

Faculty w/airport experience: 3

Hands on experiences: N/A

Best practices: Videos provide accurate content and the ability for subscribers to view videos on mobile devices, for flexible training.

Talent Pipeline and Selection

Min Quals (students): N/A

Acceptance rate: N/A

Enrollment rate: 4,000

General barriers: Training cost, due to limit airport training budgets.

Occupations specific barriers: Limited content for jobs in the administrative field.

Cost/ROI

Avg cost per course: N/A

Avg cost per diploma/cert: N/A

ROI Indicators: AAAE alumni can receive CEU credits for watching videos and taking tests.

Airport Executive Leadership Program	ACI	Certificate/Credential

This programme focuses on further developing the leadership and strategic management skills of airport industry leaders. It provides participants with advice on strategies to effectively handle leadership responsibilities; provides global, regional and cultural perspectives on airport management; and discusses new professional opportunities. Participants will also be able to access a global forum to network with peers and other future leaders. Successful participants are awarded an ACI/JMSB-Concordia University Diploma; others will receive a certificate of attendance. This course can also be taken as an Airport Management Professional Accreditation Programme (AMPAP) elective course.

Airport Focus: 30% focus on airport leadership, 70% focus on general leadership

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	0	0	0	0	0	0

Capacity

Annual Enrollment: 24

Participating airports: 14

Degrees/Certs per year: 24

Growth Rate: 10%

Max 1 year growth: 10%

Max 5 year growth: 50-100%

Quality

Accreditation: Concordia University John Molson School of Business

Completion rate: 99%

Evaluation sources: Course exercises, individual and group assignments, course survey and faculty feedback

Exposure to industry experts: 100%

Min Quals (faculty): Business school PhD's, airport CEOs

Faculty w/airport experience: 40%

Hands on experiences: 3 assignments (2 in a multicultural group and 1 individual) related to innovation for airports, change management assignment for their airport and a paper on the outlook for aviation to 2040

Best practices: Training needs assessments evaluated by World Governing Board made up of 28 airport CEO's, and continual updates based on changes in the airport industry

Talent Pipeline and Selection

Min Quals (students): Must be sponsored by CEO, and hold a Director or above position within the airport; Must have previous airport management experience

Acceptance rate: 90%

Enrollment rate: 100%

General barriers: Cost and location of course

Occupations specific barriers: None

Cost

Avg cost per course: $6,200

Avg cost per diploma/cert: $6,200

Airport Operations Diploma Program	ACI	Certificate/Credential

The Airport Operations Diploma Programme is designed to expose participants to all the facets of activities associated with an airport from airside operations and landside to terminal operations, and equip them with key knowledge and tools necessary to proactively address the essential operational and business needs of 21st century airports. Completion results in the ACI Airport Operations Diploma.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	0	0	0	0	0	1

Capacity		
Annual Enrollment: 107	Participating airports: 100+	Degrees/Certs per year: 108
Growth Rate: 59%	Max 1 year growth: Unlimited	Max 5 year growth: Unlimited
Quality		
Accreditation: ACI	Completion rate: 95%	Evaluation sources: Student evaluations
Exposure to industry experts: Only through completing the course	Min Quals (faculty): Recognized experts in their field	Faculty w/airport experience: 100%
Hands on experiences: None	Best practices: Online course	
Talent Pipeline and Selection		
Min Quals (students): None	Acceptance rate: 100%	Enrollment rate: 100%
General barriers: Knowledge and awareness of the program in the industry (new program)	Occupations specific barriers: None	
Cost		
Avg cost per course: $1,795	Avg cost per diploma/cert: $1,795	

Online Learning Centre	ACI	Certificate/Credential

The Online Learning Centre (OLC) was established by Airports Council International to provide online training services to the global airport industry. ACI specializes in providing a broad range of industry standard online training courses designed to help airports deliver high quality training through a fully managed e-learning solution quickly, easily and cost effectively. Both certificate and non-certificate courses are available.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	1	0	1	1	0	0	6

Capacity

Annual Enrollment: 1017

Participating airports: 250

Degrees/Certs per year: 1017

Growth Rate: 20%

Max 1 year growth: Unlimited

Max 5 year growth: Unlimited

Quality

Accreditation: ACI

Completion rate: 90%+

Evaluation sources: User ratings

Exposure to industry experts: All instructors and authors are experts in their given field

Min Quals (faculty): None

Faculty w/airport experience: 50%

Hands on experiences: None

Best practices: Business Process Automation via online training and e-Learning

Talent Pipeline and Selection

Min Quals (students): None

Acceptance rate: 100%

Enrollment rate: 100%

General barriers: Industry knowledge and awareness of the availability of these services

Occupations specific barriers: None

Cost

Avg cost per course: $50-$95

Avg cost per diploma/cert: $1,795 for Diploma Program; $295-$695 for Certificate Programs

ACI Professional Certificate Courses	ACI	Certificate/Credential

ACI Professional Certificate Courses are available in six major categories: safety, security, facilitation, economics, environment, and management and technical. They consist of a full range of professional classroom courses covering a multitude of airport-related topics, and are designed to enhance the competencies of airport personnel from entry through to management levels. They can be taken in both classroom and e-learning formats.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	9	3	7	3	0	0	23

Capacity

Annual Enrollment: 5,716

Participating airports: 700+ worldwide

Degrees/Certs per year: 5,710

Growth Rate: 18%

Max 1 year growth: 20%

Max 5 year growth: 100%

Quality

Accreditation: Recognized by ICAO

Completion rate: 95%+

Evaluation sources: Course exercises, study checks, formal exams, post course surveys

Exposure to industry experts: Course faculty & guest lectures

Min Quals (faculty): varies, hands on experience for technical subjects, PhD for leadership programs

Faculty w/airport experience: 85%

Hands on experiences: Exercises include conducting an airside safety review or developing a strategic plan and master plan

Best practices: Multiple yearly training needs assessments, focus groups with faculty and member airports, and input from ACI's regional offices and 6 expert committees

Talent Pipeline and Selection

Min Quals (students): None

Acceptance rate: 95%

Enrollment rate: 100%

General barriers: Cost of travel, cost of the course

Occupations specific barriers: Courses that are not regulatory in nature require a greater effort to fill.

Cost

Avg cost per course: $50 - $950

Avg cost per diploma/cert: $1,795 -$6,200

Global ACI-ICAO Airport Management Professional Accreditation Programme	Aviation Strategies International	Certificate/Credential

This program provides global professional accreditation for airport personnel. Completion results in an International Airport Professional accreditation.

Airport Focus: 90% focus on airports; 10% focus on broader aviation expertise

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	1	1	1	1	0	0	1

Capacity

Annual Enrollment: 183

Participating airports: 197

Degrees/Certs per year: 115

Growth Rate: 13%

Max 1 year growth: 45%

Max 5 year growth: 50%

Quality

Accreditation: ICAO, ACI

Completion rate: 99%

Evaluation sources: Mastery evaluations in the form of individual and group assignments, ability to apply understanding, and situation and knowledge-based multiple-choice exams

Exposure to industry experts: 100% of instructors are seasoned airports or aviation experts in their subject matter; graduates are invited back to teach; video clips from ACI and ICAO chiefs in online courses

Min Quals (faculty): Undergraduate or graduate degree plus 5 years of directly related subject matter experience and teaching experience, references

Faculty w/airport experience: 100% aviation management experience (includes airport and airport enterprises, civil aviation authorities, aviation enterprises, ICAO, and ACI)

Hands on experiences: After graduating, IAP Community of Practice "airport labs" are introduced for direct participation and knowledge-sharing in specific areas of expertise (optional)

Best practices: Truly international in reach across borders and cultural background, blended learning (mix of face-to-face and online deliveries), community of practice, focus on practical vs. theoretical best practices

Talent Pipeline and Selection

Min Quals (students): Employed in management position within airport, civil aviation authority, ICAO and ACI management staff, or ACI World Business Partner

Acceptance rate: 97%

Enrollment rate: 100%

General barriers: English language comprehension, participants from LDC's cannot finance tuition, limited fellowship opportunities

Occupations specific barriers: N/A

Cost/ROI

Avg cost per course: $2,610 for mandatory course; $1,680-$6,000 for elective courses

Avg cost per diploma/cert: $15,000

ROI Indicators: Graduates are promoted or earmarked for succession planning; increasing number of airport advertise "IAP preferred" for job openings"

SSi, Inc. (Safety & Security Instruction)	SIDA / Authorized Signatory Training / General Aviation Security Awareness / Sterile Area Access Training / and others	Certificate/Credential

SSi is become the leading provider of safety and security training, and regulatory compliance consulting services to the aviation industry. SSi's iLS™ training system delivers cost-effective courses which are developed for quick updates when things change. In addition, SSi has developed one of the most extensive interactive courseware catalogs available to the aviation industry with more than 50 courses ranging from AARF, airport security, airport driver, fueling, safety and communications and general aviation. SSI also provides regulatory compliance consulting to assist airports write programs and manuals for TSA & FAA approval. SSi Instructor-led classroom workshops are widely offered and attended by professionals across the world.

Airport Focus: 95% focus on airports, 5% focus on broader aviation expertise

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
1	0	70	0	11	0	0	60

Capacity		
Annual Enrollment: 250,000+	Participating airports: 35	Degrees/Certs per year: 175+
Growth Rate: 20%	Max 1 year growth: 50%	Max 5 year growth: 50%+
Quality		
Accreditation: None	Completion rate: N/A	Evaluation sources: Nearly 10 years of customer feedback, service support calls are infrequent
Exposure to industry experts: 50%	Min Quals (faculty): 2-10 years of experience in aviation; College degree	Faculty w/airport experience: 20%
Hands on experiences: Dependent on individual practices of airport operators	Best practices: Ability to dissect skills and knowledge necessary for job related duties allows clients to focus on maintaining, monitoring and managing safe operations, recurrent/remedial computer-based training is always available to use	
Talent Pipeline and Selection		
Min Quals (students): Must have business need to access programs based upon job role; Must successfully complete airport enrollment and hiring background investigations	Acceptance rate: 100%	Enrollment rate: Unknown
General barriers: More and more applicants cannot pass criminal history background check or security threat assessment, which impacts resources for the airport and tenant stakeholders		Occupations specific barriers: N/A
Cost/ROI		
Avg cost per course: $395 for workshop; $10+ per person/course for computer-based training	Avg cost per diploma/cert: $395 for workshop; $10+ per person/course for computer-based training	ROI Indicators: Varies by airport

Airport University	Port Jobs	Certificate/Credential

This program, operated by Port Jobs, is a partnership with Highline College and South Seattle College to offer credit-bearing courses onsite at Sea-Tac Airport that allow airport workers and job seekers to work toward certificates and degrees at those community colleges. Courses focus on four key skill areas desired by airport employers, and build transferrable skills for career advancement within airports and beyond: Business Technology/Computer Skills, Customer Service, Workplace Safety and Security, and Leadership and Supervision. Students are a mix of job seekers and airport workers (the majority of whom are front-line workers such as customer service agents, baristas or wheelchair agents). Students are able to earn college certificates by taking classes at the airport. These include a Business Technology Certificate, Customer Service Certificate, Intro to Homeland Security certificate, and Workplace Safety certificate.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	5	0	0	0	0	0

Capacity

Annual Enrollment: 183

Participating airports: N/A

Degrees/Certs per year: 8

Growth Rate: N/A (currently at capacity)

Max 1 year growth: 25%

Max 5 year growth: 25%

Quality

Accreditation: Northwest Commission on Colleges and Universities

Completion rate: 79%

Evaluation sources: Student progress and continuation to area colleges to continue education and career advancement are tracked

Exposure to industry experts: Varies by course

Min Quals (faculty): Community college faculty

Faculty w/airport experience: Varies by course

Hands on experiences: Varies by course

Best practices: Classes can be taken between shift, career and education navigator helps students and workers plan next steps for education and career advancement, scholarships are provided to support those who want to continue their college education at area colleges with funding from Alaska Airlines

Talent Pipeline and Selection

Min Quals (students): Airport worker and/or actively seeking airport employment, CASAS reading assessment, and typing test (varies by course)

Acceptance rate: N/A

Enrollment rate: N/A

General barriers: Work schedules are a challenge for recruiting and retaining students.

Occupations specific barriers: None.

Cost

Avg cost per course: $102 per credit; Free for airport workers and job seekers below self-sufficiency standard

Avg cost per diploma/cert: Varies by credits per certificate; Free for airport workers and job seekers below self-sufficiency standard

U.C. Berkeley Airport Systems	Aviation System Consulting,	Academic/Educational

Planning and Design Short Course	LLC

The Airport Systems Planning and Design Short Course is a four-day short course covering airport systems planning, airport master planning, airfield layout planning and design, and more. It is typically attended by airport employees, government employees, and employees of private consulting firms.

Airport Focus: 100% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	0	0	0	1	0	0	0

Capacity

Annual Enrollment: 30

Participating airports: 0

Degrees/Certs per year: N/A

Growth Rate: N/A (stable enrollment rate)

Max 1 year growth: 20%

Max 5 year growth: 140%

Quality

Accreditation: None

Completion rate: 100%

Evaluation sources: Each attendee completes a course evaluation form at the end of the course that rates the course overall as well as each individual lecture

Exposure to industry experts: 100%

Min Quals (faculty): No formal minimum qualifications; All are recognized industry experts

Faculty w/airport experience: 15% (most instructors are senior staff at consulting firms that work primarily for airport authorities)

Hands on experiences: None

Best practices: Recognized industry experts cover the lecture for each topic, rather than a small number of instructors each covering multiple topics

Talent Pipeline and Selection

Min Quals (students): None

Acceptance rate: 100%

Enrollment rate: 100%

General barriers: None

Occupations specific barriers: N/A

Cost

Avg cost per course: $2,000 early bird rate; $2,300 during last month before course

Avg cost per diploma/cert: N/A

Center for Aviation Studies	The Ohio State University	Academic/Educational

The Center for Aviation Studies integrates engineering, business, and behavioral philosophies into a multidisciplinary approach to the many components of the aviation industry, supporting world class flight education programs, academic degree programs, research initiatives, and outreach activities on local, regional, national, and international levels.

Airport Focus: 20% focus on airports

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	1	0	1	1	0	0	2

Capacity

Annual Enrollment: 11

Participating airports: N/A

Degrees/Certs per year: 44

Growth Rate: Varies by program

Max 1 year growth: 25%

Max 5 year growth: 250-300 total students

Quality

Accreditation: University accredited by Higher Learning Commission, program currently undergoing review with Aviation Accreditation Board

Completion rate: 80%

Evaluation sources: Student attainment of set outcomes is assessed in each course; outcomes are further evaluated by Aviation Advisor Board

Exposure to industry experts: Guest lectures

Min Quals (faculty): Must hold advanced degree or technical certification; Waiver through Office of Academic Affairs required for technical certification holders

Faculty w/airport experience: 20%

Hands on experiences: On-campus airport and field trips to Port Columbus Regional Airport

Best practices: OSU owns its own airport, allowing students to gain experience in the classroom and through employment

Talent Pipeline and Selection

Min Quals (students): Varies by program

Acceptance rate: N/A

Enrollment rate: 100%

General barriers: None

Occupations specific barriers: None

Cost/ROI

Avg cost per course: $5,000 per year for full-time (12 credits) in-state tuition; $14,000 per year for full-time out-of-state tuition

Avg cost per diploma/cert: $40,000

ROI Indicators: Avg. starting salary of graduates over past year is $36,000

Aviation Operations: Airport Operations Diploma Program	British Columbia Institute of Technology	Academic/Educational

This 16-month diploma program in Airport Operations, supported and approved by the aviation industry, provides students with a comprehensive, interdisciplinary program of study. This is the only program of its type in Western Canada. To maintain a current, high-caliber standard, the program has an industry Advisory Committee made up of airport and airline managers, airport field staff from Canada's local regional and national airports, and Transport Canada representatives.

Airport Focus: 90% focus on airports

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	2	3	4	4	0	0	0

Capacity

Annual Enrollment: 24

Participating airports: 0

Degrees/Certs per year: 20

Growth Rate: N/A

Max 1 year growth: 200%

Max 5 year growth: 200%

Quality

Accreditation: BC Education Act

Completion rate: 80%-90%

Evaluation sources: Student evaluation administered by BCIT Institute Research and Planning group, term debrief conducted by Chief Instructor each term, and independent survey organization measures quality of effectiveness of the program (e.g., DASCO)

Exposure to industry experts: Airport Managers participate in capstone presentation, guest lecturers, and 12 industry events during program

Min Quals (faculty): Provincial Instructor Diploma OR over 10 years of experience in adult education environment (industry or post-secondary), Subject matter expert; Bachelor's degree or advanced degree

Faculty w/airport experience: 100%

Hands on experiences: Practicums to expose students to industry workplace environment and field trips to airports, airlines, MROs and other industry stakeholders

Best practices: Theory to Practice integrated into all courses, commitment by industry to host students during practicums, capstone projects allow students to demonstrate integrated knowledge and skills of program

Talent Pipeline and Selection

Min Quals (students): English 12 (50%) or Communications 12 (67%) OR 3 credits of post-secondary English, Humanities, or Social Sciences (50%); Math 11, Principles of Math 11, Applications of Math 11, Apprenticeship or Workplace Math 11, Foundations Math 11, or Pre-Calculus 11

Acceptance rate: 25%

Enrollment rate: 100%

General barriers: Demand is greater than capacity

Occupations specific barriers: None

Cost/ROI

Avg cost per course: $300

Avg cost per diploma/cert: $15,000

ROI Indicators: Hourly and salary rates for first job range from $16-$30/hour or $37,000-$70,000; 60% placement rate after 90 days; approx. 90% place rate after 180 days

Airport Program	Kansas State University	Academic/Educational

This Bachelor's degree program prepares students for rewarding careers in airport management. Coursework includes a study of airport environmental regulations, airport law, aviation/airport funding structures, an airport planning overview, airport management and airport field (lab) experience. Students also have an opportunity to graduate with the Certified Manager designation from the American Association of Airport Executives.

Airport Focus: 25% focus on airports

Course Coverage of Mission Critical Occupations

IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
3	5	1	2	2	0	0	2

Capacity

Annual Enrollment: Unknown (27 total enrolled)

Participating airports: N/A

Degrees/Certs per year: Unknown

Growth Rate: N/A

Max 1 year growth: 75%

Max 5 year growth: 150%

Quality

Accreditation: None

Completion rate: Unknown

Evaluation sources: N/A

Exposure to industry experts: Labs with subject matter experts

Min Quals (faculty): Master's degree and at least 5 years of airport experience

Faculty w/airport experience: 100%

Hands on experiences: Labs on active airfields

Best practices: Program is housed on active airfield with aircraft representing civilian and military operations and FAA tower, strong business/finance foundation in first 2 years, 10 airport-specific courses out of 40 total courses

Talent Pipeline and Selection

Min Quals (students): Two of the following – 21 ACT, 2.5 high school GPA, top ½ of high school class

Acceptance rate: Unknown

Enrollment rate: Unknown

General barriers: Making potential candidate student tours "pop" with ability to take tours around the airfield to see what labs look like, challenge if lab not in session

Occupations specific barriers: Students think finance and budgeting means many math courses

Cost

Avg cost per course: $342

Avg cost per diploma/cert: $35,000

Masters of Aviation	University of North Dakota	Academic/Educational

The Airport Management curriculum is offered to those students seeking employment in administrative positions with companies in and related to the groundside activities of the aviation industry. All aspects of general aviation, air carrier and the total aviation industry will be studied in-depth with sufficient flexibility in courses to allow the student to concentrate in a particular area of the industry such as general aviation operations, airline management, airport administration, or corporate aviation management.

Airport Focus: 10% focus on airports, 90% focus on broader aviation expertise

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
0	1	0	0	1	0	0	1

Capacity

Annual Enrollment: 20

Participating airports: N/A

Degrees/Certs per year: 8

Growth Rate: Varies

Max 1 year growth: N/A

Max 5 year growth: 20%

Quality

Accreditation: None

Completion rate: 90%

Evaluation sources: Assessment plan for program and direct and indirect measurements of current students, graduates, and employers

Exposure to industry experts: Guest speakers

Min Quals (faculty): Aviation industry experience and/or private pilot license, GRE and 3.0 undergrad GPA

Faculty w/airport experience: 1 faculty member

Hands on experiences: Internships

Best practices: Online courses taught live with bona fide faculty in residence at UND

Talent Pipeline and Selection

Min Quals (students): Private pilot and/or industry experience, GRE, 3.0 undergrad GPA

Acceptance rate: 90%

Enrollment rate: 90%

General barriers: Lack of advertising and marking budget

Occupations specific barriers: None

Cost

Avg cost per course: $900 per credit in-state; $2200 per credit out-of-state

Avg cost per diploma/cert: $15,000-$45,000

MSc in Airport Planning and Management	Cranfield University Centre for Air Transport Management	Academic/Educational

The MSc in Airport Planning and Management was created to meet a demand clearly stated by employers for graduates skilled and qualified in airport business development, planning, design, operations and environmental management.

Airport Focus: 67% focus on airports, 33% focus on broader aviation expertise

Course Coverage of Mission Critical Occupations							
IT	Finance	Security	Development	Planning	Engineer	Electrician	Airport Ops
1	3	1	3	5	1	0	1

Capacity

Annual Enrollment: 23

Participating airports: N/A

Degrees/Certs per year: 23

Growth Rate: 5%

Max 1 year growth: N/A

Max 5 year growth: N/A

Quality

Accreditation: UK Chartered Institute of Logistics and Transport

Completion rate: 99%

Evaluation sources: Internal feedback methods, UK Higher Education Postgraduate Taught Experience Survey (PTES), two external examiners, Industry Advisory Board

Exposure to industry experts: 30% sessions delivered by guest lecturers, group project presented to 35 industry experts and employers

Min Quals (faculty): Bachelor of Science, 2:1; IELTS of 7 or above

Faculty w/airport experience: 40%

Hands on experiences: Group project in which students develop business and master plan for an airport within an intensive two-week period

Best practices: Modifications implemented every year to align program with industry dynamics, use of tablets to implement innovative learning techniques (e.g., blended learning)

Talent Pipeline and Selection

Min Quals (students): Bachelor of Science

Acceptance rate: 35%

Enrollment rate:

General barriers: None

Occupations specific barriers: None

Cost/ROI

Avg cost per course: £45 ($60) per credit

Avg cost per diploma/cert: £9,000 ($12,015)

ROI Indicators: 50% job placement rate prior to program completion; 95% job placement rate within 3 months of completion; £30,000 ($39,330) avg. salary within first year of completion; £40,000 ($52,440) within two years of completion

Appendix E: Education Pipeline Information for MCOs Without Airport-Specific T&E Programs

The largest gaps in coverage of airport mission critical occupations and competencies among airport-focused T&E programs occur in the electrical, engineering, and IT professions. As a result, airports cannot rely on airport oriented programs to fill these roles. The fact that a larger number of non-airport T&E programs support these occupations makes it difficult to evaluate their ability to support the workforce needs of airports. Essentially, airports are competing with a wide range of organization in the local, regional, and even national or international marketplaces for talent in these fields. The tables below are designed to help airports better understand how both demand in the broader economy and the educational and training pipeline for these occupations may impact availability of electrical, engineering, and IT talent. Each table includes information on a) the typical educational pathway for that career, b) recent trend data on the number of degrees or apprenticeships awarded annually, and c) the projected outlook for this segment of the industry.

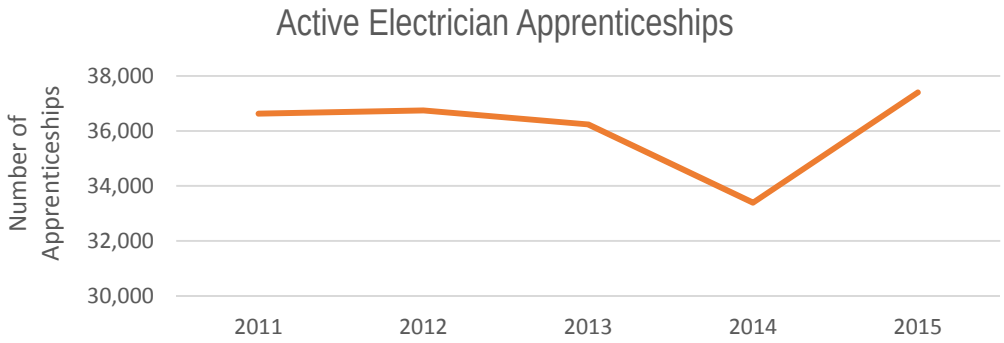
Electrician

EDUCATIONAL PATHWAY

Electricians typically need to be licensed; however, the level of required license varies by airport and position, and licensing requirements vary from state to state. While some electricians begin their training with a formal technical training program, others may immediately begin gaining experience in the field as an assistant. To become an Apprentice Electrician, a licensing exam may be required, and then an apprenticeship will typically last about four years. Following successful completion of an apprenticeship, a Journeyman Electrician licensing exam can be taken. For many airport electrician jobs, a Journeyman Electrician license is required; however, some jobs require a Master Electrician license. Airport electricians typically learn airport-specific requirements on the job rather than through formal education. Because airports have large, high voltage electrical systems, experience working with high voltage systems is often preferred.

CURRENT PIPELINE

The number of active electrician apprenticeships has fluctuated over the past five years from a low of approximately 33,000 in 2014 to a high of more than 37,000 in 2015 (DOL, 2015). Note that these numbers reflect total active apprenticeships (rather than annual completions or new enrollments), and that the average electrician apprenticeship lasts four years.



Electrician

PROJECTED OUTLOOK

Approximately 85,900 new jobs are projected for Electricians through 2024 across industries. This represents growth of 14 percent, which is much faster than average (BLS, 2015). Additionally, the electrician workforce is aging, with more than 60 percent of the workforce over the age of 45 as of 2013 (Wright, 2013). Between industry growth and replacement needs, the Construction Labor Research Council (2013) estimated that nearly 170,000 new electricians would be needed over the ten-year period between 2012 and 2021. Overall, a shortage of electricians is anticipated across industries, including airports.

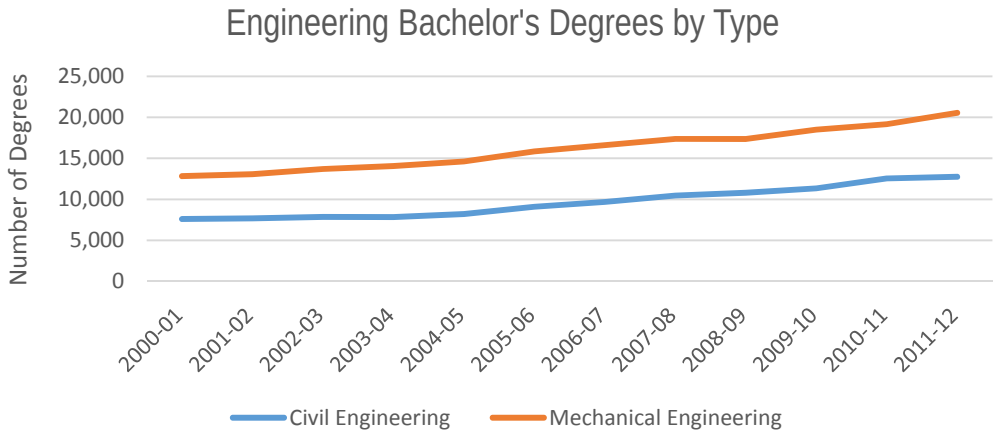
Engineer

EDUCATIONAL PATHWAY

Most engineering jobs require completing a four-year college degree (e.g., civil engineering, mechanical engineering) from an accredited engineering program. The Fundamentals of Engineering (FE) Exam can be taken after graduation to obtain an entry-level job. After at least four years of experience, it is possible to take the Professional Engineer (PE) exam to earn a PE license. Engineers may also choose to obtain additional certifications (e.g., Building Security Certified Professional (BSCP); Envision Sustainability Professional (ENV SP)) or graduate degrees (e.g., Master's in Engineering) to further distinguish themselves. Airport-specific knowledge and skills are typically gained through experience rather than formal education.

CURRENT PIPELINE

The number of both Civil and Mechanical Engineering Bachelor's degrees has been steadily increasing in recent years, from less than 8,000 Civil Engineering degrees in 2000-01 to nearly 13,000 in 2011-12 and less than 13,000 Mechanical Engineering degrees in 2000-01 to nearly 21,000 in 2011-12 (NCES, 2013).



PROJECTED OUTLOOK

Civil Engineering jobs are expected to see 8% growth through 2024 with 23,600 projected new jobs, while Mechanical Engineers are expected to see 5% growth with 14,600 new jobs projected. These growth rates are considered to be average. Engineering opportunities in airports are expected to grow as well, as the nation's infrastructure and airports continue to age (BLS, 2015). With the growth in Engineering Bachelor's degrees, there appears to be enough supply for the engineering pipeline in general; however, the availability of Airport Engineers specifically is difficult to ascertain from available data.

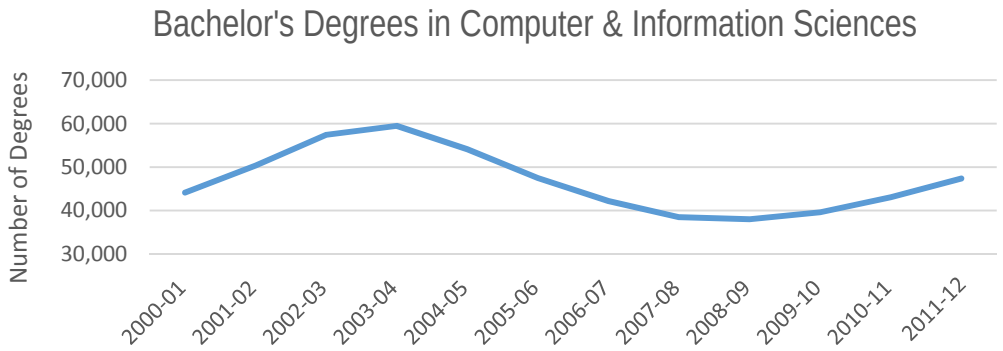
Information Technology

EDUCATIONAL PATHWAY

Information technology (IT) encompasses a broad range of occupations, which vary in their educational requirements. While some IT jobs do not require a college degree (e.g., Support Specialists), a Bachelor's degree in Computer or Information Sciences is required or preferred for many IT occupations (e.g., Computer Programmer, Computer Systems Analyst, Database Administrator, Software Developer, Information Security Analyst). Although much less common, some specialized IT jobs may require a graduate degree (e.g., Computer and Information Research Scientists). Airport-specific knowledge and skills are typically learned on the job rather than through formal education.

CURRENT PIPELINE

The number of Bachelor's degrees in Computer and Information Sciences has fluctuated in recent years from a low of about 38,000 in 2008-2009 to a high of over 59,000 in 2003-2004. The number of degrees has been trending upward over the past few years (NCES, 2013).



PROJECTED OUTLOOK

The role of IT in airports is continuing to increase. For example, global airport spending on IT climbed to 5.82% of revenues in 2014, with projections of 6.25% for 2015 – a global amount of $8.7 billion (SITA, 2015). Growth is expected in most IT occupations through 2026, with the fastest growing jobs including Web Developers (27%), Computer Systems Analysts (21%), Software Applications Developers (19%), and Information Security Analysts (18%). Overall, IT jobs are projected to have 12% growth, which is faster than average. With strong competition for IT professionals across industries, airports may need to make a targeted effort to retain a capable IT workforce.