



C. Daniel Prather, Ph.D., A.A.E., CAM

# Airport Management



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*Airport Management*

by C. Daniel Prather, Ph.D., A.A.E., CAM

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## Foreword

I consider it an honor to be asked to write the foreword for *Airport Management*. This textbook's author, Dr. C. Daniel Prather, A.A.E., CAM, has been my mentor since I entered this dynamic and fast-paced community of airports. Dr. Prather has extensive airport experience from his tenure as an Assistant Director of Operations at Tampa International Airport, and is now a key player in education program development and in the training of hundreds of airport professionals nationally and internationally. He is an accredited member of the American Association of Airport Executives (AAAE), and recently developed and implemented the first aviation program at California Baptist University in Riverside, California.

Dr. Prather's objective in all of his educational development and presentations is to provide airport professionals with practical, industry-focused information. You will find this as the baseline throughout all chapters of *Airport Management*. This textbook covers the exciting areas that other airport professionals and I are involved with on a daily basis, including airport planning, design, and construction; air traffic and capacity delay; environmental issues; regulatory compliance; airport operations and maintenance; safety and security; and much more. The chapter scenarios and case studies are designed to allow readers to apply knowledge gained in the text to solving real-world airport challenges.

Some of the more specific topics on the minds of airport professionals include the integration of the National Incident Management System (NIMS), Incident Command System (ICS) into airport emergency plans, and the training and exercise of personnel for use during incidents and events; operational safety on airports during construction, as most airports are always in some phase of construction; addressing FAA Runway Safety Action Team (RSAT) action items; implementation of safety management systems (SMS); measurable metrics; and airport sustainability, just to name a few.

I personally began my aviation career in the United States Marine Corps as an avionics technician on CH-46E Sea Knight helicopters, and quickly progressed through the enlisted ranks as well as becoming a qualified Aerial Observer/Door Gunner, Quality Assurance Inspector, and working on other helicopter and fixed-wing aircraft platforms. While traveling and serving in the United States Marine Corps, I was fortunate to have the opportunity to complete my undergraduate degree from Southern Illinois University, Carbondale, where I got my first taste of aviation industry business management from an academic perspective.

At the end of my second enlistment in the United States Marine Corps, my family and I decided to take the leap from the military and I began my civilian aviation career as an Airport Operations—Communications Center Dispatcher at Tampa International Airport in Tampa, Florida. This position was ideal for someone new to an airport. I was able to experience the full spectrum of daily operations at an airport, ranging from response coordination to small incidents such as broken plumbing pipes in a terminal, to higher-level incidents such as security breaches, people jumping from parking structures to commit suicide, and aircraft alerts. Since that first position as a dispatcher, I have again been very fortunate to hold several positions within airport operations departments at Tampa International Airport (TPA), Burbank Bob Hope Airport (BUR), and now at Los Angeles International Airport (LAX). I have held positions ranging from my initial position as a dispatcher, to Airside and Landside Operations Manager, to my current position as a Chief of Operations I at LAX.

My current job responsibilities include working some shifts as the Airport Duty Manager, and serving as the LAX Department Operations Center (DOC) Director during large-scale events. In this position, I was on duty for the Asiana Airlines Flight 214 accident at San Francisco Airport in which we received multiple flight diversions; utility disruptions affecting multiple terminals and other facilities; and one of the most challenging incidents our airport has experienced in the past ten years involving an active shooter at Terminal 3 in which three of our nine terminals were evacuated, and Terminal 3 remained closed for 28 hours.

If this is your first exposure to the airport community, airports are often referred to as “cities within cities.” Airports have several components, regulations, and political pressures similar to a city. Depending on the size of an airport, it may have components similar to a city, such as a municipal fire station or its own fire department; a police, security, and/or public safety department; emergency medical personnel; administrative and financial services; and a maintenance department similar to city public works. Unlike a city, however, hazards at airports can pose unique challenges since the operation of aircraft traffic, vehicle traffic, pedestrian traffic, baggage, and cargo throughput must continue to flow, or be restored promptly, to sustain commerce and e-commerce.

In addition, airports have multiple federal agencies, private entities, contractors, and airport personnel that all operate within the same few acres of airport property to provide safe and secure services to the traveling public. In addition to these departments and divisions that are similar to those of a city,

airports will also have an airport operations department. The personnel in this department conduct inspections of the airside, terminals, and landside to identify and report any irregular conditions that impact operations, and coordinate the response by emergency services, maintenance personnel, and others to resolve these issues. Airport operations, along with public safety, agency, and stakeholder partners, also responds to emergencies such as aircraft accidents, security breaches, structure fires, hazmat spills, property damage incidents, utility disruptions, etc., with the primary objective of coordinating the flow of the airport's operation around the incident, and then becoming the incident commander during the recovery phase of an accident or incident.

The best phrases, words, and guidance that I have learned from fellow employees and leaders in airports include: exciting, high consequence, and political; operations revolve around local, state, and federal regulatory compliance; airports must partner, train, and build solid relationships with stakeholders and mutual aid responders to ensure efficient response plans and procedures have a common operational picture; the only thing constant at an airport is change; your customers include the traveling public, airport tenants, contractors, and your own airport employees; and the most critical asset at an airport are the employees that keep it operating, so keep them involved.

In conclusion, you will find this textbook and the aviation professionals you meet to be valuable resources as you progress through your career. Anyone who intends to work and succeed in this exciting and challenging field must master a thorough understanding of the rules, regulations, and standards that affect airports, and be able to apply critical thinking skills to continue to progress. *Airport Management* will prove to be an excellent resource for current and future airport professionals.

Richard N. Steele, C. M., MCA  
Chief of Operations I  
Los Angeles International Airport (LAX)  
Los Angeles World Airports (LAWA)

## Acknowledgments

The development of this book would not have been possible without the significant level of support provided by colleagues in the industry. My experiences have been enriched because of others. I would like to thank Mr. Robert Burr, Mr. Grant Young, and Mr. Ed Cooley for believing in me. These gentlemen provided me with ten outstanding years of experience in airport operations at Tampa International Airport (TPA). Ms. Marilyn Gauthier, a coworker at TPA, was a friend from day one and continues to be to this day. I would also like to thank collegiate aviation faculty everywhere who are members of the University Aviation Association (UAA), as well as Mrs. Carolyn Williamson, former UAA Executive Director. Collegiate aviation faculty are a small group of devoted professionals, and I have learned from and with them extensively over the years. These professionals have supported me in many ways as I transitioned from the airport industry to being a faculty member at a collegiate aviation program. I especially benefitted from the annual UAA Fall Education Conferences and the *Collegiate Aviation Review*. I would like to particularly thank Dr. Julie Speakes for providing me an opportunity to teach online as an adjunct faculty member in the Delta State University Master of Commercial Aviation degree program and being a close friend. Dr. Alexander Wells graciously provided me the first opportunity to author a book, by asking me to revise his *General Aviation Marketing and Management* textbook. Mr. Dave Boelio and Ms. Nicole Sgueglia both encouraged me to write this *Airport Management* text, while Mr. Fred Boyns and Ms. Jackie Spanitz enthusiastically asked me to write this text for ASA.

I would like to thank Dr. Paul Craig for giving me my first position as a faculty member at Middle Tennessee State University. California Baptist University (CBU) President Dr. Ronald Ellis, former Provost Dr. Jonathan Parker, and College of Arts and Sciences Dean Dr. Gayne Anacker believed in me and trusted that I was the right person to develop the nation's newest collegiate aviation program at their fine institution. I am humbled by this opportunity and would like to express my heartfelt gratitude for their tremendous support. This has been by far the greatest professional challenge and thrill of my life. Mrs. Kim Roper and Mrs. Maria LeBlanc have been instrumental in my success at CBU, as have our wonderful team of faculty and flight instructors.

I would also like to thank the staff of the American Association of Airport Executives, specifically Mr. James Johnson, A.A.E. (now retired), Ms. Starla Bryant, Mr. Kevin Miller, C.M., ACE (now with the Boca Raton Airport Authority) and Mr. Scott Boeser, C.M., ACE for trusting me to revise the Airport Certified Employee (ACE)—Operations modules and subsequently train airport professionals across the country in Part 139. I would also like to thank

Mr. Jay Evans and Mrs. Sarah Wolf of the National Business Aviation Association for allowing me the opportunity to serve on the Professional Development Program (PDP) Review Committee and provide professional training to business aviation professionals nationwide. I would also like to thank Ms. Anne Nevel of the Helicopter Association International for allowing me the opportunity to provide professional training to helicopter aviation professionals nationwide.

My past and current students have provided me significant insight and allowed me the opportunity to improve my teaching abilities. I am proud of each and every one of you who have graduated and are now making significant contributions to the industry. Your success keeps me motivated.

I am indebted to the following individuals who have provided me the greatest direct support in the development of this text, through their research, photographs and case studies:

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Ms. Diana Fernandez, ACE	Mr. Richard Steele, C.M.
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Mr. Peter Lubbers, ACE	

Additionally, I must recognize Mr. David Nicewinter (TPA) and Mr. John Padgett (Nashville International Airport), both of whom spent a number of hours with me allowing me to tour their respective airfields to obtain photos.

I would like to express my love and gratitude to my family, who supported me throughout this project. My wife, Grace, my daughter, Savannah, and my son, Layton, are the joys of my life and I would not be the man I am today if not for you guys. Thanks for being such an awesome family.

My dad, Mr. Louis Prather, and my mom, Dr. Barbara Corry, provided me the opportunity to take flying lessons with Mr. Langley Nelson at Hawkins Field in Jackson, Mississippi, while I was still in high school. These lessons fueled my passion for the aviation industry, which led me to Delta State University for a Bachelor of Commercial Aviation degree, Southern Illinois University for a Master of Public Administration degree, and ultimately to Tampa International Airport, which allowed me the experiences necessary to be able to write this textbook. Thanks Mom and Dad!

Finally, my Lord and Savior Jesus Christ daily provides me the strength and wisdom to accomplish and succeed to bring Him glory. My life verse is found in Philippians 4:13, "I can do all things through Christ who strengthens me." This book would not be possible without the breath He alone provides me.

## About the Author

Serving as Assistant Director of Operations at Tampa International Airport (TPA) from 1998 to 2006, and Associate Professor of Aerospace at Middle Tennessee State University (MTSU) from 2006 to 2012, Dr. C. Daniel Prather, A.A.E., CAM, has been serving as professor and founding chair of the Department of Aviation Science at California Baptist University (CBU) since July 2012. In this position, Dr. Prather has been responsible for developing curriculum and recruiting students and faculty to the nation's newest collegiate aviation program.



Active with the University Aviation Association (UAA), the American Association of Airport Executives (AAAE), and the National Business Aviation Association (NBAA), Dr. Prather is an Accredited Airport Executive through AAAE, a Certified Aviation Manager through the NBAA, and an instrument-rated private pilot. He is also an active aviation industry consultant, often busy on projects with the Airport Cooperative Research Program (ACRP) of the Transportation Research Board (TRB). He holds a Doctor of Philosophy degree from the University of Nebraska at Lincoln, a Master of Public Administration degree from Southern Illinois University at Carbondale, and a Bachelor of Commercial Aviation degree from Delta State University.

In addition to this textbook, Dr. Prather is author of *General Aviation Marketing and Management: Operating, Marketing and Managing an FBO*. He is also the designated Airport Certified Employee (ACE) – Operations trainer for AAAE, and a leadership trainer for NBAA and the Helicopter Association International (HAI).

Not counting his one year as a flight coordinator intern at FedEx Express while in college, or flight training he undertook while in high school, Dr. Prather entered the aviation industry in 1996 and has never looked back. Visit Dr. Prather at [www.dprather.com](http://www.dprather.com).

# Introduction

As a collegiate aviation professor with ten years of airport managerial experience, I have always endeavored to teach courses in airport management from a practical, real-world perspective. However, the available textbooks on this topic are lacking in practical application. For me, this was not significant, because I could easily supplement the text I was using with real-world examples from my ten years of experience at Tampa International Airport. However, I began to meet other faculty members across the country who were being asked to teach courses in airport management, but had no professional airport industry experience from which to draw when teaching these courses. As a result, students in these courses learned less practical application than is necessary to be prepared for positions in the airport industry.

It was this realization that led me to begin writing this practical book on airport management. Of course, I soon learned that writing a book was a tremendous undertaking. Writing this book soon became a labor of love that required a significant investment. While working on the manuscript each day, I thought of all the current students who would become airport professionals in the future. This book has been written for your benefit. My goal has been to provide practical insight into the airport management business, and I trust this first edition will accomplish that.

The book has been designed to cover all areas of airports, to give a future airport manager a thorough understanding of the many aspects of the airport business. Key terms are identified at the beginning of each chapter and set in bold within the text. Features throughout the chapters shine the spotlight on specific airlines, airports, and other entities. Each chapter ends with scenarios designed to allow readers to apply knowledge gained from studying the chapter to solving real-world airport issues. The book also includes comprehensive case studies that allow readers to dive even deeper into the topics. Helpful review questions are provided for each chapter to prompt reflection and focus attention on the most important concepts. As these questions are meant to stimulate thought, discussion with your instructor, and classroom conversation, specific answers are not provided. Additional resources and information related to airport management can be found on the Reader Resources webpage for this book at [www.asa2fly.com/reader/airptmgt](http://www.asa2fly.com/reader/airptmgt).

Chapter 1, Historical Overview, presents a historical perspective of both the airport and airline industry, including important pieces of legislation that played an integral role in the safe development of both. The funding of airports

is also discussed to allow the reader to better understand the role of federal funding in airport development. This chapter is important to the reader to gain a full understanding of the airport industry; we must understand from where we came to better prepare for future challenges.

Chapter 2, *Structure of Airports*, presents the organizational structure of airports, including types and the nature of ownership. It covers the major departments common at larger airports, as well as available airport training and career opportunities. This chapter is important in understanding the breadth of airports in this country, including how they are organized and owned.

Chapter 3, *Air Traffic, Capacity and Delay*, introduces the capacity and delay issue that airports must confront. In addition, it presents classes and types of airspace; NAVAIDs; airport lighting, signage, and markings; radio communications; the federal contract tower program; and NextGen. This chapter is full of information that introduces readers to the airspace in which airports are located, as well as the facilities and equipment in place to provide guidance to pilots and ground vehicle operators on the airfield.

Chapter 4, *Planning*, presents the need for airport planning, from the national level to the local airport-specific level. Airports are always planning for the future, and specific processes are in place to carry out this planning. To effectively plan, however, forecasting must take place, and this chapter covers the types and uses of forecasting in airport planning. This chapter is important for the reader in understanding the nature of and need for airport planning to prepare for future demand.

Chapter 5, *Design and Construction*, is a lengthy chapter that explains the nature of design and construction, from pre-bid to project completion. Airport construction projects can require many months or even years from start to finish, and there are specific procedures to be followed in designing a project, selecting a contractor, and maintaining safety on the airfield during construction. This is especially true of projects funded by the FAA. This chapter is important for the reader in understanding the design and construction side of airport management, which can oftentimes appear too technical for non-engineers. However, even the smallest airports have need for the occasional construction project, which makes the information in this chapter important to understand.

Chapter 6, *Environmental*, presents the many environmental impacts of an airport, and the regulations and requirements necessary to ensure environmental compliance. This chapter addresses noise, compatible land use, zoning, easements, water quality, air quality, and hazardous materials. For airports to

be good neighbors and operate within regulations, it is imperative that airport management understand various environmental impacts and implement procedures to ensure environmental compliance (from both the airport and all tenants). Sustainable environmental stewardship is the ultimate goal, and this chapter is important in leading readers to that goal.

Chapter 7, Operations, focuses on the actual operation of the airport with a specific emphasis on airfield operations. Specifically, 14 CFR Part 139, Airport Certification, provides the foundation for this chapter. This is the regulation to which air carrier airports must comply to maintain an airport operating certificate and is, as a result, an important regulation to understand. Topics addressed in this chapter include snow and ice control, emergency response, aircraft rescue and firefighting, wildlife, and NOTAMs. This chapter is important for all future airport professionals because of the extreme importance placed on Part 139 compliance at air carrier airports. Lack of Part 139 compliance could result in the airport losing its operating certificate (in extreme cases), which would prohibit air carrier operations at that airport.

Chapter 8, Maintenance, is to some degree the flip side of Chapter 7. Operations personnel rely heavily on support of maintenance personnel to maintain the airfield in peak condition and within Part 139 requirements. Specifically, this chapter addresses airport pavements and airside and landside maintenance, including the use of contracted maintenance providers. This chapter is important for readers to understand because maintenance is integral to maintaining a safe and efficient airport.

Chapter 9, Safety and Security, addresses the need to ensure a safe and secure airport. This chapter addresses the protection of the public, employees and tenants; fire hazards; driving on the movement area; safety management systems; emergency preparedness; aircraft accidents and incidents; media relations; security; etc. This chapter is valuable for the reader in understanding the role of safety and security in maintaining a top-notch airport.

Chapter 10, Marketing, focuses on the importance of effectively marketing airports to ensure a competitive position to minimize the leakage of passengers and ensure positive publicity in the community. Topics include the basics of marketing; goals and objectives; SWOT analysis; promotional mix; marketing plans; and air service development. This chapter is important for the reader in understanding the role of marketing in airport management, which includes much more than securing additional air service or building a website.

Chapter 11, Governmental, Legal, and Public Relations, presents a valuable overview of the politically active climate in which airports always operate, and

covers national, state, and local governmental relations. This chapter examines the manner in which FAA regulations and advisory circulars are revised, and describes Robert's Rules of Order to enable the reader to understand formal procedures typically in use during city council meetings, airport board meetings, and other formal meetings. Regulatory agencies and industry trade associations are also presented within the chapter. This chapter is important for the reader to gain an understanding of the political nature of airports and the concepts to be adhered to in managing an airport facility in this environment. The politically naïve airport manager (with no knowledge of the concepts presented in this chapter) will likely encounter more of a challenge on the job than is necessary.

Chapter 12, Properties, Contracts, and Commercial Development, is the first of the “money” chapters. Without an understanding of airport property, the nature of contracts, and the common ways in which to develop airport property to increase revenues (and create jobs), an airport will effectively lose money annually from lost opportunities in the form of commercial development of property. The chapter presents aeronautical lease agreements, airline operating agreements, land lease agreements, rate-making methodologies, concessionaires, FBOs, minimum standards, rules and regulations, MOUs/LOAs, self-fueling, etc. This chapter is important for the reader in understanding the myriad of ways in which airports earn revenue through various tenants, vendors, and others and the legal agreements that must be in place to define these relationships.

Chapter 13, Financial Management, is the second of the “money” chapters and presents operating and capital budgets, including budgeting techniques; financial ratios; fees, rates, and charges; and risk management. This chapter is important for the reader in understanding how to budget properly and manage the budget to track revenues and expenditures, as well as assets and liabilities. Although the chapter presents common financial management terminology, airports have unique budgeting requirements that airport managers must fully understand. Otherwise, the knowledge gained in chapter 12, even if applied properly, will be less successful.

Chapter 14, Funding and Financial Impacts, continues the “money” discussion with a focus on capital development funding, including matching funds, bonds, PFCs, internally generated funds, state and local sources, and AIP. This chapter covers grant assurances, which airports must comply with once federal funds are accepted, as well as methods to determine the economic impact of

airports, the impact of airline bankruptcies, and benchmarking. This chapter is important for the reader in understanding the methods available to airports in funding large capital projects, as well as the role airports play in the economy.

Chapter 15, Future Challenges and Opportunities, wraps up the book by presenting the expected challenges airports will face in the future, as well as the opportunities that may be grasped. Specifically, airline bankruptcies and mergers, new large aircraft (such as the A380), capital development funding, unfunded federal mandates, passenger leakage, customer service, sustainable initiatives, airside congestion, and unmanned aircraft systems are presented. This chapter provides a few last thoughts on future challenges to be faced by airport managers.



Tampa International Airport, with main terminal complex and satellite terminals connected by automated people movers shown. (Hillsborough County Aviation Authority)

# Historical Overview

## Key Terms ↘

14 CFR Part 139, Certification of Airports  
AIP Temporary Extension Act  
Air Cargo Deregulation Act of 1976  
Air Commerce Act of 1926  
Airline Deregulation Act of 1978  
Airport and Airway Development Act of 1970  
Airport and Airway Improvement Act of 1982  
Airport and Airway Revenue Act of 1970  
Airport and Airway Safety and Capacity Expansion Act of 1987  
Airport and Airway Safety, Capacity, Noise Improvement, and Intermodal Transportation Act of 1992  
Airport and Airway Trust Fund  
Airport Development Aid Program (ADAP)  
Airport Improvement Program (AIP)  
Airways Modernization Act  
Americans with Disabilities Act of 1990  
Aviation and Transportation Security Act (ATSA) of 2001

Aviation Investment and Reform Act for the 21st Century (AIR-21)  
Aviation Safety and Capacity Expansion Act of 1990  
Aviation Safety and Noise Abatement Act of 1979  
Aviation Security Improvement Act of 1990  
cargo revenue ton miles  
Civil Aeronautics Act of 1938  
Civil Aeronautics Administration (CAA)  
Civil Aeronautics Authority (CAA)  
Civil Aeronautics Board (CAB)  
Civil Works Administration (CWA)  
Clean Air Act  
continuing resolution  
Contract Air Mail Act of 1925  
Contract Air Mail (CAM) routes  
Department of Transportation Act of 1966  
Development of Landing Areas for National Defense (DLAND)  
Emergency Relief Appropriation Act of 1935

# Objectives ↘

Upon completion of this chapter, you should:

- Understand the historical events and important pieces of legislation affecting the development of airlines.
- Understand the historical events and important pieces of legislation affecting the development of airports.
- Understand the historical funding of airport development.
- Understand the pre- and post-deregulation periods.
- Understand the significance of the events of 9/11 on the aviation industry.
- Be able to discuss contemporary issues and future challenges confronting the airport industry.

Essential Air Service (EAS)  
Federal Aid to Airports Program  
Federal Airport Act of 1946  
Federal Aviation Act of 1958  
Federal Aviation Administration Authorization Act of 1994  
Federal Aviation Agency (FAA)  
Federal Aviation Reauthorization Act of 1996  
Federal Emergency Relief Administration (FERA)  
Federal Water Pollution Control Act  
general aviation (GA) airports  
Homeland Security Act of 2002  
hub and spoke  
Implementing Recommendations of the 9/11 Commission Act of 2007  
Kelly Act  
load factors  
low-cost airlines  
Military Airport Program (MAP)  
National Airport Plan

National Civil Aviation Review Commission  
National Commission on Terrorist Attacks Upon the United States  
National Transportation Safety Board (NTSB)  
oligopolistic  
omnibus spending bill  
passenger facility charge (PFC)  
Planning Grant Program (PGP)  
revenue passenger miles  
Security Guidelines for General Aviation Airports  
spending bill  
State Block Grant Program  
Transportation Security Administration (TSA)  
Vision 100—Century of Aviation Reauthorization Act of 2003  
Works Progress Administration (WPA)  
World War I  
World War II

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### **The Role of Federal Express in the Air Cargo Industry .....** 25

Federal Express played an integral role in establishing the air cargo industry and the subsequent deregulation of that industry.

### **The Rise and Fall of People's Express .....** 27

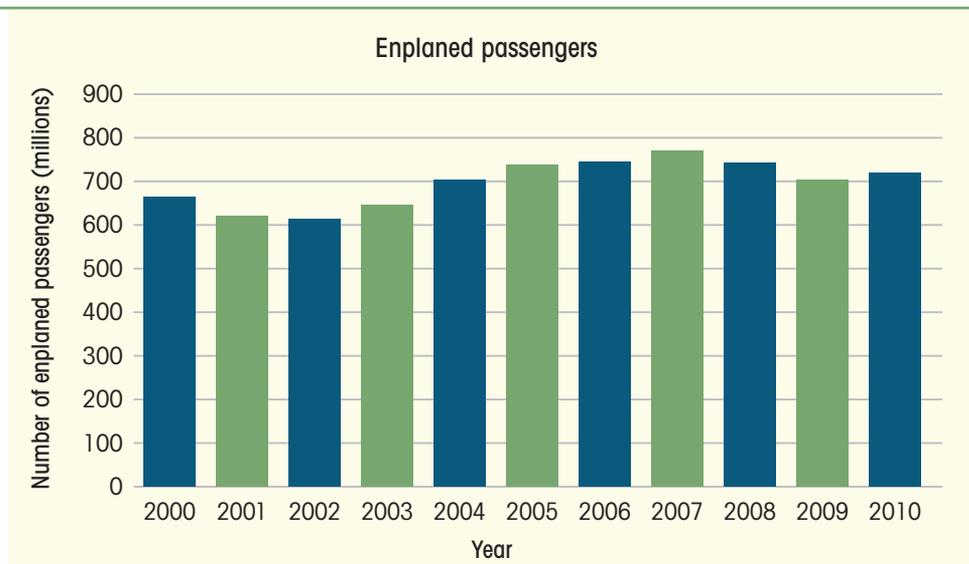
A low-cost airline that attained great success, but eventually went out of business due to competition from other airlines during the deregulated era.

# Introduction

Airports are an integral part of the aviation industry. In this industry, billions of passengers and billions of tons of cargo have been moved from point to point since it began, which could not have occurred without airports. The industry is a little more than 100 years old and yet responsible for more than \$1 trillion per year in economic activity and almost 10 million jobs. Consider the U.S. airlines (Figure 1-1). Although down from a ten-year high of 769.6 million enplaned passengers in 2007, U.S. airlines enplaned 720.5 million passengers, which equates to 798 billion **revenue passenger miles**, in 2010. Additionally, airlines generated more than 27 billion **cargo revenue ton miles** and generated more than 10 million departures during the year (Air Transport Association, 2011).

Each of these departures, passengers, and pounds of cargo were accommodated at an airport. Whether large or small, public or private, airports serve as an interface between ground and air transportation (Figure 1-2). As an industry, they directly serve the needs of pilots, passengers, and meeters and greeters, and provide employment to hundreds of thousands of employees nationwide. Indirectly, they serve the communities in which they are located by providing facilities to support emergency medical transport, law enforcement services, and the movement of goods and services. Even **general aviation (GA) airports** provide beneficial economic impacts to the local community. Airports in the United States have a significant impact on local, state, regional, and national economies. As part of an industry that provides 10 million jobs, \$396 billion in wages, and an impact of \$1.3 trillion to the economy, airports clearly play a crucial role in the aviation industry (Federal Aviation Administration, n.d.). In sum, airports serve a unique and substantial need throughout the world, and have an interesting history in the United States—the birthplace of aviation.

**Figure 1-1.**  
Number of enplaned  
passengers, U.S.  
airlines, 2000–2010





**Figure 1-2.** Airports are transportation lifelines, often serving airline passengers and cargo carriers, flight training and general aviation pilots, with beneficial economic impacts felt locally, regionally, and nationally.

(jlye/Bigstock.com)

## The Beginning of an Industry

The history of the aviation industry in the United States began on December 17, 1903. It was on this day that Orville Wright first flew the now-famous Wright Flyer I in a controlled flight lasting 12 seconds (see Figure 1-3). However, aviation did not immediately succeed. After these first flights at Kitty Hawk, North Carolina, the Wright brothers faced quite a challenge in promoting their aircraft to a willing buyer. In fact, five years passed before they were able to convince the U.S. government to test a much improved version.

**Figure 1-3.**

The first flight of Orville Wright (1871–1948) at Kill Devil Hills, Kitty Hawk, North Carolina, on December 17, 1903 (120 feet in 12 seconds). His brother Wilbur Wright (1867–1912) is standing on the right.

(Wikimedia Commons; see credit on page 623)



Although the four flights flown by the Wright brothers on that day marked the beginning of controlled, powered, and sustained heavier-than-air human flight, the first scheduled commercial airline flight using heavier-than-air aircraft did not occur until eleven years later, when on January 1, 1914, Tony Jannus piloted the Benoist XIV flying boat biplane across Tampa Bay (Florida) on an historic 23-minute flight (see Figure 1-4). This inaugural flight also carried the mayor of St. Petersburg, Florida—Mr. Abram C. Pheil. At a fare of five dollars per passenger, this was the first time in history that tickets were sold to the general public for point-to-point scheduled air travel. Known as the St. Petersburg-Tampa Airboat Line, the airline offered service six days per week with two roundtrip flights daily until ceasing service on March 31, 1914, which was five weeks after the termination of a three-month contract that had been signed with the St. Petersburg Board of Trade. This service greatly improved travel between the two cities, as travel by steamship took 2 hours, rail between 4 and 12 hours, and automobile around 20 hours (Bluffield, 2010).

Although the early days of aviation did not start and end at airports as we know them, these airfields did serve as the first airports. Whether in the form of a grassy field, sand dune, body of water, or other flat place, these first airfields served the unique needs of the early aviators. As more aircraft were built and the aviation industry began growing, the need for landing areas grew.

**Figure 1-4.**

The historic departure of Jannus and Pheil.

(Wikimedia Commons; see credit on page 623)



Providing dedicated airfields was seen as the best solution to this need. One way in which to do this was to develop dirt-only fields (see Figure 1-5). This option improved aircraft performance on takeoff roll, due to an elimination of the drag produced by grass. As can be imagined, however, these dirt landing sites were only usable in dry conditions. Muddy landing sites were, in fact, worse than the old grass landing sites. Often, race tracks, golf courses, or fairgrounds doubled as landing sites.

A significant boost in the quality of airfields came about with the addition of concrete landing areas. Portland cement, which had been invented in 1824 by English inventor Joseph Aspdin, was the preferred material. However, macadam or cinders were also used. Macadam was a type of road construction pioneered by Scotsman John Loudon McAdam around 1820. Single-sized aggregate layers of stone with a coating of binder as a cementing agent were mixed in an open-structured macadam. Cinder, on the other hand, is a small type of volcanic rock that has many uses, including material for road construction and decorative rock for landscaping, especially in the southwest U.S.

Possibly the first use of the term “airport” was by a Brazilian airship inventor, Mr. Alberto Santos-Dumont. According to the April 11, 1902 edition of *The New York Times*, Mr. Santos-Dumont explained his expectation that the city of New York would be “the principal ‘airport’ of the world in less than a score of years” (*The New York Times*, 1902). However, the nation’s first municipal airport was built in 1908 in Albany, New York. Located on a former polo field, the airport was moved to Westerloo Island after one year due to the unsuitability of the former polo field. Deemed an ideal location, Westerloo Island had long, level stretches of land bordering the Hudson River. During its early years, the airport welcomed such famous aviators as Glenn Curtis, Charles Lindbergh, Amelia Earhart, and James Doolittle. The mayor of Albany at the time, Mr. John Boyd Thacher II, once said, “A city without the foresight to build an airport for the new traffic may soon be left behind in the race for



**Figure 1-5.**  
Early landing strip.

(©iStock.com/andipantz)

competition.” So, in 1928, a new modern airport was built. The new airport originally consisted of 249 acres and contained two brick hangars and a brick administration building. As part of airport construction, three runways were built—the first was 2,200 feet long, the second 2,350 feet long, and the third measured 2,500 feet long. Two of the runways were paved with macadam and one with cinders. By 1930, Albany was known as the “aerial crossroads of the great Northeast.” Although the airport was closed for a brief period by the Civil Aeronautics Administration (CAA), it remains in operation to this day, overseen by the Albany County Airport Authority (Hakes, n.d.).

Although Albany Airport was initially funded by the City of Albany, its operation and upkeep during the first eight years was financed through a special fund established by the Albany Chamber of Commerce. Even in those early years, airports required financial resources for maintenance and operation. Airport maintenance during this time involved grading to maintain the level runway, mowing grass, and keeping the runway free of obstructions. In January 1939, however, the newly formed **Civil Aeronautics Authority (CAA)** closed the new airport to commercial flights declaring it unsuitable for use. This action was taken by the CAA following a long dispute between the city and federal officials over who should be responsible for paying for needed improvements to the airport. Mayor Thacher believed the city should not have to pay for improvements that would benefit national defense and commerce. The CAA disagreed and as a result, eventually closed the field to all air traffic. The city then initiated a **Works Progress Administration (WPA)** project to make the necessary improvements at the airport, resulting in the CAA allowing daylight operations to begin once again in December 1940. On January 21, 1942, the CAA, recognizing the improvements to the airport, allowed the airport to reopen for nighttime use. Except for wartime restriction, the airport has had uninterrupted flight service since that time (Hakes, n.d.).

The College Park Airport in Maryland was established by Wilbur Wright in 1909, one year after the Albany Airport. It claims the distinction of being the “World’s Oldest Continually Operating Airport.” It is indeed an airport with a long history. In 1909, after the U.S government agreed to purchase a Wright Flyer, the aircraft was officially accepted by the U.S government. However, the contract required the Wrights to teach two army officers to fly the plane. A field in the small town of College Park, Maryland, was selected for this flight instruction and the College Park airfield was established. Operating strictly as a general aviation facility, in 1977 the airport was added to the National Register of Historic Places (College Park Aviation Museum, n.d.).

Even so, very few airports were built during these early years of aviation. Rather than focus on areas at which to land aircraft, efforts were focused on improving the design of aircraft. In fact, by 1912, only 20 landing facilities were thought to exist in the U.S. Although this seems like a small number, this network of landing facilities was sufficient to meet the needs of aviation at that time. It is interesting to note that all of these landing facilities, including Albany and College Park, grew from fields or country clubs. They had not been designed as airports, per se (Mola, n.d.).

## World War I

However, the environment soon changed as **World War I** (WWI) began in 1914, triggered by the assassination on June 28 of Archduke Franz Ferdinand of Austria, the heir to the throne of Austria-Hungary. Thousands of aircraft were subsequently produced to serve in WWI, most of which were produced and utilized in France, Germany, and England (Figure 1-6). Of course, hundreds of pilots were needed to fly these aircraft and numerous landing facilities were needed to accommodate their operation. Although the U.S. Army had established three military airfields by the time WWI began, an additional 67 military airfields were established during the war to meet this need. These airfields provided facilities for fueling, maintenance, and aircraft parking. At the time, the military envisioned returning these airfields to grassland upon the war's conclusion.

By the end of WWI in 1918, the U.S. Army listed no less than 980 official landing fields. However, many of these fields were unsuitable for regular aircraft operations. For instance, pilots may have had to avoid flags, sand traps, and water hazards while landing on a golf course. Additionally, racetracks were generally sufficient for landing aircraft, but too short to allow for takeoffs. Some, however, worked quite well—including dry lakebeds in Nevada or long stretches of country roads. During this time, “aerial garages” were being built to accommodate aircraft storage and maintenance needs. These forerunners to contemporary hangars and maintenance shops were oftentimes built out of whatever materials were on hand, including the packing crates used for new aircraft delivery (Mola, n.d.).



**Figure 1-6.**  
Aviation in use during  
World War I.

(©iStock.com/igs942)

## Post World War I

Upon the conclusion of WWI, there were a large number of aircraft and skilled pilots that desired to utilize their talents. Conveniently, in 1918, the U.S. Congress appropriated \$100,000 for the first regularly scheduled airmail service. This route, between Washington, DC, and New York, was to be flown roundtrip once daily by U.S. Army Service pilots (Figure 1-7). Major Reuben H. Fleet was picked by Army Colonel E.A. Deeds to manage the first regular airmail flights. Although Assistant Postmaster General Otto Praeger and Fleet disagreed about landing fields, pilots, and the date airmail service would begin, the inaugural airmail flight occurred on schedule on May 15, 1918.

Interestingly, the two pilots selected for these inaugural airmail flights were not chosen for their experience or abilities; rather, they were the sons of politically important men. Lt. George Boyle was to fly from the Potomac Park Polo Grounds in Washington, DC, to a relay handover point in Philadelphia. Simultaneously, Lt. James Edgerton was to fly from Hazelhurst Field on Long Island, New York, to the same relay handover point in Philadelphia. Lt. Boyle's flight was a failure. He was inexperienced, encountered low visibility due to thick fog, flew a poorly equipped airplane in the form of an open cockpit Curtiss Jenny, and followed the wrong railroad tracks to Philadelphia. He quickly became lost,

flying for only 24 miles before landing in a field and flipping over. Although he was not injured, the mail he was carrying (3,300 letters weighing 140 pounds) had to be offloaded and placed on a train to Philadelphia. Lt. Edgerton's flight, however, was a success, leading the newspapers to declare this inaugural airmail service a success (Mola, n.d.).

Two months later, pilot Leon Smith refused to fly his route of New York to Washington, DC, due to rain, clouds,

and 200 feet visibility. Praeger ordered him to make the trip regardless of the weather. Smith and his fellow pilot, E. Hamilton "Ham" Lee refused to fly in those weather conditions. As a result, they were both fired, which then led to a strike by all pilots in the airmail system. After three days of talks, it was agreed that field managers would make a flight check in bad weather. If the field managers were not pilots, they would sit in the mail bin in front of the pilot to visually verify the weather. Flights would then continue only if the field manager gave the go-ahead (U.S. Centennial of Flight Commission, n.d.[c]).

Over the following three months, pilots flying these airmail routes were heartily challenged. With only a simple magnetic compass and maps with no elevations or landmarks, these pilots were pressured to maintain a six day per week schedule regardless of weather. In less than three months, the army had

**Figure 1-7.**

Early days of airmail in the United States.

(Wikimedia Commons; see credit on page 623)



made 270 flights and carried 40,500 pounds of mail. Although several pilots had been injured, none had been killed. However, the Post Office felt that the army had not sufficiently met the schedule and had been uncooperative. As a result, the army contract was cancelled and the Post Office began carrying the mail on August 12, 1918 (Mola, n.d.).

As the airmail system grew, so did the country's airports. Indeed, many communities began constructing airports to allow them a connection to the rest of the world. Early airfields built by the Post Office typically had a 2,000-foot by 2,000-foot square to allow for takeoffs and landings in any direction. Landing surfaces were generally of gravel or cinders, as they allowed for adequate drainage. Airfields generally ranged in size from 70 to 100 acres and consisted of a hangar, storage of gasoline and oil, a wind indicator, a telephone connection, and a location marker. By the end of 1920, there were 145 airports owned and operated by municipalities. Clearly, a national network of airports was being established (Mola, n.d.).

The first permanent, hard-surfaced runway in the United States, at 1,600 feet long, is thought to have been constructed at Newark, New Jersey, in 1928. Some airports were being developed by airlines. For instance, Pan American Airways, flying a Miami–Key West–Havana route twice daily, constructed the first U.S. land-based international airport: Pan American Field.

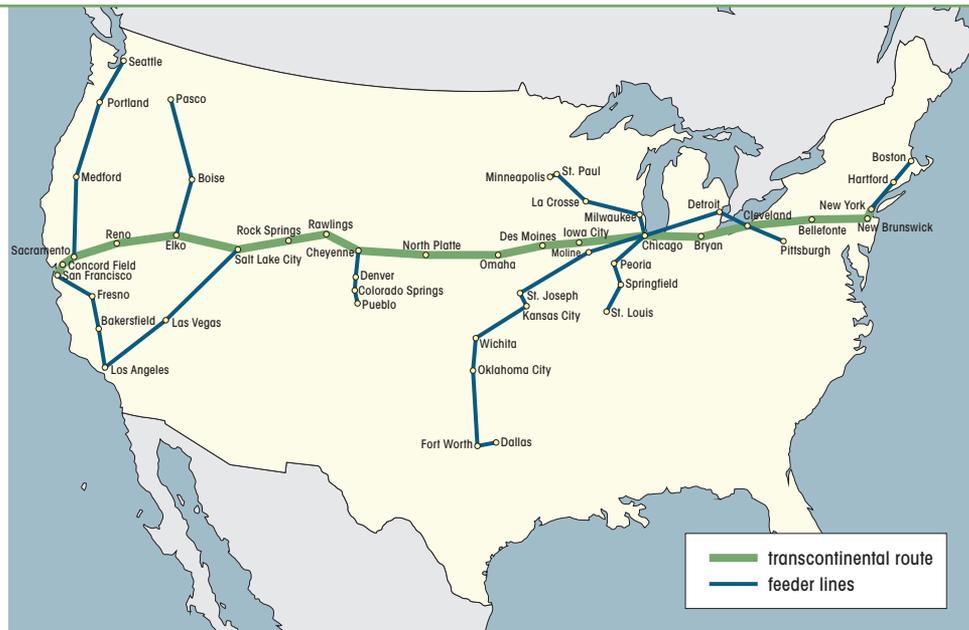
Yet as airmail began crossing the country successfully in the mid-1920s, the owners of various railroads expressed their frustration with the government's sponsorship of the airmail system. They felt that railroad profits were being negatively impacted due to the carriage of mail by air. Congressman Clyde Kelly of Pennsylvania, chairman of the House Post Office Committee, was a friend of the railroad industry and on February 2, 1925, sponsored H.R. 7064: the Contract Air Mail Bill, which, upon enactment, became the **Contract Air Mail Act of 1925**, also known as the **Kelly Act**. The act elevated airmail to another level by allowing the postmaster general to contract for domestic airmail service with commercial air carriers. It also set airmail rates and the level of cash subsidies to be paid to companies that carried the mail. The Act was successful in expanding airmail service without undue burden on the taxpayers. Routes created as part of the Act were known as **Contract Air Mail routes** or **CAM routes** (see Figure 1-8). Initial routes were flown between cities such as New York and Boston, Detroit and Cleveland, and Atlanta and Jacksonville. Eventually, a transcontinental route was established. In essence, this Act effectively established the commercial aviation industry. Indeed, several airlines that existed well into the twentieth century (such as Trans World Airlines, Northwest Airlines, and United Airlines) were formed during this time (U.S. Centennial of Flight Commission, n.d.[a]).

To financially support the airmail service, 80 percent of the airmail stamp revenues received by the Post Office were to be paid to the airmail carriers. The number of stamps needed depended on the weight of the mail and the number of zones the mail had to cross.<sup>1</sup> Due to the structure of the system, air-

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<sup>1</sup> The country had been divided into three air zones on July 1, 1924.

**Figure 1-8.**  
CAM routes.



mail operators realized that carrying smaller, but heavier, pieces of mail would result in greater revenues. Additionally, since they received the same amount of money regardless of the miles flown within a zone, they preferred shorter trips. Postmaster General Harry New, in an effort to encourage passenger service, encouraged operators to buy larger aircraft and engage the passenger.<sup>2</sup> Beginning in October 1925, New awarded eight airmail routes to seven airmail carriers.

In these early years of the aviation industry, the industry remained without regulations and as a result, there were many accidents. To enhance safety and increase public confidence in the industry, on May 20, 1926, the **Air Commerce Act of 1926** became law. This new law, considered the “cornerstone of the Federal Government’s regulation of civil aviation,” was designed to promote the development, and ensure the stability, of commercial aviation (Preston, n.d.). To achieve this, the Act created an Aeronautics Branch assigned to the United States Department of Commerce, and vested that entity with the fundamental regulatory powers needed to ensure civil air safety. The Secretary of Commerce was responsible for fostering air commerce, issuing and enforcing air traffic rules, licensing pilots, certificating aircraft, establishing airways, operating and maintaining aids to air navigation, and investigating aviation accidents and incidents. Initially, the Department of Commerce focused on safety rulemaking and the certification of pilots and aircraft. In time, they began further developing the nation’s system of lighted airways, as well as improving and introducing radio beacons. The first head of the Aeronautics Branch was William P. MacCracken, Jr., who, interestingly, received the nation’s first pilot license on April 6, 1927 (U.S. Centennial of Flight Commission, n.d.[a]; Preston, n.d.).

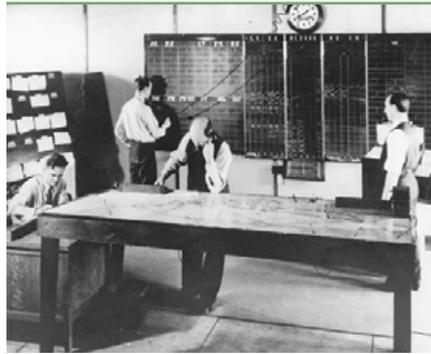
<sup>2</sup> To generate revenues from passenger service rather than the Post Office.

In 1934, an administrative order of the Secretary of Commerce effectively renamed the Aeronautics Branch as the Bureau of Air Commerce. Two divisions, air navigation and air regulation, made up the Bureau of Air Commerce. In one of its first acts, the Bureau encouraged a group of airlines to establish the first air traffic control centers (Newark, New Jersey; Cleveland, Ohio; and Chicago, Illinois) to provide enroute air traffic control. In 1936, the Bureau took over these centers. These early air traffic controllers used nothing more than maps, blackboards, and mental calculations to control aircraft (see Figure 1-9).

Although progress was being made in the regulation of air traffic, pilots, aircraft and airways, this was not the case for airports. In fact, the Air Commerce Act specifically prohibited the use of federal funding for building or maintaining airports. However, the political landscape changed with the stock market crash in October 1929. In response to this period known as the Great Depression, the federal government began a massive spending effort in civil works projects to stimulate the economy and employ the unemployed. As part of this, an exception to the prohibition on federal funding of airport projects was made. This allowed the **Civil Works Administration (CWA)**, and later the **Federal Emergency Relief Administration (FERA)**, to spend approximately \$11.5 million by spring 1934 for 943 airport projects in small cities, resulting in 585 new airports (U.S. Centennial of Flight Commission, n.d.[b]).

The following year, the WPA was established and funded by Congress with passage of the **Emergency Relief Appropriation Act of 1935** on April 8, 1935. The WPA was the largest of the “New Deal” programs put in place by President Franklin D. Roosevelt to put millions back to work and help Americans weather the Great Depression. The WPA employed millions to carry out public works projects, including the construction of public buildings, roads, and airports. Total WPA expenditures from 1936 to 1939 totaled nearly \$7 billion, although only about half of the expense for materials and equipment for an airport project were provided by the federal government. The other half was contributed by the airport sponsor. During its eight-year history, the WPA built 651,087 miles of highways, roads, and streets; and constructed, repaired, or improved 124,031 bridges, 125,110 public buildings, 8,192 parks, and 853 airport landing areas (Indiana University, n.d.).

While the Department of Commerce made great strides in improving aviation safety, several high profile accidents created doubt as to the department’s oversight responsibilities. In 1931, popular University of Notre Dame football coach Knute Rockne was killed in an aircraft accident. Four years later, U.S. Senator Bronson Cutting of New Mexico died in an aircraft accident. Thus,



**Figure 1-9.**

Early air traffic control in the U.S.

(FAA)

the public cry for greater federal oversight of aviation safety made this a top priority for Congress.

As a result, the **Civil Aeronautics Act of 1938** was signed into law. With this act, the civil aviation role of the Department of Commerce was transferred to a new independent agency—the Civil Aeronautics Authority (CAA). Now all functions and regulation of air transportation were under one authority. In addition, the Act created the Administrator of Aviation and the Air Safety Board. The CAA was mainly focused on the economic regulation of air carriers. In essence, the federal government now had the authority to regulate airline fares and airline routes. This form of regulation was important for the young airline industry and would continue for some 40 years, prior to the deregulation of the airline industry. The Administrator of Aviation was responsible for implementing the safety policies promulgated by the CAA, as well as addressing the construction, operation, and maintenance of the airway system. The role of the Air Safety Board was to investigate aviation accidents (Preston, n.d.).

By 1940, it was necessary to reorganize these agencies. Thus, the Reorganization Act was signed by President Franklin Roosevelt. The Act divided the CAA into two agencies. First, the **Civil Aeronautics Board (CAB)**, which evolved from the CAA, was responsible for safety rulemaking, accident investigation, and economic regulation of the airlines. Second, the **Civil Aeronautics Administration (CAA)** became responsible for air traffic control, airman and aircraft certification, safety enforcement, and airway development. Although both organizations were part of the Department of Commerce, the CAB functioned independently of the Secretary.

## World War II

Under Section 303 of the Civil Aeronautics Act, federal funding of airport construction was authorized as “reasonably necessary for use in air commerce or in the interest of national defense” (U.S. Centennial of Flight Commission, n.d.[b]). This “interest of national defense” was recognized by the administrator in September 1939, with the invasion of Poland by Nazi Germany. As a result, Congress authorized the appropriation of \$40 million for the **Development of Landing Areas for National Defense (DLAND)**. Under this program during **World War II**, the Secretaries of War and Commerce and the Secretary of the Navy authorized expenditures for airports. These airports were constructed if governmental units provided the land and agreed to operate and maintain the facility. Additionally, in 1940, due to an expansion of the Army Air Corps, many more airports were needed than had been appropriated under DLAND. In the end, a total of 986 airports were built nationwide under DLAND. (U.S. Centennial of Flight Commission, n.d.[b]; Murdock, 1997).

In total, during the 1939–1945 period of WWII, the federal government, through the CAA, expended more than \$353 million for the construction and