# ACRP

## REPORT 16

AIRPORT COOPERATIVE RESEARCH PROGRAM

Sponsored by the Federal Aviation Administration

# Guidebook for Managing Small Airports

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 16

# Guidebook for Managing Small Airports

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## AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

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Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

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# FOREWORD

By Michael R. Salamone
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*ACRP Report 16: Guidebook for Managing Small Airports* introduces the myriad issues facing small airports in the United States to airport practitioners. Generally, these practitioners—owners, operators, managers, and policy makers of small airports—are assumed to be responsible for a wide range of activities, often unrelated to the management responsibilities of the airport. This report presents the critically important issues that these practitioners will frequently encounter while wearing the airport manager's hat.

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Managers of small airports are responsible for a wide range of activities that include financial management, oversight of contracts and leases, safety and security, noise control, community relations, compliance with federal grant conditions, facility maintenance, and capital improvements. Yet these managers have varying degrees of experience and a range of backgrounds. Although some management guidance is available for their use, much of it is dated, focused on specific issues, intended for larger airports, or designed as a textbook rather than a practitioner's handbook. Research was needed to provide operators and managers of small airports with current, comprehensive advice on resources and techniques that can be applied to meet their responsibilities.

Under ACRP Project 01-01, the University of Minnesota, Center for Transportation Studies, contacted nearly 200 airport managers to identify critical issues facing small airports. This valuable input was an important step toward collecting this compendium of references and resources, which are vital links to finding viable solutions. Many of these airport managers participated in an early review of the draft guidebook to add value, utility, and significance to the final, published report.

The report has the added benefit of presenting a broad array of relevant material in a way that will assist new airport managers and other important airport stakeholders to understand small airport management. Moreover, it presents numerous resources and references, which are relevant to these issues and will help guide readers to solutions, regardless of their level of airport experience or role at the airport.

*ACRP Report 16* does not represent all material relevant to managing a small airport, nor is it intended to be a complete collection and dissertation of issues facing small airports. Many topics, which are relevant to small airports, warrant their own research and report. Nonetheless, this report is undoubtedly the most current informative resource about many of the most important issues in small airport management.

*ACRP Web-Only Document 5: Development of a Guidebook for Managing Small Airports* documents the research process and is available on the TRB website (www.trb.org) by searching for "ACRP Web-Only Document 5".

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SUMMARY

# Guidebook for Managing Small Airports

The objective of this project was to develop a guidebook for managing small airports that would be a single source of information for airport owners, operators, managers, and policy makers. The challenge lay in creating a guidebook that addresses an extraordinarily wide range of topics as succinctly as possible and that is relevant to an extremely diverse audience while presenting information in an easy-to-use manner.

Managers of small airports are responsible for a broad range of activities and interact with a variety of stakeholders on a daily basis. They must carry out their duties in accordance with an array of federal, state, and local regulations and ordinances. Many small airports operate under fiscally constrained circumstances that require maximizing scarce resources and utilizing county or municipal employees to perform certain functions, including snow removal, mowing, and pavement maintenance.

Very few small airport managers are trained in aviation management. They are hired or volunteer for the job because of an interest in or a passion for aviation. Many small airports have no airport manager, but rather are managed by elected or appointed local officials, such as a city clerk or a director of public works.

There is a great deal of published information pertaining to the management and operation of airports. The Federal Aviation Administration (FAA) and other government agencies have produced many publications relevant to airports, most of them regulatory in nature. State aviation offices also publish information for maintaining and operating airports within their jurisdictions. Over the years, many books have been written on the various aspects of managing airports. However, it can be difficult for managers of small airports to find the time to locate these publications and determine which parts of each publication are germane to the particular problem that needs to be solved.

To determine the most common issues facing small airports throughout the United States, the research team conducted an extensive literature review from which a survey was developed and administered to small airport managers via the Internet. Based on the results of the literature review and survey, the research team developed an outline for this guidebook around the most frequently identified issues and problems for small airports. The research team also attempted to capture unique or innovative practices already in use at small airports. Perhaps the most significant finding of the project is that small airport managers possess a wealth of practical information and, in general, are more than willing to share that knowledge with fellow airport managers. Consequently, often the best source of information for a manager of a small airport is the manager of the neighboring small airport.

The result of this project is a guidebook that addresses many of the topics related to managing small airports. This guidebook is an excellent source of information and current practices.

However, because of the diversity of small airports, both in terms of geography and size, and the ever-changing regulatory environment, it cannot be considered a single authoritative source. The intent of the guidebook, therefore, is to provide the reader with information on a subject and, more important, direction for finding additional information.

Guidebooks by their very nature are static. They represent the collective knowledge of a subject at a given point in time. The aviation industry, on the other hand, is extremely dynamic. As the air transportation system evolves, the challenges faced by small airport managers will change—and so too must the guidance provided to them. The research team encourages small airport managers to continually update their individual guidebooks with notes and additional materials, and to freely share that knowledge with other small airport managers.

CHAPTER 1

# Airport Organization

## Governance

### Types of Airport Ownership

Several types of ownership exist for public-use airports in the United States. Typically, ownership and operation of an airport are conducted by the same entity, such as a city, county, state, or special unit of government. Airports can be established and maintained by the following jurisdictions:

- Airport authorities,
- Counties,
- Municipalities,
- Joint county–city commissions,
- Park districts,
- Port authorities,
- Bi-state authorities, or
- Private owners.

The research team conducted a survey across the United States and found that most airports do have an airport manager responsible for it. As shown in Figure 1, 73% of respondents indicated that an airport manager managed their airport, while 13% indicated that the fixed-base operator (FBO) served as the airport manager.

### Structure and Role of the FAA, State, and Airport

The FAA is charged with making sure that aviation in the United States is safe. The FAA's major functions are to

- Regulate civil aviation to promote safety and fulfill the requirements of national defense;
- Encourage and develop civil aeronautics;
- Develop and operate a common system of air traffic control and navigation for both civil and military aircraft;
- Conduct research and development with respect to the National Airspace System and civil aeronautics;
- Develop and implement programs to control aircraft noise and other environmental effects of civil aviation; and
- Regulate U.S. commercial space transportation.

An administrator and deputy administrator head the FAA. Reporting to the administrator are six associate administrators who direct the line of business organizations that carry out the FAA's principal functions. The chief counsel and eight assistant administrators are responsible for other

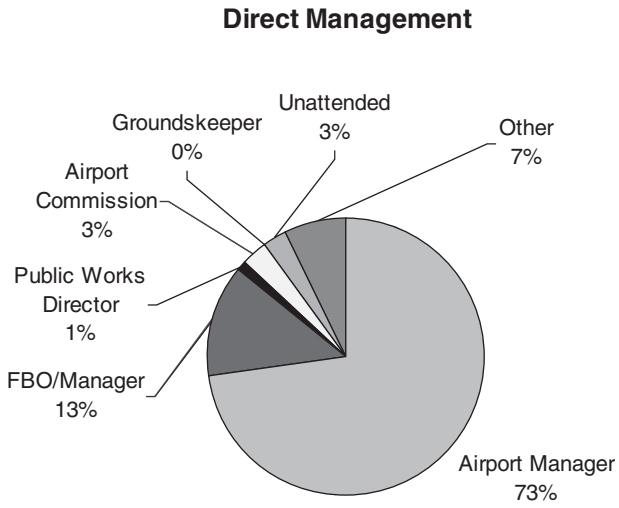


***Figure 1. Survey responses indicating party responsible for airport management.***

key programs. The FAA's field organizations include nine geographical regions and two major centers.

State aviation agencies organize, promote, and fund a wide variety of aviation programs. All states develop statewide aviation system plans and airport capital improvement plans. The states invest about $450 million annually in planning, operations, infrastructure development, maintenance, and navigational aids at 5,000 airports across the country. Many states also build, own, and operate their own airports. Each year, state aviation officials conduct safety inspections at thousands of public-use airports. Many states also license airports and thus conduct inspections to ensure statutory requirements are met. Countless aviation activities, such as statewide meetings, airport symposiums, pilot safety seminars, and aviation education forums, are also organized annually by states.

## Function and Roles of Airport Managers

An airport manager is typically responsible for the daily operations of the airport. The airport manager directs, coordinates, and reviews all aircraft operations, maintenance of the airfield and buildings, community relations, and financial matters of the airport. Some airport managers are also responsible for running the airport's FBOs under a separate agreement with the airport-owning jurisdiction.

No matter what specific duties an airport manager has each day, his or her number one responsibility is to operate a safe and efficient airport. The overall quality of the national airspace system depends on it.

An airport manager reports to, and receives direction from, the airport's owner or operator. The manager is also responsible for interpreting the functions and activities of the airport to the public. Public relations is an important function of airport management.

Airport management is a complex process of effectively directing resources toward the accomplishment of the airport's goals. Central to achieving these goals is the ability of the airport owner to administer the basic functions of management including planning, organizing, staffing, leading, and controlling.

The position of airport manager has often been described as a "jack-of-all-trades." Serving as a successful airport manager requires a variety of skills to accomplish the managerial functions. Based

on the preliminary research, several management principles and techniques pertinent to small airports have been identified:

- **Quality Management.** Airport managers must focus the efforts of employees to strive for improvements on meeting the needs of the public and airport customers. Airport staff must be provided training, tools, and resources to maintain high-quality facilities and services.
- **Team-Based Management Techniques.** Small airport managers can be overwhelmed with the varying tasks involved with the position and with leading staff, if any, toward meeting the airport goals. Airport owners can maximize resources available to managers through industry organizations, state and federal units of government, consultants, and other airport-related networks.
- **Consistency and Standardized Methods of Operation.** It is important for airport managers to strive for consistent enforcement of airport rules, standards, and policies. A standard method of operation establishes the means for ensuring organized growth and tenant satisfaction.
- **Communication Tools and Strategies.** Communication is integral to the success of the airport as an organization. Airport managers must communicate with governmental entities, customers, tenants, regulatory agents, commissions, boards, and the general public.
- **Coordination.** Proper coordination among public entities; federal, state, and local units of government; and airport tenants is integral to the success of the airport. Coordination is essential for orderly construction and development of the airport facility and to move forward with the objectives of the airport.
- **Building Public Goodwill.** Public relations is vital to the success of any small airport. Airport managers must implement a wide variety of marketing strategies aimed at maintaining a positive perception of the facility and for building community relations.
- **Strategic Planning and Coordination.** An airport needs an organizational vision, mission, goals, objectives, and direction. This is an essential function of airport management and is vital to the ongoing assessment of the airport's role in the community.
- **Fiscal Responsibility.** Fiscal responsibility is a critical component of airport administration involving the budgeting and expenditure of public and private funds. It is important to understand the financial position of the airport and communicate the economic impact of the facility.
- **Legal Responsibility.** Airport owners are responsible for legal policies and ordinances of the community and for mandated responsibilities such as EPA guidelines.
- **Environmental Stewardship.** It is important for an airport to be a good community "neighbor" regarding environmental issues such as stormwater pollution, noise, and land use.
- **Public Safety.** Programs and policies must be implemented to ensure the safety of both the aviation public and non-flying public.

## Function and Roles of Airport Staff

Airport staff members can also perform a variety of functions, including administrative functions, maintenance, daily operations, and coordination with FBOs. Many airports share airport staff with the airport's governing body. For example, the city or county may provide maintenance staff, equipment, and other resources for daily operations. The airport staff may also serve in administrative roles, especially if the airport manager is a part-time position or if the role is delegated to someone who provides that service as part of her or his other duties outside the airport.

Airport staff must be made aware of airport policies, liabilities, standards, and normal operating procedures, as they will conduct the daily operations of the airport and may serve as the primary contact for a variety of functions. They should have a basic understanding of the full scope of responsibilities of running an airport, as they will probably represent the airport manager when that person is not available.

### Communication and Coordination with Airport Owners and Boards

Communication and coordination with the airport owner and governing board is one of the airport manager's key roles. The manager serves as the airport's representative on site and to the public at large. The owner and governing board assign the manager's responsibilities, and he or she reports back to them. A good working relationship is required for smooth operations.

Typically, the manager performs the day-to-day functions of the airport owner or authority, acting for the board members or commissioners as necessary to maintain efficient operations. In doing so, it is the manager's responsibility to keep commissioners or board members informed of activities that may reflect upon them.

The airport manager may also benefit from advocating for the airport at the state or national level. To advocate for an airport at this level, it helps to know the role of state legislative committees, how the legislature is structured, strategies for communicating with local boards and commissions, and how to package requests effectively.

At the state level, typical committees with jurisdiction over airport issues are the transportation policy, transportation finance, and state and local government operations committees. A primary goal of any advocate is to get noticed and get his or her message out to policy makers, whether at the local, state, or federal level.

One strategy is to quantify needs and costs and make this quantification known to policy makers. In addition, the airport manager should explain why airports are important and why policy makers should care about their health and future. Finally, the airport manager should get to know policy makers before needing them. He or she should know who represents the airport at all levels, and then work on building a relationship with them. The time immediately following elections is a good time to contact lawmakers since they are not as busy then.

## Regulatory Compliance

### Federal Regulations

Publicly owned airports are subject to a variety of federal regulations, as specified in Title 14 U.S. Code of Federal Regulations (CFR), Chapters I and II, Federal Aviation Regulations (FARs). These regulations regulate aircraft, airmen, airports, and the national airspace system. Many of the FARs apply to small airports, and as with any legislation, the FARs may change. The current aviation regulations, as well as additional standards and guidance in the FAA Advisory Circular 150 series, are accessible online through the FAA website (www.faa.gov/regulations_policies).

The primary FARs that apply specifically to general aviation airports include the following:

- **FAR Part 77, Objects Affecting Navigable Airspace.** Part 77 establishes standards for determining obstructions in navigable airspace; outlines the requirements for notifying the FAA of certain proposed construction or alteration; provides for aeronautical studies of obstructions to air navigation in order to determine their effect on the safe and efficient use of airspace; and provides for public hearings on the hazardous effect of proposed construction or alteration on air navigation. Section 77.25 of this part establishes imaginary surfaces around airport runways, approach zones, and navigable airspace in the vicinity of the airport.
- **FAR Part 139, Certification of Airports.** Part 139 prescribes rules governing the certification and operation of land carriers that are conducted with an aircraft having a seating capacity of more than 30 passengers. It includes provisions describing the contents, preparation, and maintenance of an airport certification manual.

- **FAR Part 150, Airport Noise Compatibility Planning.** Part 150 applies to the airport noise compatibility planning activities of public-use airports, including heliports. It outlines the procedures for developing and submitting airport noise compatibility programs.
- **FAR Part 151, Federal Aid to Airports.** Part 151 provides detailed information regarding FAA airport construction and development grants. It also specifies that all airport development under the federal-aid airport program must be done in accordance with an approved airport layout plan. Each airport layout plan and any changes to the layout are subject to FAA approval. This part also lists the advisory circulars that are incorporated in the airport development standards.
- **FAR Part 152, Airport Aid Program.** Part 152 applies to airport planning and development under the Airport and Airway Development Act of 1970, as amended. It outlines eligibility requirements and application procedures; funding, accounting, and reporting requirements; nondiscrimination in airport aid programs; suspension and termination of grants; and energy conservation programs.
- **FAR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports.** Part 157 defines the requirements for notifying the FAA when proposing to construct, alter, activate, or deactivate a civil or joint-use (civil/military) airport or to alter the status of such an airport.
- **FAR Part 170, Establishment and Discontinuance Criteria for Air Traffic Control Services and Navigational Facilities.** Part 170 sets the federal criteria for the establishment of air traffic control services.
- **FAR Part 171, Non-Federal Navigation Facilities.** Part 171 establishes procedures for requests for instrument flight rules (IFR) procedures, minimum requirements for approval, performance requirements, installation requirements, and maintenance and operations requirements for non-federal aids to navigation. This could include VHF omnidirectional range (VOR) facilities, nondirectional radio beacons, instrument leading system (ILS) facilities, microwave landing system (MLS) facilities, and others.

## State and Local Regulations

Individual states and local units of governments may have additional rules and regulations to comply with. These may cover stormwater runoff and wetland protection, zoning, labor requirements and wage rates, working hours, product use, noise ordinances, and other issues.

State aeronautics offices typically work with local airports to educate them about these rules and regulations. Some states require airports to have a license to operate. State airport conferences can be a valuable tool for learning about current requirements and for communicating with other airports about suggestions for meeting those standards. Check with the state aeronautics contact and local jurisdictions for rules that apply in a specific area.

CHAPTER 2

# Airport Finance

## Finance

### Budget Development

An essential function of airport management is to successfully develop and implement an airport budget. Proper planning and allocation of financial resources for both short-term and long-term needs is an important part of the financial management of the airport. Budgets essentially plan the dollar amounts required to operate and maintain the facility for defined periods of time. Every airport, as any business operation, must develop an operating budget for the short term, which is typically one to two fiscal-year periods. Coordinated long-term planning is needed to determine capital expenditures such as runway construction, land acquisition, or major equipment purchases.

There are many types and formats of budgets an airport can use. Forms of budgeting vary and may depend on the style adopted by a larger governmental entity such as a city, which typically follows a line-item budget, program budget, or activity budget format. This guide will not attempt to cover in great detail the various theories and appropriation methods associated with budgeting. Rather, this section is meant to give the airport manager a general overview of the small airport budget process and a working knowledge of the application of that process.

#### *Income Sources*

Airport operations budgets are normally prepared for a one-year fiscal period. This budget shows the basic operating expenses and revenues of the airport and includes financial estimates on personnel costs, operating expenses, supply expenses, and other planned services. Most governmental entities compete with each other for public funds. In most cases, the goal is not necessarily to create a profit but to ensure that financial resources are available to safely and efficiently operate the facility as a component of the public infrastructure. The airport manager must assess the fiscal requirements to both keep the lights on and responsibly protect public welfare. In many cases, simply balancing the budget is the goal.

The amount of revenue generated at a small general aviation airport is typically small and is often supplemented with intergovernmental aid. Income sources normally attributed to the operation of the airport include

- Commercial land leases and rents,
- T-hangar lease agreements,
- Private hangar land lease,
- Agricultural land lease,
- Terminal concession rents,

- Fuel flowage fees, and
- Landing and ramp fees.

Local government tax subsidy is often required to offset the gap between budgeted revenues and expenses. Innovative airport managers have also developed programs to generate non-standard airport revenues through special rentals, billboards, or direct fueling of aircraft. Each airport is unique and may have attributes such as a geographic location that lends itself to possibilities such as scenic flights for hire. Other supplemental revenues may come from sources such as investments, sale of surplus equipment or property, or utilities. These income sources may vary widely between airports.

The goal of revenue generation should be to provide for an economically self-sustaining airport operation. Most general aviation airports do, however, require some form of tax subsidy to operate. In some cases, the governmental structure of the airport provides for its own taxing authority. This structure, or airport authority, operates somewhat more autonomously than the typical small general aviation airport. In other cases, it may be possible to operate the airport as an enterprise fund that is financially self-supportive through revenues generated in the department or organization. This overview will not attempt to differentiate between the varying airport structures for the purpose of describing the financial management process.

In preparing an airport operating budget it is usually easier to anticipate airport revenues as opposed to airport expenses. Revenues are generally tied to certain operating or rental agreements and are therefore more clearly defined. The next section will discuss the expenditure component of the airport operating budget.

### *Expenses*

Determining small airport expenses depends on many factors. The structure of an airport operation within a municipal organization varies, and many actual expenses are difficult to measure. For example, equipment operators or trade personnel labor costs at the airport may be hidden within another department budget. Therefore, the actual labor costs of the organization may not be reflected in the airport operations budget. Typically, the airport manager will organize and prepare a budget within the accepted budgeting methods for the municipal organization. This budgeting normally involves anticipating expenses for both operating and non-operating expenses.

Operating expenses are all of those costs associated with the actual operation of the airport. These costs may include labor, supplies, utility, and maintenance costs that are incurred on a day-to-day basis. These costs will vary considerably according to geographic region and the structure of the airport. For example, maintenance and equipment expenses may be significantly less in warmer areas of the country as opposed to those areas that require snow removal. Another example is the cost of maintaining an asphalt slab, which increases as it ages and varies due to weather and usage.

The accounting of non-operational expenses also depends on the position of the airport within an organization. The airport manager must consider these costs—which may include equipment depreciation and debt service on existing airport financial obligations.

## Economic Impact of an Airport

Most airports must justify their improvement projects to their city council, county board members, airport authority, or other governing bodies. Economic impacts are measured by the economic activity, earnings, and jobs generated by the airport activity or because the airport exists. Economic impact generated by a local airport can be either direct or indirect. In addition, an airport may generate multiplier impacts, which include money spent at or for the airport that flows through the regional economy.

Direct impacts can include any of the following:

- Airlines,
- Air cargo carriers,
- Air taxis or charters,
- Aircraft services,
- Airport management and operations,
- Car rental agencies,
- Corporate flight operations,
- Freight forwarders,
- Fixed-base operators,
- Government projects based at airports, or
- Airport tenants.

Indirect impacts may be generated from expenditures by airport users or from regional expenditures at local businesses as a result of airport use or travel.

Some examples of indirect impacts generated by aircraft activity or users are

- Food and beverage sales,
- Lodging,
- Entertainment,
- Retail sales,
- Travel agencies, and
- Ground transportation.

To calculate the economic impact of aviation, direct and indirect impacts must be measured, along with an assessment of the multiplier effect. A study on the economic impacts of Minnesota airports, completed by Wilbur Smith Associates in January 1999, examined 20 Minnesota airports in four different categories: commercial service, key airport, intermediate, and landing strip (*1*).

The study found that economic activity for commercial service airports ranged from $13 million to $168 million, with an average of $61 million. Earnings generated from the airports ranged from $409,000 to $54 million, with an average of $13.1 million. For the airports studied, 20 to 3,061 jobs were generated, with an average of 760.

A summary of the study's findings for three of the airport categories is given in Table 1.

One way to show the importance of an airport and its growth is by calculating its economic impact on the surrounding community. This calculation will easily illustrate how the community benefits from having an airport close by, regardless of its size. William Gartner, professor of applied economics at the University of Minnesota, researched and developed a tool that airport

**Table 1. Summary of 1999 Wilbur Smith Associates study.**

| Airport Descriptor | Economic Activity | Earnings | Jobs Generated |
|---|---|---|---|
| Key airport (runway longer than 5,000 ft w/o commercial service) | $1.8 million to $5.5 million (average: $3.4 million) | $556,000 to $1.6 million (average: $1.1 million) | 25 to 74 (average: 54) |
| Intermediate system (paved runway < 5000 ft long) | $224,200 to $6.9 million (average: $1.7 million) | $65,000 to $2.1 million (average: $508,000) | 3 to 92 (average: 23) |
| Landing strip | $65,300 to $393,000 (average: $217,000) | $64,300 to $123,000 (average: $70,000) | 1 to 6 (average: 4) |

SOURCE: Wilbur Smith Associates (*1*)

personnel can use to calculate the economic impact of their airport (*2*). The calculator was designed for 134 airports in the state of Minnesota. It was not designed for use at Duluth International, Minneapolis–St. Paul International, and Rochester International Airports.

People assess economic impacts in many different ways, so defining economic impact can be challenging. This tool defines the economic impact as "the result of expenditures or sales transactions between businesses or other entities that can be directly traced to the presence of a particular facility, activity, or related service" (*2*).

Following are several input variables used in the Gartner tool for determining the economic impact of an airport.

- Public ownership:
  - Total dollar figure provided by all government sources for yearly operation of the airport; and
  - Amount of money spent for construction during the year for which the financials are being reported.
- Fixed-base operator and other aviation businesses:
  - Number of full-time annual employees;
  - Number of full-time seasonal employees;
  - Number of part-time annual employees; and
  - Number of planes operated by the FBO.
- Commercial scheduled air service:
  - Number of enplanements recorded at the airport during the last year;
  - Percentage of enplanements that are recorded by local residents;
  - Number of employees maintained at the airport by the airline providing the service; and
  - Number of TSA employees maintained at the airport.
- Retail businesses located at the airport—Number of employees maintained by the business.
- Overnight use by general aviation pilots and other visitors:
  - Amount of overnight use accounted for by general aviation pilots; and
  - Number of tourists that access the region through the airport but not as pilots.
- Businesses that ship freight:
  - Number of times a particular business uses the airport each week; and
  - Distance in miles from the airport in use to an airport with similar facilities.
- Businesses that own hangars and do their own aircraft maintenance:
  - Number of full-time annual employees;
  - Number of full-time seasonal employees;
  - Number of part-time annual employees; and
  - Number of planes operated by the FBO.
- Nonprofit or government entities:
  - Number of full-time annual employees;
  - Number of full-time seasonal employees;
  - Number of part-time annual employees; and
  - Number of planes operated by the FBO.

Most economic impact studies are performed by consultants for specific airports. There are very few economic impact calculators available online for free, and those that are available, such as the one developed by the University of Minnesota, tend to be regionally focused and may use dated information. The FAA provides guidance for determining an airport's economic impact in *Estimating the Regional Significance of Airports,* but the publication was last updated in 1992. The American Association of Airport Executives offers a service through its website to produce General Aviation Economic Impact Statements for a fee. For small airport managers who want to

determine their airport's economic impact, the best initial source of information is their state's office of aeronautics.

## FAA Policy and Procedures Concerning Use of Airport Revenue

Since 1982, the U.S. Congress has passed legislation establishing the Airport Improvement Program (AIP), which provides federal grant funding; creating the authority for airport operators to levy Passenger Facility Charges (PFCs); and governing how airport revenue is generated and used. Both the U.S. DOT and the FAA have established regulations and issued policy guidance to provide specific direction to airport operators regarding the eligibility and use of AIP funds, PFC revenue, and airport revenue. Several regulations and policies regarding airport rates and charges, which relate to how airport revenue is generated, have also been issued.

## Land Acquisition (Negotiating and Paying Fair Market Value)

Whenever feasible in constructing or expanding an airport, the FAA encourages the airport owner to use its existing owned land. However, in the event that additional land is necessary for project purposes, private property may be acquired. When receiving federal funding for an airport project, the airport owner must ensure that its property acquisition and its provision of relocation assistance and payments to displaced persons conform to applicable federal requirements. The airport owner must also adhere to state laws, which may be more restrictive.

First, the airport owner determines the specific land requirements for a particular airport development or noise compatibility project. Property can be obtained through several methods, such as purchase of property interests (in fee) or through eminent domain (condemnation). It can also be acquired through easements or by donation or exchange. Unless received through donation, private property is acquired by the airport owner through payment of just compensation to the property owner.

To ensure that fair market value is paid, the airport owner should arrange for a competent, independent, real property appraiser familiar with local property values to appraise the property. The appraiser will inspect the property and set forth an opinion of its current fair market value in a formal appraisal report. This report will be reviewed by a review appraiser for conformance to acceptable appraisal standards and FAA requirements. After the report is approved, it is used as the basis for the airport owner's written offer to purchase the property.

Fair market value is usually defined as the amount of money that would normally be paid for property in a sale between a willing seller, not compelled to sell, and a willing buyer, not compelled to buy. The amount is generally considered by the courts to be "just compensation" under the Fifth Amendment of the U.S. Constitution. Fair market value does not take into account intangible elements such as sentimental value, goodwill, business profits, or any special value that the property may have for the owner or for the government, nor does it include costs and expenses for the landowner's relocation.

After just compensation has been determined for a piece of property, an airport owner's representative will call to negotiate for its purchase. The representative will discuss the basis of the offer to buy the property with the owner, and the offer will be for no less than the amount of the approved appraisal. Landowners can get their own appraisal, and that appraisal will be paid for by the airport.

Owners are given a sufficient period of time to consider the offer. When an agreement on the price is reached, a sales contract is prepared. Upon execution by the airport owner, the contract becomes a binding agreement.

Airport owners can take only a part of a property parcel. If the acquisition of a portion of property leaves an "uneconomic remnant," the Uniform Act requires that the airport owner offer to acquire the remnant at its fair market value.

Power to acquire private property for public use is known as the power of eminent domain. Most airport owners have this power, which is an inherent power of the local government derived from its sovereignty, as well as a power implied by the Tenth Amendment of the U.S. Constitution. State laws vary and must be followed.

## Revenue Generation

With construction costs increasing, available funding decreasing, and periodic economic downturns affecting the industry, airport operators find themselves continually looking for additional revenue sources to fund projects and sustain operations. Typically, one thinks of fuel sales, hangar leases, agricultural leases, and grants as primary sources of revenue, but there are other ways to bring money into an airport and resources to describe those methods.

In the survey conducted to identify key issues for this guidebook, respondents were able to list more than one type of revenue generation method. The primary sources of revenue for general aviation airports that were gleaned from the 211 responses are shown in Table 2.

Fuel sales account for most of the respondents' revenue generation, followed closely by land leases, T-hangar leases, and rent. Other sources were mentioned by 34% of those surveyed, including industrial park revenues, advertising, parking fees, and residential or office rent on airport property. Agricultural leases are often in place at airports, and from the survey, they appear to be a common revenue generator across the United States as well.

In addition to the survey, information on revenue generation can be obtained from *ACRP Synthesis 1: Innovative Finance and Alternative Sources of Revenue for Airports* (*3*). The objective of the report is to inform airport operators and policy makers about alternative financing options and revenue sources currently available or that may be available in the future. The synthesis report provides a brief overview of common capital funding sources used by airport operators, a review of capital financing mechanisms used by airports, descriptions of revenue sources, and a review of privatization options that may be available.

Nationally, the principal sources of funds for airport capital projects, listed from most frequent to least frequent, are

- Proceeds of bonds and other forms of debt;
- PFC revenues;
- AIP grants from the Airport and Airways Trust Fund, administered by the FAA;
- Internally generated capital resulting from retained airport revenues;

**Table 2. Primary sources of revenue generation for general aviation airports.**

| Revenue generation method | Respondents indicating they use this method of revenue generation |
|---|---|
| Fuel sales | 63% |
| Commercial land leases and rent | 60% |
| T-hangar leases | 59% |
| Other methods | 34% |
| Private hangar land leases | 32% |
| Agricultural leases | 32% |
| Landing or ramp fees | 20% |
| Tax subsidies | 19% |
| Terminal concession rents | 17% |

- Security grants from the general fund and administered by the TSA; and
- State grants and local financial support.

Some airport operators (typically at large- or medium-hub airports) regularly use municipal bonds. Many airports have maintained investment-grade ratings from credit rating agencies. In addition to bonds, the ACRP synthesis study found that, to finance capital projects, some airport operators have used bond and grant anticipation notes, pooled credit programs, and capital leases. They have also reduced interest rates on outstanding bonds and managed interest rate risk by entering into interest rate swaps with investment banks.

Note that most airports do not have bonding authority, but their associated municipality may. Although the methods outlined previously have been used primarily by large- or medium-hub airports, other options exist for smaller general aviation airports. Many forms of non-airline revenue generators may be used to bring money into an airport. Like the survey, the ACRP synthesis study found that airports nationwide have developed many programs to maximize revenue sources:

- **Fuel sales.** As noted in Table 2, 63% of airport managers responding to the general aviation survey noted that fuel sales and flowage is their means of generating revenue. Pilots may stop at a general aviation airport simply because it has fuel and they want to avoid the congestion and traffic at a larger airport. Many things must be considered when initiating fuel service including storage, staffing, insurance, and environmental issues.
- **Airport parking revenues.** Parking continues to be a reliable source for airport operators. The synthesis study identified additional opportunities for increasing parking revenues, such as offering premium parking services, parking lot enhancements, parking for non-airport use, and collecting off-airport privilege fees.
- **Rental car revenues.** In addition to privilege fees and rentals, at some airports each rental car concessionaire collects a customer facility charge. These funds are used to pay the operating and capital costs of a consolidated rental car area or structured facility and may include the cost of transportation to the terminals.
- **Terminal concessions.** Depending on the size of the airport and terminal facility, retail or concession sales at airports could bring in revenue. At commercial service airports, concession sales have increased dramatically as airlines discontinue meal service and passengers arrive earlier to get through security. Airport operators have been able to maximize revenues by reinventing their terminal concessions programs to recognize the customer and create an inviting shopping or dining experience.
- **Advertising programs.** Several airports are cashing in on advertising revenue. Modern airport advertising programs specialize in the sales and maintenance of advertising sites at airports by using technology, sponsorship opportunities, and nontraditional advertising locations.
- **Commercial development and land use.** Airport operators have generated revenue from a variety of revenue-producing leases from non-airline operations including manufacturing, warehousing, freight forwarding, and farming on airport land. Commercial development and land use have been accomplished through coordinated planning efforts, mindful of FAA restrictions on land development.

The ACRP survey also identified the following innovative methods to generate revenue :

- **Late fees on leases.** Several airports reported that they charge late fees on leases, and one airport noted that it received over $15,000 one year on late fees alone.
- **Innovative pavement use.** Airports are charging for the use of closed runways and other pavement for driver training and motorcycle safety courses. Several airports rent out their airport for use in filming commercials.

- **Golf course land lease.** Golf courses are not considered compatible land use by the FAA, but rules may vary from state to state. In areas where they are allowed, airports may lease land owned by the airport and adjacent to the airfield for golf course development.
- **Industrial park land leases.** Many airports reported building industrial parks and warehouse space on airport land adjacent to the airfield.
- **Donations and fundraisers.** Several airports hold fundraisers and solicit large donations from airport supporters.
- **Other Leases.** One airport indicated that it leases space on the beacon tower for a cell phone antenna.

## Leasing and Use Agreements

An airport manager must be familiar with the many types of airport leasing and use agreements used at small airports. Airport leases may be considered commercial use agreements or non-commercial use agreements. An array of other leases may be present at an airport facility, depending on the nature of the operation considered, such as agricultural operations or other non-aviation–type uses.

It is important that an airport manager work toward consistency in the application and enforcement of lease administration and policy. This consistency is particularly important for operators of airports with commercial use agreements. Airport sponsors of federally obligated airports (see "Compliance with Grant Conditions" in this chapter) must also ensure that certain grant obligations are being met with regard to airport leasing policy. This guidebook will provide a basic overview of several components to successful lease administration at a small airport.

Further research is being conducted in this area. The ACRP funded ACRP Project 01-02, "Guidebook for Developing and Managing Airport Contracts," and ACRP Project 01-08, "Guidebook on Best Management Practices for Leasing and Developing Airport Property." The reports from ACRP 01-02 and ACRP 01-08 are expected to be published in 2009 and 2010, respectively. For a list of ongoing ACRP projects relevant to managers of small airports, please refer to the appendix.

### Minimum Standards

Owners of public-use airports routinely allow businesses to conduct commercial operations and other aeronautical activities from the airport. Commercial operators normally enter into a lease agreement or contractual arrangement with the airport owner allowing for the commercial operation or operations contemplated by the operator.

It is essential that an airport manager develop reasonable criteria for the accommodation of commercial aeronautical services on an airport. The FAA encourages operators of public-use airports to develop such criteria in the development of minimum standards.

> Airport sponsors must agree to make the opportunity to engage in commercial aeronautical activities available to any person, firm, or corporation that meets reasonable minimum standards established by the airport sponsor. The FAA suggests that airport sponsors establish reasonable minimum standards that are relevant to the proposed aeronautical activity (*4*).

The FAA suggests further in Advisory Circular (AC) 150/5190-5 that the objective of developing minimum standards is to promote safety in all airport activities, maintain a higher quality of service for airport users, protect the public from unlicensed and unauthorized products or services, enhance the availability of adequate services for all airport users, and promote the orderly development of airport land (*4*).

Minimum standards are also implemented to ensure that each like operator is meeting the same basic standards and that no one operator is given an advantage over others by the airport. Airports that have accepted federal funds agree to allow commercial entities the opportunity to engage in commercial aeronautical activities subject to meeting reasonable minimum standards established by the airport.

Every airport is unique and in developing minimum standards the airport manager must attempt to draft a set of standards tailored to that particular airport. Careful consideration must be given to the specific conditions at an airport. Use of "boilerplate" standards may not be effective and may lead to unreasonable standards.

Each airport should consider a variety of factors when establishing minimum standards. A detailed examination of the particular nature of anticipated commercial activities and the operating environment at the airport is required. In FAA AC 150/5190-5, the FAA suggests that the following factors be considered:

1. What type of airport is at issue? Is it a large airport or a small rural airport? Will that airport provide service to only small general aviation aircraft or will it serve air taxi operators as well?
2. What types of aeronautical activities will be conducted on the airport? Is there a demand for the business?
3. How much space will be required for each type of aeronautical activity that may prospectively operate at the airport?
4. What type of documentation will business applicants be required to present as evidence of financial stability and good credit?
5. To what extent will each different type of aeronautical activity be required to demonstrate to the sponsor compliance with sanitation, health, and safety codes?
6. What requirements will be imposed regarding minimum insurance coverage and indemnity provisions?
7. Is each minimum standard relevant to the aeronautical activity for which it was designed to apply? For example, the minimum space required for a repair station might not be relevant to an air taxi operation. Avoid unreasonable standards by selecting elements that accurately reflect the nature of the aeronautical activity in question.

Minimum standards should be developed to establish an actual set of requirements to accommodate a range of commercial activities. Commercial aeronautical activities may include such aeronautical activities as aircraft maintenance, fueling, charter, flight training, sales, rental, and parts.

Entities authorized to provide commercial aeronautical services at an airport are commonly referred to as FBOs. Many FBOs offer a full range of commercial services. In other cases, specialized aviation service operators will apply to provide only a single or limited aeronautical service. Care should be taken to develop reasonable, relevant, and applicable standards for each type and class of service. For example, a space requirement for a specialized service such as avionics repair that is the same as for a full-service FBO may not be reasonable.

Because airports are always changing and growing, minimum standards should be flexible to allow for changing conditions in the airport environment. Minimum standards should be somewhat dynamic and reviewed by airport management periodically. Care should be taken to not adopt standards merely to accommodate a single operator or to establish unreasonable criteria that may lead to a service monopoly. It is incumbent upon an airport manager to use consistency in the enforcement and application of standards. This consistency will also reduce potential conflict and promote the orderly development of the airport by "leveling the playing field." Airport

management can contact its local FAA airports district office (ADO) for assistance in developing reasonable minimum standards.

Minimum standards are often made part of an airport's commercial leases and address requirements such as intended scope of activities, site development standards, personnel experience, financial stability, and insurance.

## Flying Clubs

A flying club is typically a nonprofit entity formed as an organization, corporation, association, or partnership with the purpose of providing its members with a jointly owned and operated aircraft.

Minimum standards will often address the requirements set forth by the airport to operate the club from the airport. Standards established for flying clubs should provide for the noncommercial use of the aircraft for such things as charter, flight inspection, or rental. Entities established as flying clubs for the benefit of their members should not be authorized to provide commercial services to the public.

## Rules and Regulations

The FAA highly recommends that the airport owner establish rules and regulations for the safe, orderly, and efficient operation of the airport. Rules and regulations are often referenced in airport lease agreements but are developed to apply to all persons using the airport for any reason.

Like minimum standards, rules and regulations should be tailored for individual airports with public safety, preservation of facilities, and protection of the public in mind.

Airport owners of federally obligated airports are required by grant assurances to establish and enforce fair, equal, and not unjustly discriminatory airport rules and regulations.

Rules and regulations typically cover the general use of the airport for such issues as

- Aircraft rules,
- Personal conduct,
- Animals,
- Smoking,
- Waste containers and disposal,
- Storage,
- Pedestrians,
- Vehicle operations,
- Fueling safety,
- On-airport traffic rules,
- Environmental restrictions,
- Airport residences,
- Hangar construction, and
- Fire safety.

Airport managers should periodically review established airport rules and regulations.

## Exclusive Rights

FAA AC 150/5190-5, *Exclusive Rights and Minimum Standards for Commercial Aeronautical Activities,* provides airport managers with guidance pertaining to sponsor assurances and exclusive

rights. When formulating airport leases, use agreements, and minimum standards, airport management must ensure that policy does not have the effect of excluding others, either intentionally or unintentionally, from participating in an on-airport aeronautical activity. Language contained within both the airport minimum standards and operating leases should expressly provide for nonexclusive rights.

An airport obligated by federal grant assurances must be available to the public and accessible to those wanting to conduct aeronautical activities on the airport. An airport sponsor should ensure that an exclusive rights violation does not occur by any means. A monopoly on aeronautical services cannot be created by express agreement or by any other method, including requiring unreasonable minimum standards.

Situations may occur for which it appears that an exclusive right has been granted that does not constitute an exclusive rights violation. This guide will touch on these exceptions, but airport sponsors are encouraged to review these situations with the nearest FAA ADO for clarification. FAA AC 150/5190-5 provides for these exceptions, generally summarized as follows (*4*):

- The owner of a public-use airport may provide aeronautical services to the public at an airport. This proprietary exclusive right may be in the absence of a qualified commercial operator or when in the best interest of the public. The proprietary exclusive right most often occurs when a municipality elects to provide fuel service to aircraft.
- At some airports there may be only one aeronautical service operator providing one or all of the services available. This might occur when only one operator has applied to provide these services with no competition present. As long as the airport owner allows for the opportunity to offer a commercial aeronautical activity at the airport, an exclusive rights violation does not exist.
- There may be situations at small airports with minimal space suitable for aeronautical activities in which a single operator already occupies all available space. An exclusive rights violation may occur if an airport owner unjustly leases all available space to a single user.
- An airport sponsor may also deny an operator of aeronautical activity the right to operate on an airport for safety reasons. Restrictions based on safety should be discussed with the local ADO. The FAA is often the final authority in these matters of compromises of safety.
- Airport owners should not attempt to prohibit aircraft owners the right to self-service. Aircraft owners are entitled to maintain, fuel, and service their own aircraft subject to reasonable rules and regulations of the airport.

## Rates and Charges

Central to the preparation of all airport lease agreements is the incorporation of rentals and fees for the use of airport property, equipment, facilities, services, and buildings. Airport managers must establish rates and charges that help offset the cost of operating the airport facility. There are no set guidelines or standards on what individual airports should charge tenants. An airport in and of itself is not necessarily a commercial entity, but rather, a publicly funded facility. Therefore, rates should be established to reflect the cost of providing the facility, maintaining and administrating the facility, recovering capital expenditures, and any other costs associated with the airport operation.

It is not always practical to charge users for only those facilities or services they receive. Most users of the airport facility will also take advantage of common-use areas of the airport as well as airport-maintained airside facilities and navigational aids.

A common method of establishing airport rates and charges is by researching what other neighboring airports are charging for like services and facilities. When surveying other airports to determine a market basis for setting airport rates, the surveyed airports should be as comparable as possible (*5*). The difficulty in using this approach is that the outcome may not accurately reflect

the actual costs of providing the facilities or services. Another approach, referred to as the compensatory approach, is based on cost recovery for actual costs of facilities and services (*6*). There are many versions of the compensatory approach developed primarily for air carrier airport applications. Airports have commonly used a compensatory or a residual rate–making methodology, or some combination of both, to cover costs in the airport/airline relationship. The airport/airline relationship is discussed in greater detail in Chapter 6, "Commercial Service," and described in *Airport Planning and Management* (*6*). For the purposes of this section and small airport management, the compensatory approach essentially means cost recovery for actual airport facilities and services.

In most cases airport owners will utilize a mix of both market-based pricing and cost-recovery pricing in determining rates and charges. The way that fees are determined also depends largely on the structure of airport leases. Short-term agreements allow management the ability to adjust rates more frequently as required. Long-term contracts and airport lease agreements may not allow for these types of adjustments. It is fairly common to establish rate escalators in longer-term lease arrangements. The FAA recommends that all leases with a term exceeding five years provide for periodic review of the rates and charges for the purpose of adjustments to reflect the then-current values. This process also establishes parity of rates between new operators coming on to the airport and long-term tenants (FAA Order 5190.6A, *Airport Compliance Requirements*).

Of course, the nature of the activity contemplated under the lease will affect the determination of how charges are calculated. Commercial users, hangar renters, FBOs, or agricultural land leases, for example, all may require varying approaches to establishing rates depending on the activity.

A general aviation airport may also establish rates for terminal charges, airfield charges, and buildings and grounds charges (*5*). Terminal charges might involve such things as use of conference facilities, concessions, gift shops, car rentals, or office space. Airfield charges include fuel flowage fees or landing and ramp fees. Fuel flowage fees, often established at general aviation airports, are collected on gallons of aviation fuel dispensed. This fee is often collected from private commercial operators as part of the lease agreement. Other fees or grounds charges may be established for use of airport buildings and grounds for a variety of uses, such as the construction of private hangars or special events.

The airport manager should apply reasonable fees for airport rentals or other charges in a uniform manner for like uses. For example, an FBO should be subject to the same rates and charges as another FBO making use of similar facilities or services.

## Terms and Conditions

Careful consideration should be employed in determining the terms and conditions to be incorporated into an airport lease agreement. This is particularly the case with regard to commercial use agreements. The contract between a public entity and private business normally involves the right to occupy and use designated premises in the form of a lease.

The airport manager must negotiate a term consistent with other airport leases, goals, and objectives with the understanding that the commercial tenant may be contemplating a significant investment at the airport. The lease of land or premises should consider a term long enough to amortize the investment to which the tenant will be committed (*5*). The terms of the lease must, however, be consistent with the master plan for phased airport development and land use.

Airport lease agreements should also specify permitted uses and premises to be leased, establish rental rates and payments, and spell out the responsibilities of each party. Other conditions of the lease should contain provisions for required insurance, sub-leasing, and termination. It is

also important that the agreement cite the applicable operating standards, codes, ordinances, or policies of the airport.

The airport manager should establish a lease policy allowing for standardization among tenants engaged in similar activities. Basic lease conditions should be consistent between like tenants. Additionally, federal sponsor requirements should be made part of the airport lease agreements. These would include language pertaining to nonexclusive rights, use of airport, non-discrimination, and airport commitments to federal or state agencies.

## Liability and Insurance

Airport owners should ensure that the airport is protected with adequate airport liability insurance coverage. Airports and their tenants have the same general type and degree of liability exposure as the operator of most public premises. Principal areas in which claims may arise include aircraft operations, premises operations, and sale of products (*7*).

Basic types of insurance coverage include

- Basic Airport Premises Liability—covering losses arising out of liability for activities conducted on the airport (purchased by the airport owner);
- Products Liability/Completed Operation Liability—covering losses arising out of claims related to the sale of products or completed services (purchased by the service operator); and
- Hangar Keepers Coverage—covering aircraft damage while in the care, custody, or control for storage or safekeeping (purchased by the hangar or aircraft owner).

Other types of coverage include liability insurance for airport events or personal and advertising injury liability.

Airport owners should ensure that satisfactory insurance requirements are contained within the various lease agreements at the airport. Important considerations in the preparation of leases are provisions for indemnification and workers' compensation. It is recommended that airport lease policy with respect to insurance requirements provide that the airport owner is named as additionally insured.

Airport managers should review lease insurance requirements periodically with their insurance providers, risk managers, and attorneys.

## Airport Development Funding

Funding for airport development comes from five primary sources: federal AIP grants, PFCs, state and local funding, tax-exempt bonds, and airport revenue. Different airports use different combinations of these sources depending on the individual airport's financial situation and the type of project being considered. Small airports depend more on AIP grants than large- or medium-hub airports. The larger airports, whose projects tend to be much more costly, are more likely to finance projects through bonding. Airport development bonds are usually repaid through PFCs or other airport revenues.

### Grant Programs

Development of public airport facilities with minimal revenue-generating opportunities normally depends on grant programs offered by the FAA and state departments of aeronautics. The FAA has determined that these programs are necessary to provide for funds critical to airport devel-

opment as part of the National Airspace System (NAS). This section will discuss, in general, the background and provisions of these grant programs. A thorough understanding of available state and federal grant programs available to public airport owners will benefit the airport manager.

### *FAA Airport Capital Improvement Plan*

To meet the present and anticipated needs of civil aviation, the FAA has developed a detailed process for prioritizing eligible projects within the system and a methodology for planning the funding of system projects.

FAA Order 5100.39A, *Airport Capital Improvement Plan,* describes in detail the development of the national Airports Capital Improvement Plan (ACIP). This plan also serves as the basis for the distribution of grant funds under the AIP. The stated purpose of the ACIP is to allow the FAA, by identifying and investing in airport development and capital needs, to ensure to the American public that the national airspace system is a safe, secure, and efficient environment for air travel nationwide.

The ACIP employs a matrix of components such as numerical prioritizing equations, ratings, and project codes to assist in the ranking of eligible projects. Other factors also considered in the prioritization process include state and local priorities, impacts on safety, airport growth, and environmental issues, to mention a few. Through the ACIP process a plan can be developed that assesses the system needs with funding projections, providing a foundation for decisions regarding the AIP.

The National Plan of Integrated Airports System (NPIAS) provides Congress, the industry, and the general public with a planning tool that identifies significant airports and their roles, present conditions, and a cost estimate for system developments. The NPIAS is issued every two years. Public-use airports are categorized as commercial service airports, general aviation airports, reliever airports, privately owned public-use airports, and other general aviation airports.

In general, funding decisions made for the allocation of AIP dollars consider the findings of the NPIAS, comprising primarily commercial service airports, reliever airports, and certain general aviation airports (www.faa.gov).

Additional information on NPIAS and non-NPIAS airports is provided in Chapter 4 of this guidebook.

### *Airport Improvement Program*

*The Airport Improvement Program (AIP) Handbook* (FAA Order 5100.38C) includes detailed information on all aspects of the program, including the legislative history. The handbook provides that public-use airports identified in the NPIAS may be eligible for funds for certain projects through the AIP, a federal grant program. Funds obligated for the AIP are drawn from the airport and airway trust funds, which are supported by taxes and fees placed on aviation products such as airline tickets, fuel and cargo, and international departure fees. The AIP is authorized by Congress under general guiding principles discussed in the ACIP and NPIAS, but is generally in support of the development of public-use airports critical to the national transportation system. The highest aviation priority of the United States is the safe and secure operation of the airport and airway system. The AIP addresses the funding of these needs, maintains airport infrastructure, and increases system capacities. Eligible projects for AIP grants may also include planning, development, or noise compatibility projects associated with public-use airports.

For small primary, reliever, and general aviation airports identified in the NPIAS, AIP grant funding currently covers 95% of all eligible project costs.

Guidance on eligible airports and projects can be obtained by contacting the local FAA ADO or through a variety of other sources, including the FAA website (www.faa.gov) and FAA Order 5100.38C.

Generally, most airport airfield capital improvements or repairs are eligible for AIP grant funding together with most planning, design, and other engineering costs. Examples of eligible projects are

- Runway/taxiway construction,
- Land acquisition,
- Apron construction/rehabilitation,
- Airport layout plans, and
- Environmental studies.

There are a number of other criteria required of the airport sponsor for the airport to become eligible for AIP project funding. Some of these criteria are sponsor requirements must be met, sufficient local funds must be available, and the project must be depicted on approved airport layout plans.

The FAA considers many factors when determining which projects will be funded. The FAA has determined that current demands on the AIP funds exceed the availability of funds. Aviation demand at the airport must justify the projects. The FAA determines distribution of AIP funds based on national priorities. AIP funds are then distributed from a variety of programs, discussed in detail in Chapter 4.

Airport managers should be aware of grant programs and work closely with state and FAA representatives in preparing and planning for potential AIP projects. When an airport accepts federal grant participation, the municipality agrees to specific obligations. Airport sponsor obligations or assurances are in place for a 20-year period. The conditions set forth in the grant assurances involve such things as how the sponsor will operate and maintain the airport, nonexclusive rights, and making the airport available for public use on reasonable terms. Many of these assurances should be reflected in airport policy, standards, and lease agreements.

FAA Order 5190.6A, *Airport Compliance Requirement* (1989), provides detailed information about the airport sponsor's responsibility to comply with grant conditions. The FAA is interested in improving the national airspace system and provides grants to airports in exchange for commitments designed to ensure that the public interest is served. Airport managers of federally obligated airports must be aware of the responsibilities of the airport sponsor with respect to the compliance requirements.

### *Compliance with Grant Conditions*

The Airport and Airway Improvements Act of 1982 (49 USC, subtitle VII, as amended) states that grant assurances are required as part of a project application from airport sponsors who are eligible to request federal funds. Upon acceptance of grant money, these assurances are incorporated into and become part of the grant agreement. The airport sponsor is obligated to comply with specific assurances, which include the maintenance of compatible land use within the vicinity of the airport. The assurances that apply to planning-related projects are limited compared to other types of projects and have stipulations that are outlined in the grant agreement documents. A complete list of assurances can be found on the FAA website (www.faa.gov/airports_airtraffic/airports/aip/grant_assurances/media/airport_sponsor_assurances.pdf).

Specifically, Grant Assurance 21 included in the September 1999 amendment to U.S. 49 USC Section 47107 requires all airports that accept federal money to take appropriate action against incompatible land uses in the immediate vicinity of the airport. Such actions include adopting zoning laws and zoning changes that will increase airport land use compatibility. This grant assurance obligates an airport sponsor to protect the federal investment through the maintenance of a safe operating environment.

## Federal, State, and Local Funding

### *FAA Airport Improvement Program Funding*

The FAA fiscal year starts on October 1 and ends on September 30. Congress approves the FAA appropriation funding level for each fiscal year. Afterward, the Office of Management and Budget issues the FAA its funding allotments and FAA headquarters works through a formula that considers set-asides—such as entitlement funds for state apportionments and airports, and specified discretionary funding for noise projects—and distributes to each FAA region its allotment based on information submitted with the region's ACIP. An airport must be identified within the NPIAS to receive consideration.

AIP funding falls into the following areas:

1. Primary airport entitlement funds are available for commercial service airports that have at least 10,000 enplaned passengers per year. The amount is determined by a formula based on AIP authorization law and the number of enplaned passengers. Regardless of the number of passengers boarded, the minimum entitlement of a primary, commercial service airport is $650,000 per year ($1 million per year if total AIP is at least $3.2 billion).

   An airport can retain the right to receive its entitlement money for three years (four years in the case of smaller airports that are classified as non-hub airports). Entitlement money deferred to a later year is referred to as carryover entitlement.
2. Cargo entitlement funds are available for airports served by aircraft providing air transportation of cargo only with a total landing weight of more than 100 million pounds per year. These airports receive 3.5% of the total AIP funds. A cargo service airport shares in this money in proportion to what the total landed weight of cargo-only aircraft landing at an airport is to the total landed weight of such aircraft at all cargo service airports.
3. Non-primary entitlement (NPE) funds are available to general aviation airports. The amount given to an airport is based on the amount of development that airport has identified within the NPIAS. The maximum amount an airport can get is $150,000 per year. An airport can retain the right to receive its entitlement money for three years. For example, if an airport does not use an annual entitlement of $150,000 for 2005 and 2006, those funds can be added to the 2007 entitlement for a total funding level of $450,000. If an airport chooses not to use the entitlement, it will then be redistributed to projects at other airports.
4. State apportionment funds are available to any general aviation airport or non-primary commercial service airport within a state and included within the NPIAS. General aviation airports receive 20% of the total AIP funds. The first draw on general aviation funding is to identify and allocate funds to those non-primary airports entitled to an NPE allocation. The remaining general aviation balance is then divided among the states and territories. The amount of funds remaining after the general aviation entitlement funds are determined is allocated to the states by a formula that takes into consideration the population and area of each state. General aviation airports seeking AIP money from this allocation usually apply directly to the FAA. Some states require their airports to channel their AIP applications through the state aviation agency. The FAA then decides which airports will get the money.

   Nine states (Illinois, Michigan, Missouri, New Hampshire, North Carolina, Pennsylvania, Tennessee, Texas, and Wisconsin) participate in the State Block Grant Program. Under this program, the FAA gives the states a block grant and the state decides which airports will receive grants. States that participate in the State Block Grant Program do not receive more funding, but they do get more control over how it is distributed to the airports in their states. The block grant contains a state's NPE allocation and its state apportionment allocation.
5. Discretionary funds are available to any airport identified within the NPIAS. After the entitlements and set-asides are funded, the remaining money can be invested at the FAA's discretion.

These funds are often referred to as "pure discretionary" AIP money. Seventy-five percent of these discretionary funds must be invested in projects that enhance capacity, safety, or security or that will reduce noise.

The law sets aside 35% of AIP discretionary funds for noise/environmental projects. Under the military airport program (MAP), the FAA selects 15 current or former military airports (including at least one general aviation airport) to share in the set-aside, which is equal to 4% of the discretionary funds. The purpose of the MAP is to increase overall system capacity by promoting joint civilian–military use of military airports or by converting former military airports to civilian use.

### *Passenger Facility Charges*

Airports are currently permitted to assess a fee on passengers known as a passenger facility charge. PFCs are collected by the airlines and paid directly to the airport. They are intended to supplement AIP funding by providing more funding for runways, taxiways, terminals, gates, and other airport improvements. Currently no airport may charge a PFC of more than $4.50 per passenger, and no passenger has to pay more than $18 in PFCs per round-trip regardless of the number of airports through which a passenger connects. No airport can charge a PFC until the FAA approves it.

### *State Grants*

Nearly all states provide financial assistance to airports, primarily in the form of grants as matching funds for AIP grants or as separate state grants. Some states have grant programs for items that are generally ineligible for AIP funding, such as hangars, pavement maintenance, and terminal buildings at general aviation airports. States offer a slightly greater share of their grants to smaller airports than does the federal government grant program. To find out what grant programs are available, an airport manager should contact his or her state aviation agency.

### *Local Funding*

Normally the primary local funding source is the general funds of the governmental body that owns the airport. It is often difficult to receive a large amount of funding from local taxpayers because of the scarcity of revenue and the competition from other governmental services. Because airports are not used by the majority of citizens, it is necessary to make a strong case based on economic development in order to receive funding.

### *Airport Revenue*

Commercial airports can generate revenue from landing fees and terminal leases (both paid by airlines), concessions (such as parking fees), and other income (such as advertising). General aviation airports' primary sources of revenue are normally fuel flowage fees, land leases for hangars, FBO leases, and agricultural leases. It is rare for a small airport to generate enough revenue to offset its operating costs. Thus, very rarely are capital improvement projects funded from airport revenues.

### *Airport Bonds*

The single largest category of airport funding is bonds. However, the vast majority of airport bonds are issued by large-hub and medium-hub airports. More than 95% of all airport debt issued since 1982 has been in the form of airport revenue bonds, which are secured by an airport's future revenue.

Smaller airports have issued revenue bonds, but this is rare. Far more common are general obligation bonds for airport development, which are backed by the taxing power of a governmental unit and thus rate a stronger credit standing and carry lower financing costs. Many times airport improvement projects at small airports are included with other municipal projects in a single general-obligation bond.

### *Other Capital Sources*

Federal and state grants, PFCs, bonds, and airport revenue make up the vast majority of capital funding sources for airports. However, some airports have received funds for airport improvement projects from corporations, state or local enterprise funds, economic development funds, and other federal agencies.

A small airport that is considering an airport improvement project that especially benefits one or more large users should consider asking those users for financial assistance in completing the project. Most often the funds from private corporations are used to help pay the airport owner's share of a state or federal-aid project.

Many states and some local governments have set up enterprise funds. These funds are used primarily to attract new business to the state (or community) or to assist with the substantial expansion of an existing business as part of a competitive recruitment situation. An airport improvement project that plays a role in attracting new businesses or assisting existing businesses may qualify for enterprise funds. Some states have other similar-type grant programs that can be used for airport development projects that enhance economic development. Each program has different eligibility requirements and criteria, so an airport manager needs to research what is available in the area.

Airports have received grants through programs offered by the U.S. Department of Homeland Security. This department improves the ability of states, local and tribal jurisdictions, and other regional authorities to prepare, prevent, and respond to terrorist attacks and other disasters by distributing grant funds. Localities can use grants for planning, equipment, training, and exercise needs. These funds are usually administered and distributed by state offices of homeland security. Airport managers should check with their state homeland security office for grant opportunities. Current information on the location of the office in each state that administers the Homeland Security grants can be found on the U.S. Department of Homeland Security's website. Usually this office comes directly under the Office of the Governor. Items that may be eligible include security fencing, security training, security monitoring systems, and other equipment related to airport security.

## Capital Improvement Programming and Cash Management

Cash management and coordination of cash flow is an important element in airport development. Because an airport owner can be required to pay out a significant amount of cash prior to being reimbursed, the owner should coordinate contractor and consultant pay requests with the state and the FAA (if applicable).

To illustrate the cash flow considerations, typical funding, projected costs, and cash flow for an example project are discussed in the following paragraphs.

In the example airport development project, the funding is obtained from federal and state grants with the following restrictions:

- Federal grant
  - Bid prices must be provided with the grant application;
  - 90% of eligible costs are reimbursed; and
  - 10% of eligible costs are paid by local owner.
- State grant
  - Design services can be funded by the grant;
  - 60% of eligible costs are reimbursed; and
  - 40% of eligible costs are paid by local owner.

The local airport owner may seek federal reimbursement for design after the project is bid.

Assumptions for the example project:

1. Assuming an eight-month design process, there will be four $20,000 invoices from the design consultant (billed bimonthly for a total of $80,000).
2. Assuming a 10-month construction schedule, there will be five $20,000 invoices from the design consultant for managing construction (billed bimonthly for a total of $100,000) and five $164,000 pay requests from the contractor (billed bimonthly for a total of $820,000).

Figure 2 shows the local agency's share as a balance over the duration of the project. The overall costs and reimbursements for the project are as follows:

Month 1 — The state grant is awarded for design, and the local agency begins with a $100,000 balance.

Month 2 — The consultant invoices $20,000, leaving the local agency with a balance of $80,000.

Month 3 — The local agency is reimbursed by the state for 60% of the consultant costs, bringing its balance up to $92,000.

Month 4 — The consultant invoices $20,000, leaving the local agency with $72,000.

Month 5 — The local agency is reimbursed by the state for 60% of the consultant costs, bringing its balance up to $84,000.

Month 6 — The consultant invoices $20,000, leaving the local agency with $64,000.

Month 7 — The local agency is reimbursed by the state for 60% of the consultant costs, bringing its balance up to $76,000.

Month 8 — The consultant invoices $20,000, leaving the local agency with $56,000.

Month 9 — The local agency is reimbursed by the state for 60% of the consultant costs, bringing its balance up to $68,000.

Month 10 — The design is complete, the project is bid, and the FAA awards the grant. The local agency is reimbursed by the FAA so that the total reimbursement is 90%

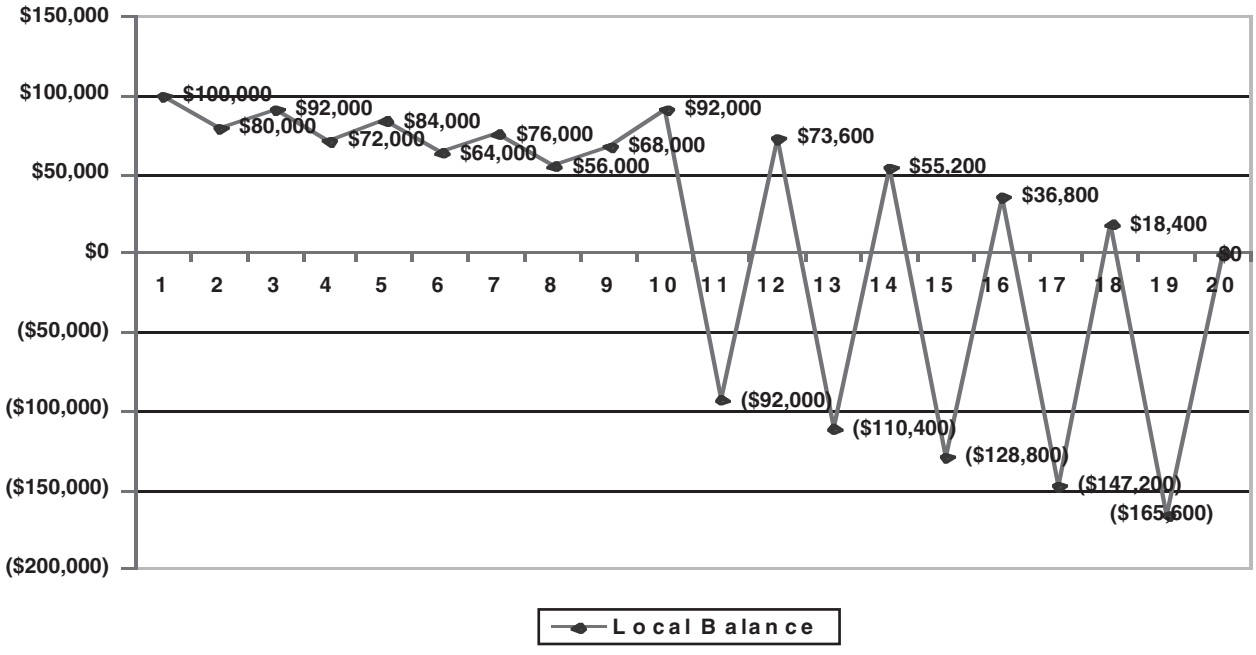


***Figure 2. Local balance for a typical airport project.***

of the design fees, to bring the agency's balance back up to $92,000 (design fees were $80,000).

Month 11 The contractor invoices for $164,000 and the consultant invoices for $20,000. This brings the local balance down to –$92,000.

Month 12 The local agency is reimbursed by the federal grant for 90% of the construction and consultant costs for construction administration, bringing its balance up to $73,600.

Month 13 The contractor invoices for $164,000 and the consultant invoices for $20,000. This brings the local balance down to –$110,400.

Month 14 The local agency is reimbursed by the federal grant for 90% of the construction and consultant costs for construction administration, bringing their balance up to $55,200.

Month 15 The contractor invoices for $164,000 and the consultant invoices for $20,000. This brings the local balance down to –$128,800.

Month 16 The local agency is reimbursed by the federal grant for 90% of the construction and consultant costs for construction administration, bringing its balance up to $36,800.

Month 17 The contractor invoices for $164,000 and the consultant invoices for $20,000. This brings the local balance down to –$147,200.

Month 18 The local agency is reimbursed by the federal grant for 90% of the construction and consultant costs for construction administration, bringing its balance up to $18,400.

Month 19 The contractor invoices for $164,000 and the consultant invoices for $20,000. This brings the local balance down to –$165,600.

Month 20 The local agency is reimbursed by the federal grant for 90% of the construction and consultant costs for construction administration, bringing its balance up to zero.

Each time a payment is made, the owner is able to request reimbursement. However, there is an average delay of approximately two weeks in getting that reimbursement. Actual times may vary regionally. Note that without proper planning, the airport owner is responsible for a significant outlay of monies while waiting for reimbursement. Planning for this outlay is required if the airport project is to be executed successfully.

## Additional Resources

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CHAPTER 3

# Airport Operations

## Safety

In the survey conducted for this guide, the majority of airport managers cited wildlife as their most significant safety threat, followed closely by theft, accidental aircraft incursions by the public, and vandalism. Airport security is a priority for 70% of the survey respondents. The survey showed that most airports have signage, fencing, and security plans and that many airport managers would like closed circuit television screens and card reader security gates. Figure 3 shows what practices survey respondents are employing to increase airport safety.

Other safety preferred practices noted by survey respondents include

- Full-perimeter security fencing, with daily perimeter inspections;
- Controlled access (allowing only airport and FAA employees on the airfield);
- Random patrol by local police for additional security; and
- Coded electronic gates for vehicle access.

Safety is clearly an issue for airport managers across the United States.

## Public Protection

### *Awareness*

It is the airport owner's responsibility to undertake every effort to protect the public from hazards that may exist in the airport environment. The general public visiting the airport should be clearly reminded of these hazards and generally not given access to the airfield unless under supervision. Safeguards to prevent inadvertent entry to the airfield and protection from aircraft blast can be provided through fencing, signage, public announcements, and proactive maintenance. Emphasis should be placed in areas of common use such as parking lots, sidewalks, terminals, and FBO facilities. Routine maintenance tasks, construction, and weather are common factors that may lead to additional hazards.

### *Airfield Signs, Fencing, and Lighting*

Aircraft movement areas—including, but not limited to, runways, taxiways, ramps, and hangar access routes—present an obvious and important hazard to the general public unfamiliar with the operating procedures in these areas. Unauthorized vehicles, pedestrians, bicyclists, and pets are concerns that need to be addressed. A common method to prevent inadvertent access is to erect fencing and gates to define the area. In addition, airport property "no trespassing" signs provide awareness of the airport environment and security procedures that may be in place. Such signs should be placed every 200 feet, at each access point, and on each fence corner. Well-lighted parking lots, sidewalks, and additional pedestrian areas will help improve visibility hazards and provide a certain level of deterrence for unwanted activities. The FAA regulations for airport markings,

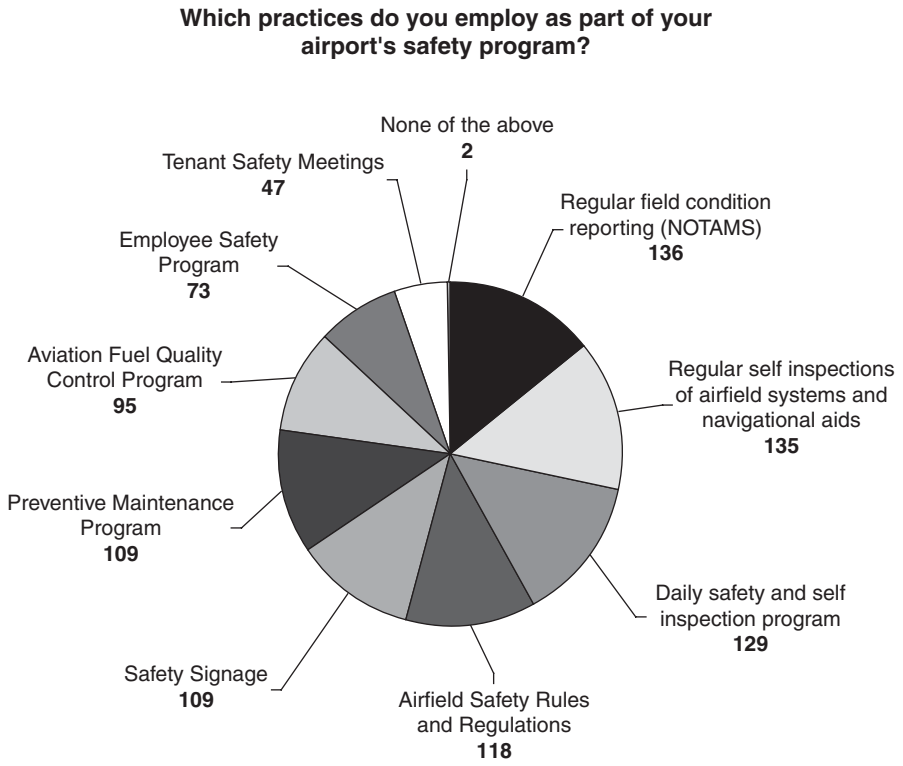


***Figure 3. Airport safety practices employed by survey respondents.***

signs, and lighting are contained in 14 CFR Part 139. In addition, the FAA provides guidance for appropriate airport signage in AC 150/5340-18, *Standards for Airport Sign Systems.*

### *Terminal Areas and Buildings*

Because the public uses the airport's building facilities, consideration should be given to safe access and utilization. Well-lighted areas, clean and dry floors, and well-maintained facilities will limit exposure to hazards. Areas off-limits to the public, such as aircraft ramp areas, utility rooms, and basements, should be secured to prevent inadvertent entry.

### *Accommodating Individuals with Disabilities*

An airport owner also has the responsibility under the Americans with Disabilities Act to safely accommodate individuals accessing public facilities. Local building codes should provide guidance in this area. The "Checklist for Existing Facilities: The Americans with Disabilities Act Checklist for Readily Achievable Barrier Removal" provides a means for assessment. This checklist may be obtained at the Accessing Safety website: www.accessingsafety.org. The FAA also provides guidance to airport managers on this subject in AC 150/5360-14, *Access to Airports by Individuals with Disabilities.* This AC is available online through the FAA website: www.faa.gov/regulations_policies.

## Tenant and Contractor Protection

The airport owner's responsibility to protect airport patrons does not stop with the visiting general public. Airport tenants, contractors, and frequent users of the airport's facilities also require safety awareness and protection. Ideally, safety is addressed when initially establishing a contract or lease with the individuals or companies. The contract or lease should specifically state each party's responsibilities concerning a safe operation, including airport familiarization,

specific airfield access points, and authorized operation areas. Any airfield hazards or unique situations requiring awareness should be addressed during the term of the contract or lease. Finally, the airport must ensure an appropriate level of training is provided to all individuals involved in the contracted operation. Ensuring this may include the airport owner providing the training to ensure the manager, supervisors, and subordinates are properly trained and understand their responsibilities.

## Employee Protection

Every efficient and safe operation involves adequate employee training and safety programs. Each airport operator should establish initial and recurrent training for every employee that, at a minimum, includes airfield operations, maintenance operations, administrative procedures, emergency and security procedures, and safety. The programs need not be complex and can evolve as the airport grows. Each program should be written and made available to all employees. Initial and recurrent training records should be documented and retained for each employee for liability purposes. An employee safety program should define personal protective equipment and require its use. Such items as hearing protection; hand, foot, eye and head protection; visibility vests; and proper clothing may be crucial in protecting individuals in the airport environment. The Occupational Safety and Health Administration website (www.osha.gov) provides additional resources for establishing employee and overall public safety guidelines and procedures.

## Aircraft Fueling

Aircraft fueling at smaller airports may be provided by the airport owner or an airport operator such as an FBO. Regardless of who owns and operates the fueling operation, it is the ultimate responsibility of the airport owner to ensure the fueling systems are well maintained and the services are provided safely. Aircraft fueling presents two major concerns: storage and handling of hazardous materials and fire safety. When establishing proper airport fueling operation procedures, the airport manager should include at a minimum the following two sources: the latest edition of the National Fire Protection Association (NFPA) 407, *Standard for Aircraft Fuel Servicing,* available at the NFPA website (www.nfpa.org/catalog) and the latest edition of FAA AC 150/5230-4, *Aircraft Fuel Storage, Handling and Dispensing on Airports,* available at the FAA website (www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars).

It is imperative that the fueling operator establish and provide initial and recurrent employee training. Although only FAR Part 139–certificated airports are required to use them, the FAA maintains a list of approved agencies that provide fuel safety training programs. These agencies may provide the resources needed to establish a professional training program. Such programs should include at a minimum aircraft familiarization, aircraft towing, product (fuel) recognition, bonding, testing, inspections, and fire safety training.

To ensure safe and efficient fueling operations, a routine equipment inspection program should be established, combined with timely maintenance. Fueling systems generally include fuel farms (storage tanks) and fueling trucks. An increasing trend at smaller airports is the installation and operation of self-serve fuel systems. These systems provide efficiency and great customer service. However, the airport owner's liability may increase if the system is not properly and routinely inspected. Providing clear user instructions and ensuring the system is well maintained and safe will reduce the airport's liability. An inspection checklist can be developed and include routine (daily), monthly, quarterly, and annual inspections and maintenance tasks. The checklist should be documented and kept on file for a minimum of one year.

Providing fire safety training is a large component of fueling operations. Initial and recurrent training should cover awareness, static control, extinguishing agents, and emergency procedures.

Because local fire codes may vary, fire safety training and inspections should involve the local fire jurisdiction's personnel.

## Notice to Airmen

The Notice to Airmen (NOTAM) system was established to provide timely information to aircraft operators to describe conditions on or around the airport that may affect aircraft operations. Typically, a NOTAM is issued and canceled by the airport owner or operator. (The FAA may also issue and cancel NOTAMs regarding certain circumstances, such as FAA-owned navigation aids and temporary flight restrictions.) The NOTAM is issued by calling the local flight service station (FSS) and identifying the airport affected, person issuing the NOTAM, and information establishing the NOTAM. The NOTAM is then disseminated by the FSS until canceled by the person or agency originating the NOTAM. Because the intent is to disseminate critical information, procedures must be in place to notify local tenants and coordinate any updates as conditions change. The NOTAM issuance procedure has been enhanced recently in many states because of a newer program supported by Lockheed Martin. The airport manager should contact state aeronautics offices or local FSS offices to verify the procedures for issuing a NOTAM.

A NOTAM log should be used to record the issuing date and time, NOTAM information, initials of the person issuing the NOTAM, and initials of the FSS individual receiving the information. The log should also include the cancellation date and time and initials of the individual canceling the NOTAM. The NOTAM log should be retained for event documentation and liability purposes. Further guidance on using the NOTAM system may be obtained from FAA AC 150/5200-28 (www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars).

## Airfield Data and Communications

Most small airports do not have an air traffic control tower and are therefore considered uncontrolled airports. Aircraft communications and airfield advisories are generated through a common traffic advisory frequency or UNICOM frequency by a local radio operator at the airport. Weather information is typically provided though an automated system on the airfield, such as an automated weather observation system or automated surface observation system. Such systems provide information on wind direction and intensity, visibility, barometric pressure, and precipitation. Because these systems are so important, the airport owner or operator ensures their correct operation by monitoring and reporting deficiencies to the proper maintenance personnel. In addition, a small airport may utilize a ground communications outlet or remote communications outlet. These communications facilities are unstaffed and enable a pilot to contact air traffic control or the FSS to obtain flight clearances, close flight plans, and obtain the weather.

Specific information about each airport is found in the FAA Airport Master Record—Form 5010-1 and the *U.S. Airport Facility Directory*. Each one contains airport owner contact information, runway data, communication frequencies, and remarks on potential airfield hazards. The FAA Airport Master Record also provides the number of based aircraft and annual aircraft operations. It is the responsibility of the airport owner to ensure the information contained in these records is current. An airport's current Form 5010, and information on how to update Form 5010, are accessible through the FAA website (www.faa.gov).

## Airfield Driving Programs

The airport owner is responsible for ensuring that access to the aircraft movement areas is limited to what is necessary for airport operations. The airport owner may achieve this through fencing and access barriers and, in addition, through airport rules and regulations defining who has access and to what extent.

An airfield driving program should be established at each airport to ensure access control procedures and safe operations. The airfield driving program should be tailored to the individual groups using the airfield. Tenants and contractors will be limited to those areas necessary to perform their driving operations. Typically, these areas are only ramps, hangar access areas, and areas closed to normal aircraft operations. Airport employee and FAA personnel driving programs will normally include those previously mentioned areas as well as the aircraft movement areas. These programs will be more complex, involving runway markings and signs, airfield lighting, aircraft communications, and specific vehicle requirements. The driving program should include a training session followed by a written test (documentation retained for individuals' files) and a behind-the-wheel road test to ensure proficiency. FAA AC 150/5210-20, *Ground Vehicle Operations on Airports,* provides guidance for developing ground vehicle operation training programs.

Airfield familiarization is the most important component of the airfield driving program. Anyone allowed access to aircraft movement areas needs to be assured of their surroundings and current conditions. The airport environment will look different at night and during low-visibility conditions. In addition, it is essential that the driving program includes vehicle/aircraft radio communication procedures.

An airfield driving program should also address the vehicles allowed on the airport, and more important, the aircraft movement areas. Vehicles should be well maintained; should be marked, painted, or lighted for high visibility; and should include working radios with the proper frequencies for communication. Additional information can be found in ACs on the FAA website (www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars).

## Wildlife Hazard Mitigation

As a good steward, the airport owner balances the issues of wildlife protection and public protection/wildlife hazard mitigation. Airport owners and operators throughout the nation cite wildlife hazards as the most prevalent and realistic concern for the flying public's safety.

Regardless of an airport's location, wildlife is a concern. Whether it is migratory waterfowl, deer, coyotes, or reptiles enjoying the warmth of the runway pavement, wildlife inadvertently poses a threat to public safety. It is important to assess an airport's wildlife hazard situation to determine the hazard level. During airfield inspections, any visible wildlife, as well as the time, location, and methods used to remove any wildlife hazard presence, should be noted. This documentation is valuable for assessing the threat, assisting with the development of a hazard mitigation program, and recording proactive mitigation. Demonstrating proactive mitigation will help the airport owner's defense in the event of an aircraft accident involving wildlife at the airport.

Several effective methods have been developed over the years to successfully mitigate wildlife hazards at airports. Unfortunately, every airport environment and wildlife situation is unique. An airport manager should establish a strong relationship with a local wildlife professional. These individuals are well educated with particular species, habitats, and annual rituals and can help develop a successful program to protect the wildlife and the public. Additional wildlife mitigation is provided on the FAA website (http://wildlife-mitigation.tc.faa.gov/public_html/index.html).

Preferred practices obtained from the survey conducted when developing this guidebook include vegetation control, fencing, proactive hazing, and installation of a lightweight string between the airport's access area and a nearby water source to deter walking geese from entering.

### *Methods for Reducing Wildlife Hazards*

Methods for reducing wildlife hazards on an airfield fall into two major categories: legal/liability and operational. Wildlife logs, strike reporting, wildlife hazard assessment, wildlife

hazard management plans, and wildlife hazard working groups are methods that consider legal/liability issues. Exclusion, repellents, hazing, harassment, shooting, and trapping are methods that consider operational issues.

**Techniques for Legal/Liability Issues.** Recent court cases dealing with wildlife control have established that liability is born by the airport operator. These court cases have also made clear the need to

- Document *all* wildlife control efforts,
- Obtain opinions from wildlife biologists, and
- Establish requirements for issuing NOTAMs for existing hazards.

Documenting all wildlife control activities protects both the airport manager and the airport. Airport managers should conduct an inspection of the airfield every day and document any wildlife seen (or not seen). These wildlife logs also provide a historical record of wildlife activity at the airport. If Canada geese tend to be seen only in September, the airport can prepare before the Canada geese arrive. A log also identifies wildlife population reductions or increases and makes employees aware of wildlife hazards.

A wildlife hazard assessment and wildlife hazard management plan are generally recommended for Part 139 airports rather than general aviation airports. Part 139 airports are required by the FAA to conduct a wildlife hazard assessment when either a significant wildlife strike has occurred or a wildlife species or numbers capable of causing such a strike are on an airport. The assessment documents wildlife species, numbers, seasonal use patterns, behavior, and attractive habitat features at the airport and provides recommendations to mitigate these hazards. A wildlife hazard management plan, which is created if required after an assessment, outlines a wildlife hazard management program specific to the airport.

A first step in reducing wildlife hazards is to identify attractive habitats on the airfield. These could consist of open water, ponding areas, or nesting and perching sites or food sources such as landfills, waste transfer stations, or agriculture. Removing these habitat areas is an effective way to avoid attracting wildlife to the airport.

**Tools and Techniques for Operational Issues.** Variety is the key to any wildlife control program. Using more than one technique has proven to be more effective than using the same method every day to control wildlife.

Maintenance activities include

- Removing trash and litter,
- Covering garbage cans and dumpsters,
- Removing dead animals from the field, and
- Prohibiting wildlife feeding.

Exclusion—such as fencing, putting grids along culverts, placing pin wire on top of lights or signs, or using duct tape to cover holes used for nesting—can help eliminate wildlife on an airport. Covering retention ponds and installing bird netting along hangars and buildings are other exclusion methods.

Using chemical repellents is another way to help control wildlife at an airport. These repellants may be cost-prohibitive for large areas, however, because they must be reapplied after rain or mowing.

Active wildlife hazard management techniques include hazing or harassment, removal, trap and relocation (which is usually not recommended and is against state statute for most species),

and egg or nest destruction. Other alternatives include the use of remote control planes, dogs, falcons, or effigy.

Pyrotechnics are a common way to scare birds from the airport. Twelve-gauge cracker shot, 15 mm launchers, and screamers and bangers are useful pyrotechnics. Scare devices, which are also used to haze and harass wildlife, include propane cannons, distress-cry generators, horns and sirens, Mylar tape, and scare-eye balloons.

Shooting with a rifle or a shotgun is an effective way to reinforce hazing and harassing techniques and to remove hazardous wildlife. Trapping wildlife may also be effective for certain species.

### *Federal and State Involvement*

Several federal and state agencies can help when working with wildlife control at an airport. They include the FAA, U.S. Department of Agriculture (USDA) Wildlife Services, U.S. Fish and Wildlife Services (USFWS), Environmental Protection Agency (EPA), Department of Defense, the U.S. Army Corps of Engineers (ACE), and the state agency responsible for managing wildlife resources.

The Migratory Bird Treaty Act is a federal law that protects all birds except English sparrows, pigeons, and starlings. The CFR lists all federally protected birds. The CFR also covers the different types of permits needed to remove wildlife. Airports must get a depredation permit to lethally remove wildlife from an airfield.

The USFWS grants federal permits to airports to lethally remove migratory birds. It also provides biological opinions on proposed federal activities that may affect federally listed endangered or threatened species. The USDA Wildlife Services recommends the issuance of a permit for an airport to the USFWS.

Individual state agencies may also issue state permits to take mammals and birds. Both a state and federal permit may be needed in some cases, and both permits must be in sync with one another. For example, if the federal permit allows taking 50 Canada geese, then the state permit should also say that 50 Canada geese can be taken.

The Department of Defense has a wildlife strike reduction organization: the U.S. Air Force's Bird Aircraft Strike Hazard (BASH) team. The BASH team documents and records wildlife strikes on military aircraft in a database similar to the FAA/Wildlife Services database for strikes on civilian aircraft. Because of low-level high-speed flights, the military experiences a large number of bird strikes.

The EPA works with the FAA on wetland projects. The EPA also approves or disapproves landfill sites and pesticides. ACE deals primarily with the federal Clean Water Act. It issues permits required for wetland filling or disturbance.

### *Permits*

Federal permits issued by the USFWS protect migratory birds, and state permits issued by the state's wildlife management agency protect birds and mammals. Any protected bird except the bald eagle can be hazed or harassed without a permit. A state and federal permit is required to remove gulls, waterfowl, wading birds, raptors, and other protected birds. A federal or state permit is not needed for crows, blackbirds, or magpies if they are causing damage or are a hazard. Finally, permits are typically not required to take starlings, English sparrows, and pigeons but airport staff should abide by city ordinances if the airport is within the city limits.

The process for obtaining a migratory bird depredation permit (needed for all federal migratory birds except starlings, pigeons, and English sparrows) from the USFWS is as follows:

- The applicant obtains and completes the one-page application form (airports are exempt from the application fee).
- USDA Wildlife Services recommends a permit for approval to the USFWS, including the species, numbers, and conditions.
- The USFWS approves the recommendation and issues a permit.
- The airport operator fills out an annual report reviewing the number, species, and methods used to take wildlife from the airfield.
- The permit is easily renewed after the annual report is received.

A state's wildlife management agency may issue wildlife removal permits. No permit is required for rabbits, squirrels, raccoons, coyotes, woodchucks, weasels, and striped skunks if they are causing damage. For deer, bears, and moose, a permit is needed from the local area wildlife office. For state-protected birds and routinely controlled mammals, a permit is needed. Airport operators should be aware of local firearm ordinances even with mammals for which no permits are needed.

#### *Wildlife Identification*

Identification of birds and mammals affecting an airfield is an important step toward reducing hazards. Field marks—certain characteristics of animals—make identification of the species of wildlife that are on the airport easier. Field marks to look for when identifying wildlife are

- Size (larger or smaller than a robin or crow);
- Color(s);
- Color patterns (tail, wings, eye stripes);
- Bill type (long and skinny or short and stout); and
- Habitat (marsh, water, short grass, forested area).

*Peterson Field Guides* are a useful reference for identifying wildlife. They can be found in almost any bookstore.

## Maintenance

### Inspections and Surveillance

A safe and efficiently operated airport employs a successful maintenance program. This success begins with routine airport inspections and surveillance. The importance of routine inspections cannot be overstressed. If the airport is utilized on a daily basis, provisions should be made to inspect it on a daily basis. Such daily inspections are considered routine inspections. Activities such as construction or wildlife migration may require continuous surveillance to prevent hazards to aircraft. Periodic inspections are less frequent and may include specific assessments of pavements and pavement markings and recording on airfield lighting circuit performance. Special inspections include checking the airfield after an unusual condition such as an aircraft accident or meteorological event. A special inspection will ensure the pavements and safety areas are clear and airfield lighting systems are functioning correctly. In the survey conducted when developing this guidebook, one airport manager shared that he would walk the runway (with a Unicom radio) for a thorough inspection and for exercise!

Checklists should be developed and used during the inspections, with any discrepancies and corrective actions noted. The inspection logs should be filed and maintained to provide historical data and helpful evidence in the event airport maintenance is ever challenged in court.

## Preventive Maintenance Programs

A proven and effective method to operate an efficient airport and reduce maintenance costs is to establish preventive maintenance programs. The adage "pay me now or pay me later" may definitely be applied to this topic. Spending a certain amount of time and money on airport systems each year will significantly reduce the need to spend larger amounts later and replace systems prematurely.

If an airport receives federal funding, it may be required to develop a pavement preventive maintenance program. Annual monitoring and recording is an important part of the preventive maintenance program. Pavement programs may include crack sealing, surface sealing, and partial- and full-depth repairs. Lighting programs may include replacing fixtures, wiring controls, and repainting fixtures. Measuring lighting circuit voltage and recording the numbers may indicate the loss of electrical current requiring maintenance prior to system failure. Building structures and heating, cooling, and ventilation systems should be monitored and addressed as needed. The airport's vehicles and equipment also should be routinely checked and maintained to ensure safe and efficient operations.

## Maintenance Equipment

Each airport should keep an inventory of current equipment and desired future equipment needed to safely and efficiently maintain the airport property. To obtain the equipment in a timely manner, it should be identified during the budgeting and capital improvement project (CIP) process. The high cost of some airport equipment will also require early planning and a financial plan. A revolving equipment schedule—which is an inventory of equipment listed by year and showing its replacement schedule based on age and use—can help in this planning process.

Because many airports are publicly owned and operated, most federal, state, and local regulations require the airport to purchase goods through a public advertising and bidding process. Some state agencies organize this process and receive bids for certain equipment and services. Publicly operated airports may then purchase from the state's established contract. In addition, airports may elect to bid for certain equipment and services themselves. The first step is to research the airport's specific needs and the optional equipment available. Visiting with equipment vendors and following up with references is a key step to this education process. It may be useful to use staff (and neighboring airport's) experience and opinions. Assembling a set of bid documents and precise specifications is extremely important. Airport managers should devote adequate time to carefully review these documents prior to advertising. It is important to ensure the documents are written precisely but do not exclude vendors from the ability to participate. Bids are usually received sealed and opened at a public meeting. The award is generally given to the lowest-priced qualified bidder.

In addition, the survey conducted during the preparation of this guidebook suggested consideration of the following practices to improve equipment management: establish and maintain a preventive equipment maintenance program, hire and maintain experienced personnel, acquire a single piece of equipment for multiple roles, and maintain an inventory of frequently needed parts to prevent long downtime repair periods. Cost-saving practices also mentioned included utilizing used equipment from local governments and participating in the Federal Surplus Property Program. More information about this program is available on the FAA website.

## Record Keeping

The value of establishing written forms, logs, or checklists, documenting efforts, and maintaining organized files cannot be stressed enough. Record keeping should involve inspections, training, and maintenance efforts. It should also include special conditions such as significant weather

events and accidents or incidents involving aircraft, vehicles, and people on the airport property. Proper record keeping may be used to prove the airport owner is proactive in management programs and may reduce potential liability if challenged in court. In addition, these records may be useful in determining cost of ownership and pre-existing factors for developing the budget for the next fiscal year. Records should be retained for a minimum of one year.

## Airfield (Airside) Maintenance

An airfield inspection program should be established and include aircraft movement surfaces, safety areas, lighting, navigational aids (NAVAIDs), construction, wildlife hazards, and public protection. The inspections should be standard, and more important, performed on a routine basis. Because an airport owner is exposed to liability regarding the safety of the operating environment, it is recommended that an airfield inspection (followed by corrective actions for noted deficiencies) be conducted on a daily basis.

Much is written on the subject of airport pavement maintenance. Because runways are the backbones of airports, much time and money are spent nationally to inspect, repair, and replace airfield pavement. Again, routine inspections and preventive maintenance programs cannot be stressed enough because of the expense of pavement repair.

If there is the slightest chance that an airport will experience snow and ice conditions, a snow and ice control plan should be established. At a minimum, a snow and ice control program should identify equipment, personnel, airfield inspection procedures, snow removal priorities, and a list of key contact personnel involved in coordinating airfield operations. It is recommended that a snow removal committee be established and the snow and ice control plan updated and discussed on an annual basis prior to the snow season. An effective method to disseminate current airfield conditions to the pilots and local tenants should be established as well.

FAA AC 150/5200-30, *Airport Winter Safety and Operations,* is an excellent source when establishing or revising the airport's snow removal plan. This source provides information on runway-friction reporting equipment utilized to measure the runway's breaking conditions for aircraft. In addition, it discusses treatment of pavements with chemical and nonchemical techniques to improve conditions.

Properly maintained airfield lighting is an essential component of successful airfield operations. Lighting should be inspected on a daily basis during a period of low daylight to ensure all units are working properly. Lighting is required to be replaced as soon as a deficiency is noted. NAVAIDs may be maintained by the FAA or state or local agencies but should be monitored by the airport owner or operator to provide timely maintenance reporting. Lighting and NAVAID maintenance logs will assist with preventive programs and replacement determinations.

As part of the daily airfield inspection, special attention should be given to airfield signage and markings. Markings may fade over time because of weather, frequent aircraft landings, and snowplow operations. This fading or erosion may not be noticeable to the daily inspector. A periodic inspection specifically noting airfield markings with a fresh set of eyes will help with this issue. Outlining the critical markings with black paint and glass beads for lighting reflection are also recommended to improve safety. Signage is critical for airfield safety, especially for transient pilots unfamiliar with the airport. Ensuring that airfield signs have reflective panels and working lights and remain clear of obstructions will also improve safety.

Vegetation obstruction and erosion control is also part of the daily inspection. Because these issues change slowly and may not be noticeable to the daily inspector, they should be included in a specific periodic inspection. The airfield should be inspected on an annual basis for trees and other objects that may violate the airport's approach airspace. Once identified, the objects should

be removed and a management plan established for future growth. A plan should be established to control erosion that may affect the aircraft movement areas and security fencing. Vegetation growth may also contribute to wildlife hazards. The survey conducted during the preparation of this guidebook indicated that a large percentage of airports use herbicide to help manage vegetation as a maintenance practice and a wildlife mitigation technique. Most airport managers cite frequent grass mowing as the preferred practice. In addition, airports will allow local individuals to cut the grass as hay, which saves the airport time and money. Contact the local wildlife representative for help in developing an effective plan to manage vegetation and control certain wildlife.

The attacks of September 11, 2001, resulted in more financial aid for airport security. However, the motivation at most small airports for installing fencing is not the threat of terrorist attacks as much as pedestrian and wildlife incursions. Financial assistance for most small airports recognizes the combined value of safety and security. Prior to installing an airport fence, the airport manager should consider local conditions and the object to be deterred. Ground frost may push fence bases upward in northern climates; special bases may be required in sandy or wet locations; and heights exceeding 10 feet may be recommended for keeping out deer.

### Landside Maintenance

Airport maintenance includes the landside, or pedestrian side, of the airfield as well. Routine inspections should cover public areas such as buildings, sidewalks, roadways, and parking lots. Special attention should be given to safety-related items, especially during construction and adverse weather conditions. Routine inspections help the general upkeep and save dollars under an efficient preventive maintenance program. Remember, the airport is the "front door" to a community and a good (or bad) first impression is the responsibility of the airport owner and operator.

## Security

### History and Overview

The FAA established airport and airline security regulations in 1972 to primarily address a series of airline hijackings and other criminal threats. The security regulations were established under FAR Part 107, Airport Security, and FAR Part 108, Airplane Operator Security, to control access to the air operations area and prohibit explosives, incendiary, or deadly/dangerous weapons aboard commercial aircraft. These regulations applied to commercial air carriers and airports certified for air carrier service; there were no mandates for smaller, general aviation airports to establish and maintain an airport security program.

The attacks carried out on September 11, 2001, changed the way the United States views aviation security. President George W. Bush signed into law the Aviation and Transportation Security Act on November 19, 2001. This law created the Transportation Security Administration (TSA) within the Department of Transportation (transferred to the Department of Homeland Security in November 2002). The TSA became the federal agency responsible for security in all modes of transportation. The TSA assumed the federal regulations overseeing aviation security. The FAA's security regulations, FAR Part 107 and Part 108, were revised and renumbered Transportation Security Regulation (TSR) Part 1542, Airport Security, and TSR Part 1544, Aircraft Operator Security: Air Carriers and Commercial Operators.

Although the general consensus does not consider smaller airports and aircraft a threat, general aviation has also been considered under the efforts of reducing potential terrorist activities. The TSA in April 2003 requested the Aviation Security Advisory Committee develop a working group made up of general aviation industry organizations, general aviation airport managers, and repre-

sentatives of various state government aviation agencies to develop guidelines for security enhancements at general aviation airports. This resulted in a publication titled *Security Guidelines for General Aviation Airports,* which will be discussed briefly later in this section.

The public's common notion of airport security tends to revolve around screening commercial airline passengers and preventing terrorist activity. Because historically these issues have not played a significant security role at smaller airports, the focus of small airport security programs has been on protecting the public and preventing inadvertent entry of individuals and wildlife into the airport operations area. Airports surveyed for this guidebook were asked their perception of the most realistic security threat(s) to their airport. The results are ranked as follows:

1. Wildlife,
2. Vandalism,
3. Theft,
4. Accidental airfield incursions by the public,
5. Terrorism, and
6. Unreasonable response time from local authorities.

The top four threats cited are common concerns for almost every airport in the nation and should be addressed in an airport security program. However, each individual airport is unique and a specific site assessment is required to determine the threats and respond adequately to the level of those particular threats.

Of the airports that responded to the security portion of the survey, more than 75% had airfield fencing, gates, and signage for airport security. At least 60% of the respondents want to improve their airport security by obtaining and installing access control systems and closed circuit television systems. Several respondents commented that a low funding priority and the lack of proper funding for security improvements is the airport's biggest security challenge.

## Federal Regulations

The TSA has issued security rules and regulations under 49 CFR Chapter XII, Parts 1500 through 1699. These rules and regulations generally apply to certain airports serving commercial air carrier operations. A summary of the potentially applicable security requirements related to airport operations follows:

- **Part 1520—Protection of Sensitive Security Information.** Restricts the availability of security information to those with a "need to know" only. The airport security program defines those who have access to the sensitive security information.
- **Part 1540—Civil Aviation Security.** Contains rules that cover all segments of civil aviation security. It includes "individual accountability" and rules that apply to passengers, aviation employees, and other individuals and persons related to civil aviation security including airport operators, aircraft operators, and foreign air carriers.
- **Part 1542—Airport Security.** Requires airport operators to adopt and carry out a security program approved by the TSA. It describes requirements for security programs, including establishment of secured areas, air operations areas, security identification display areas, and access control systems. This part also lists requirements for fingerprint-based criminal history record checks of specified individuals.
- **Part 1544—Aircraft Operator Security: Air Carriers and Commercial Operators.** Applies to certain aircraft operators that hold operating certificates for scheduled passenger operations, public charter passenger operations, private charter passenger operations, and other aircraft operators. This part requires such operators to adopt and carry out a security program approved by the TSA. It lists requirements for screening of passengers and property.

- **Part 1548—Indirect Air Carrier.** Applies to indirect air carriers, such as freight forwarders. It requires such carriers to adopt and carry out a security program and describes requirements for preventing the carriage of unauthorized explosives or incendiaries aboard passenger aircraft.
- **Twelve-Five Rule.** Requires certain aircraft operators using aircraft with a maximum certificated takeoff weight (MTOW) of 12,500 pounds or more to establish and maintain a security program.
- **Private Charter Rule.** Similar to the Twelve-Five Rule but adds additional requirements for aircraft operators using aircraft with a MTOW greater than 45,500 kilograms (100,309.2 pounds) or with a seating configuration of 61 or more.

## Safety and Security Guidelines for General Aviation Airports

Although the TSA regulates airport owners and operators serving air carrier operations, a set of guidelines has been established and recommended for the remaining airports to implement. The document, titled *Security Guidelines for General Aviation Airports,* is an excellent resource when developing or revising an airport security program. The guidelines can be found on the TSA website (www.tsa.gov/what_we_do/tsnm/general_aviation/airport_security_guidelines.shtm).

The document recognizes that every airport is unique and a specific assessment is needed to determine the vulnerability of each facility. Within the document is an Airport Characteristic Measurement Tool to help determine which security enhancements are appropriate based on location, number of based aircraft, runway size, and operations specific to a facility. The document also covers various security enhancement recommendations that include physical aspects as well as personnel training, surveillance, and reporting procedures. An airport manager should also establish a relationship with the local TSA representative for his or her geographic area. Although the TSA may not have jurisdiction over the airport, the TSA representative can be a valuable source of information on airport security issues.

The TSA, in coordination with the Aircraft Owners and Pilots Association (AOPA), has implemented a general aviation hotline [866-GA-SECURE (1-866-427-3287)] for reporting any suspicious activity on or around the airport. The hotline was developed to complement the AOPA's Airport Watch Program, which can be viewed in detail on the AOPA website (www.aopa.org/airportwatch/). In addition, *ACRP Synthesis 3: General Aviation Safety and Security Practices,* identifies current practices in safety management and security, including FBO practices, and presents low-cost and easily implemented practices and ideas that may be transferable to many airports.

## Incorporation of State and Local Regulations

Incorporating state and local regulations into the airport security program is important to maintain consistency of enforcement procedures with the applicable agencies. Also, some states may have laws that refer to airport security. Regulations obviously vary for each airport in this regard, so it is important to establish a point of contact for each agency and compare the airport security program with state and local regulations. In some cases, local ordinances specific to the airport's operations may need to be established and adopted by the local governing body to enforce airport security procedures.

## Development of an Airport Security Program

When initially developing an airport security program, establishment of a committee representing airport management, airport tenants, and local law enforcement is recommended. Individuals with knowledge of the airport's operations, tenant operations, and local law enforcement procedures contribute to the success of such a program. These individuals serve a key role when com-

pleting the vulnerability assessment to identify which security enhancements will be required. In addition, their participation may contribute to the acceptance and implementation of the program in a timely manner.

The TSA's *Security Guidelines for General Aviation Airports* lists the essential components for developing a security program. These components include personnel, airport facilities, surveillance, security procedures, communications, and specialty operations. The circumstances of each airport will determine which security enhancements will be included in the program and how they will be implemented and enforced.

Once developed, the written airport security program should be shared with others on a need-to-know basis only. The TSA considers the plan to be sensitive security information, and the airport owner aids security by safeguarding such site-specific information.

## Local Training and Airport Familiarization

An airport security plan is only as effective as it is current and rehearsed. Airports regulated under TSR Part 1542 are required to provide a review of the plan every 12 months, including every agency with a responsibility in the airport security program. Today, most response agencies have annual training requirements and it makes good sense to include the airport in those, thereby combining efforts to save time and costs. This also provides a great opportunity for multiple agencies to practice coordination and learn of each other's resources and capabilities. The ability to disseminate information about illegal and suspicious activities is imperative. Exercising contingency plans and maintaining current contact information and procedures ensures efficient response in times of need.

Local law enforcement agencies should understand their responsibilities in the airport security program. They need to be as familiar with the airport's operating procedures and the airport property as they are with local procedures for their city streets and facilities. Commonly, local agencies do not spend the time to familiarize themselves with the airport's surroundings and airfield access procedures. Fences, locked gates, locked doors, and security regulations may pose obstacles for responding agencies unfamiliar with the airport. Airport operators must also consider informing agencies of airport issues such as construction, procedural changes, and seasonal operations that could affect their response.

In addition, security training should be provided to tenants, contractors, and anyone else who has authorized access. This should include airport familiarization, security procedures, and reporting procedures. Special consideration should be given to responsibility for individual awareness. A comment provided during the security portion of the survey raises an excellent issue—complacency. The comment stated, "Another problem that people like myself who manage a small county airport face is the fact that we have always lived in a safe and secure environment and this causes us to doubt what we may actually be seeing and just write it off when the situation requires urgent action." The survey also indicated a strong need to include provisions in the security program to deter theft and vandalism.

## Security Technology

Security technology utilized to enhance airport security comprises various components. Items such as access control and closed circuit television (CCTV) systems are becoming more popular and financially reasonable compared to past years.

Access systems for doors and gates leading to secured areas range from the simple—lock and keys, remote-controlled gates, and proximity cards—to the complex—computer-based access

control systems and biometric systems. Obviously, the more complex the systems, the higher the cost will be for installation and operation. To determine which system is appropriate for a particular facility, such factors as physical requirements, costs, reliability, and data recording will need to be considered. An important factor to remember when choosing an access system is its ability to remain uncompromised. The airport owner should keep an inventory of access media and have the ability to negate access if required.

Surveillance methods such as CCTV systems are becoming more and more popular due to their lower costs, provision of security coverage with fewer personnel, and the ability to record events to document activities. Certain systems also have the ability to monitor and record off-site via the Internet. Various systems are available at local electronic retail outlets or national vendors.

Intrusion detection systems are another method for monitoring individual facilities or the property's perimeter. The systems are typically monitored by an off-site contracting company. If an intrusion or other event such as a power outage or fire is detected, the company will contact the airport manager or local police or fire department. Again, the costs will be directly proportional to the complexity of the systems installed.

Airport security requires a team concept. Awareness, education, surveillance, and vigilance must be shared by all airport users.

## Emergency Preparedness

### Airport Emergency Plan

Small airports not certified under FAR Part 139 are not required to develop and maintain an airport emergency plan (AEP). The majority of airport operators, however, have undertaken this task because of its importance and the airport operator's recognition of responsibility to public safety. Airport operators face challenges in emergency events due to the airport's distance from the responding agencies, few resources, and inadequate funding. These challenges emphasize the airport owner's need to establish a basic AEP to minimize the possibility and extent of personal injury and property damage in the event of an emergency.

The primary purpose of an AEP is to establish delegation of duties, assign agency responsibilities, provide coordination of response efforts, and provide an orderly transition between normal and emergency operations. The development of an AEP will also provide an inventory of available resources and those that will be needed in an emergency event. A good starting point in the AEP development process should be a review of FAA AC 150/5200-31B, *Airport Emergency Plan* (2008).

### Operational Planning Procedures

Each airport operator should establish operational planning procedures for the airport. The first hour of response is critical for life-saving efforts, considering an airport's lack of resources and a possible lengthy response time from other professional emergency responders. During this period, on-duty staff should be given an organized checklist that provides guidance and coordination. Such a checklist should include a prioritized list of names and phone numbers of the agencies to contact. It should also provide procedures to follow as the emergency response progresses. Finally, it should cover procedures to ensure airport operations are restored properly and safely before returning the facilities to public use. Checklists are best kept concise and in easy reach of potential users.

## Emergency Training and Airport Familiarization

An AEP is only as effective as it is current and rehearsed. FAR Part 139.325 requires a review of the plan every 12 months and a live exercise every 36 months that includes every agency with a responsibility in the AEP. Today, most response agencies have annual requirements to perform training, and it makes good sense to include the airport and combine efforts to save time and costs. Combining training also provides a great opportunity for multiple agencies to practice coordination and learn of each other's resources and capabilities. Communication is the most significant problem encountered during emergency events. Providing a practice drill provides an excellent opportunity to research this challenge and improve shortfalls.

Responding agencies should be as familiar with the plan and the airport as they are with local procedures for their city streets and facilities. Commonly, local agencies do not spend the necessary time to familiarize themselves with the airport's surroundings and airfield access procedures. Fences, locked gates, locked doors, and security regulations may pose obstacles for responding agencies unfamiliar with the airport. Airport operators must also consider informing agencies of airport facility changes that could affect their response such as construction, procedural changes, and seasonal operations.

## Aircraft Accidents and Incidents

Statistics show the greatest potential for aircraft accidents occurs during the landing or departure operation of the flight. A high percentage of all aircraft accidents occur on or near the airport property, but accidents may occur at any time or any place. Such unpredictable occurrences are another reason to closely coordinate efforts with agencies that have jurisdictional responsibilities for the surrounding community.

The response to each aircraft accident or incident will be different because of variables such as location, aircraft type, number of people involved, type and amount of fuel or cargo on board, and weather. However, the basic response should include the same considerations. Safety for the lives of the victims and the responders is paramount throughout the response and recovery efforts. Professional responders are equipped with the resources and training to provide an efficient and safe response. The airport operator and first responders should keep the area clear of all people until it is safe to enter. Once a safe perimeter is established and rescue efforts have been completed, the aircraft and perimeter need to be protected from disturbance until necessary investigations are completed. (Investigations may be performed by the NTSB, FAA, FBI, TSA, and other state and local agencies.) It is the responsibility of the aircraft owner or operator to remove the aircraft when released by the investigating agencies. The airport owner, however, will need to oversee the coordination of such events and be prepared to possibly help with local resources.

## Media Relations

Involving the media in the AEP and training events provides a great public relations opportunity to demonstrate the hard work and preparedness the airport and responding agencies develop during the AEP process. More important, involving the media in the AEP informs them how, when, and where to respond during an emergency. The airport operator should establish an area for media briefings and be prepared to provide timely and informative briefings during an event. This step makes for good public relations and demonstrates professionalism by the airport and responders. Inviting the media to the AEP reviews and live exercises also educates them about the dangers of emergency response and stresses safety procedures. Once the scene is secured, the airport operator can coordinate times and methods to film and cover events in a safe manner.

Prior to interacting with the media during an emergency, the airport manager should spend a few moments preparing a brief and factual statement, select an appropriate site without a view of death or destruction, and arrange to have the media members' identification verified to prevent unauthorized entry to press briefings. During interaction with the media, the airport manager should project a positive image for the airport and responding agencies by remaining calm and serious and avoiding emotional statements, control the briefing by providing brief facts only, and refrain from accepting responsibility for the accident. Chapter 5, Public Relations, contains additional information about media relations.

### Preferred Practices and Recommendations

The following preferred practices and recommendations were provided by airport owners and operators during the development of this guidebook:

- Host a base of the local ambulance authority to provide a quicker response time to the airport and throughout the city.
- Get involved with the local emergency management association.
- Ensure mutual aid agreements are in place and the airport is included in the local emergency agency's response plans, too.
- Maintain a certain amount of control during the emergency to include limiting unnecessary radio chatter.
- Include provisions in the airport emergency plan for fuel spills and natural disasters.
- Ensure responding agencies are familiar with utility shut-off sources.
- Conduct annual fire inspections of airport facilities to include aircraft hangars.
- When calling 9-1-1 with a cell phone, always tell the dispatcher specifically where the emergency is located. (In one instance, the dispatcher sent the agencies to the neighboring airport by mistake!)
- Establish a chain of command prior to an event, improve communication procedures, and train, train, train!

## Additional Resources

### Wildlife Mitigation

Cleary, E., and R. Dolbeer. *Wildlife Hazard Management at Airports: A Manual for Airport Personnel,* 2nd ed., FAA, July 2005.

FAA Airport Wildlife Hazard Mitigation homepage: http://wildlife-mitigation.tc.faa.gov/public_html/index.html.

FAA CertAlerts: www.faa.gov/airports_airtraffic/airports/airport_safety/certalerts:

- FAA CertAlert 04-16 Deer Hazard to Aircraft and Deer Fencing
- FAA CertAlert 03-03, Guidelines for Submitting Bird Strike Feather Remains for Identification
- FAA CertAlert 02-09, Alternative Deer Fencing
- FAA CertAlert 01-01, Deer Aircraft Hazard

*Hazardous Wildlife Attractants on or near Airports,* FAA AC 150/5200-33, available online from FAA Regulatory and Guidance Library: www.airweb.faa.gov/.

International Civil Aviation Organization Safety Management website: www.icao.int/anb/safetymanagement.

Peterson, R., and V. Peterson, *Peterson Field Guide to the Birds of Eastern and Central North America,* 5th ed. Houghton Mifflin, 2002.

Protocols for submitting bird samples for identification, available from FAA Airport Wildlife Hazard Mitigation: http://wildlife.pr.erau.edu/BirdIdentification.htm.

Safety guidelines for picking up bird remains (in light of recent bird flu developments), available from FAA Airport Wildlife Hazard Mitigation: http://wildlife.pr.erau.edu/safety/Safety_Precautions_for_Handling_Birdstrike_Remains.doc.

Three videos on wildlife control, produced by and available from Transport Canada Aerodrome and Air Navigation office and website:
Transport Canada, Aerodrome and Air Navigation
330 Sparks Street
Place de Ville, Tower C
Ottawa, Ontario, Canada K1A 0N8
Phone: 613-990-0515
www.tc.gc.ca/civilaviation/AerodromeAirNav/Standards/WildlifeControl/Awareness.htm

## Security

Aircraft Owners and Pilots Association Airport Watch Program: www.aopa.org/airportwatch.

Quilty, S. M. *Module 15: Airport Security and Response to Emergencies.* American Association of Airport Executives, Alexandria, Va.

*Security Guidelines for General Aviation Airports.* Transportation Security Administration, Washington, D.C., May 2004.

TSR Parts 1520, 1540, 1542, 1544, and 1548.

Williams, C. *ACRP Synthesis of Airport Practice 3: General Aviation Safety and Security Practices.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

CHAPTER 4

# Airport Planning and Development

Airport planning and development is essential for the success of an airport. It provides the foundation for growth of an airport by creating a plan not only for the development but also for the process used to implement the planned projects. A number of federal requirements govern various development projects, as well as the planning and development process. This chapter will address the planning and development process and the various tools, techniques, and requirements associated with implementing this essential part of the airport management process.

## Planning

Planning provides a framework to establish a baseline of existing land uses and to forecast future growth. A number of planning processes, at various levels, can assist with the development of an effective and efficient aviation system:

- National Plan of Integrated Airport Systems;
- State aviation system plans
- Regional aviation system plans;
- Airport master plans and airport layout plans;
- Design standards;
- Project justifications;
- Compatible land use plans; and
- Airport zoning ordinances, including land use and height limitations.

### National Plan of Integrated Airport Systems

In the mid-1940s, when the aviation industry was in its infancy, the federal government and aviation industry recognized that a national approach to managing the emerging aviation system was necessary. More than 60 years later, this need to plan for the aviation system from a national perspective is still taking place through the NPIAS. The most recent version of the NPIAS addresses the future of the system, from 2007 to 2011. This plan was developed in accordance with 49 USC 47103.

#### *Primary Principles of the NPIAS*

First issued in 1946, the NPIAS provides guidance to the national aviation system, which has evolved to be guided today by the following nine primary principles:

- Airports should be safe and efficient, located at optimum sites, and developed and maintained to appropriate standards.

- Airports should be affordable to both users and government, relying primarily on user fees and placing minimal burden on the general revenues of the local, state, and federal governments.
- Airports should be flexible and expandable, able to meet increased demand and to accommodate new aircraft types.
- Airports should be permanent, with assurances that they will remain open for aeronautical use over the long term.
- Airports should be compatible with surrounding communities, maintaining a balance between the needs of aviation and the requirements of residents in neighboring areas.
- Airports should be developed in concert with improvements to the air traffic control system.
- The airport system should support national objectives for defense, emergency readiness, and postal delivery.
- The airport system should be extensive, providing as many people as possible with convenient access to air transportation, typically by ensuring that most travelers will have no more than 20 miles to travel to the nearest NPIAS airport.
- The airport system should help air transportation contribute to a productive national economy and international competitiveness.

In addition to these guiding principles, the national aviation system is also under the requirement associated with Executive Order 12893, which states that investment in federal infrastructure systems must be cost beneficial. The national priority system, as outlined by the NPIAS through the aforementioned principles, guides the general distribution of funds, with flexibility provided if there is additional analysis and justification.

### *Airports within the NPIAS*

The plan identifies 3,431 airports that are of significance to the national air transportation system. As of July 2006, the FAA reported that there were 5,261 airports open for public use within the United States. Of these 5,261 airports, 3,431 (65%) are identified as part of the NPIAS. These NPIAS airports comprise 3,364 existing airports and 67 proposed airports. Of the existing airports, 3,251 are publicly owned while 113 are privately owned. A brief summary of existing NPIAS airports by FAA classification is as follows:

- 382 primary airports,
- 135 commercial service airports,
- 274 reliever airports, and
- 2,573 general aviation airports.

### *Non–NPIAS Airports*

There are 918 airports open for public use but not included within the NPIAS. These airfields are not included because they do not meet the minimum criteria:

- At least 10 based aircraft,
- At least 20 miles from another NPIAS airport, and
- Adequate opportunities for expansion or improvements at the site.

According to the 2007–2011 NPIAS, public-use airports not included in the NPIAS have an average of one based aircraft, compared to an average of 33 based aircraft at general aviation airports included in the NPIAS.

### *NPIAS Funding*

Inclusion in the NPIAS establishes an airport's eligibility to receive grants under the FAA AIP, as well as identifies its role in the national system. According to the 2007–2011 NPIAS, over the next five years there will be an estimated $41.2 billion in AIP-eligible infrastructure development spread over the various segments of the national aviation system.

### *NPIAS System Performance Factors*

Developers of the NPIAS recognized that periodic assessment of the plan's effectiveness was necessary. Six key factors have been established to assess system performance:

- Capacity,
- Safety,
- Environment,
- Pavement condition,
- Surface accessibility, and
- Financial performance.

Each of these factors is relevant to the overall quality of the national aviation system and the provision of air transportation. Combined, these factors provide a good indication of the system performance as a whole. These factors can also be used to assess the performance of each individual airport and to guide development. Priorities for project development can be set by using the six factors. For example, in recent years, improvements to the system that address increases in capacity and that improve safety have been a focus.

## State Aviation System Plans

As a complement to the NPIAS, each state has developed a state aviation system plan that provides guidance for an individual state's needs for a viable aviation system. The individual state plans assess the interaction of airports within the state's geographic boundary while evaluating the aviation needs, economic benefits, population requirements, and surface transportation needs of the local area and the state as a whole. FAA AC 150/5070-7, *Airport System Planning Process,* contains guidance for the development of a state aviation system plan report (*8*). It provides a summary of the various data that should be evaluated as well as identifies the steps used in the planning process and the general deliverables that should result from the work.

The state airport system planning process should be consistent with state or regional goals that involve examining the relationship between airports and aviation user requirements. Once these relationships are established, the airport system planning process should result in the identification, preservation, and enhancement of both current and future aviation demand. This AC provides a detailed outline for developing an acceptable airport system plan.

In many instances, state system plans include both NPIAS and non–NPIAS airports in which the non–NPIAS airports represent those airports acknowledged by their state aviation agencies as being of local or regional significance. These state plans include about 5,000 airports, which is approximately 33% more than the number contained in the NPIAS.

## Regional Aviation System Plans

In some instances, there may be significant concentrations of airports within a specific geographic area that may warrant the development of a regional aviation system plan. A regional plan utilizes the same general principles addressed in the state system planning process but within the small context of the geographic region. For example, in a large metropolitan area, there may be a commercial service airport and several small general aviation airports providing services to meet the demands for aviation activity. It would be important to assess the capacity, infrastructure needs, and use patterns of each of these airports as they relate to the entire area instead of assessing only their individual needs, because they likely provide services that complement the other airports.

Evaluating these types of relationships is important, especially in areas where airports are in proximity to one another, when airports may be offering similar services, or when airports may be

providing very specialized aviation activities. Developing a regional aviation system plan allows for the assessment of the individual needs of each facility and then measures these needs compared to the needs of the greater regional system. Alternatives for development are often created using these regional goals, and recommendations are developed based on the resulting assessment.

## Airport Master Plans and Airport Layout Plans

Airport master plans and airport layout plans (ALPs) are a companion set of documents essential to the development of an airport. These two documents combine to provide the foundation from which an airport sponsor can make decisions about the future growth and development of an airport. The master plan document is the narrative piece of the planning process that documents the process, alternatives, and recommendations. The ALP is the drawing set that graphically depicts the recommendations of the planning process.

### *Purpose of an Airport Master Plan and ALP*

Airport master plans and ALPs are long-range plans that detail the growth and development of the airport. These plans are typically based on a 20-year planning time frame and should be reviewed and updated every five to 10 years. The contents of an airport master plan are governed by FAA AC 150/5070-6B, *Airport Master Plans,* which can be found on the FAA website (www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars).

The contents of individual airport master plans are often used as the basis for the development of state aviation system plans, discussed in the previous subsection. The process of developing an airport master plan and the resulting ALP provides airports with the opportunity to assess existing facilities and evaluate future development options. Essentially, the master plan is the airport owner's or sponsor's strategy for developing the airport.

While airport master plans and ALPs are developed to address future needs, they should also consider the costs associated with the implementation of the plans. Additionally, consideration must be given to the environmental and socioeconomic impacts that may result from or be caused by the proposed actions. Efforts to avoid, minimize, or mitigate potential impacts to sensitive resources should be considered as part of the planning process.

As outlined in the FAA AC 150/5070-6B, *Airport Master Plans* (*9*), a master plan and the planning process should meet nine objectives:

- Document the issues that the proposed development will address;
- Justify the proposed development through the technical, economic, and environmental investigation of concepts and alternatives;
- Provide an effective graphic presentation of the development of the airport and anticipated land uses in the vicinity of the airport;
- Establish a realistic schedule for the implementation of the development proposed in the plan, particularly the short-term capital improvement program;
- Propose an achievable financial plan to support the implementation schedule;
- Provide sufficient project definition and detail for subsequent environmental evaluations that may be required before the project is approved;
- Present a plan that adequately addresses the issues and satisfies local, state, and federal regulations;
- Document policies and future aeronautical demand to support municipal or local deliberation on spending, debt, land use controls, and other policies necessary to preserve the integrity of the airport and its surroundings; and
- Set the stage and establish the framework for a continuing planning process. Such a process should monitor key conditions and permit changes in plan recommendations as required.

### *Importance of Airport Master Plans and ALPs*

Master plans and ALPs provide local decision makers with information to guide growth and development of an airport and should be used as a resource for the development of other community planning documents, such as local comprehensive plans. An airport master plan and the associated ALP should be provided to the local land use decision makers when they are evaluating projects in proximity to an airport in order to maintain compatible land uses for ultimate airport development. These plans are a guide in the continued development of an airport. While predominantly used by those with an interest in aviation, such as airport owners, state aviation agencies, and the FAA, an airport master plan and the associated ALP drawing set can be a useful document for municipal officials, planners, and the general public.

The planning process can afford not only the airport and those interested in aviation issues, but also those within the local community, an opportunity to work together to assess the future needs of the airport and the local community. Airports included in the NPIAS are required to have an ALP on file with the FAA. This file allows the FAA to evaluate airspace concerns within the vicinity of the airport, utilizing the FAR Part 77 surface criteria and the Terminal Instrument Procedures (TERPS) criteria. While an airport's master plan and ALP are reviewed by the FAA, only the forecast of demand and the ALP are actually approved by the FAA. Some states require airports to meet very specific requirements in order to receive state funding of their planned projects.

Additionally, at the local level, it is essential that the local community's comprehensive planning process consider its local or neighboring airport(s). If a local planning document does not provide a foundation to support decision making regarding the development of compatible land use in the vicinity of a local airport, it is unlikely that an effective planning process can be accomplished. Airport sponsors should become involved early in the planning process to share the airport needs and future development plans with the local municipality. This involvement should focus on educating the local municipality regarding the value the airport brings to the community as well as the need to preserve its operational areas. Airport sponsors or directors can become involved in the planning process in several ways:

- Have representation on the planning advisory or steering committee;
- Provide comments during the public comment portion of the process;
- Provide comments to other representatives of the advisory/steering committee to present airport-related concerns and issues; and
- Share airport master plans/airport layout plans with the local municipality to inform it of airport development.

Airport-related representatives should become engaged in the general planning process on a regular basis, not just during comprehensive planning exercises, to ensure adequate representation of airport interests.

### *Development of an Airport Master Plan and ALP*

Both an airport master plan and an ALP contain a specific set of information that guides the growth and development on an airport. Each of the documents and its associated components are described below in a general manner to outline the basic elements of each. It is recommended that prior to beginning a planning project, a considerable amount of time and effort be spent on developing a project scope of work that will clearly define the goals, objectives, and specific work elements of each of the documents.

An airport master plan is a comprehensive study of an airport or system of airports with short-, medium-, and long-term development plans to meet future airport demand. It is designed to put forward recommendations for the safe, efficient, and economic development of an airport to meet the demands of the community it serves. The process should focus on preparing a thoughtful, well-

coordinated, and practical plan that includes a realistic assessment of needs and resources. The end product should be a cost-effective plan of action for an airport or system of airports consistent with established goals and objectives.

The importance of the planning process can be summarized by "plan first, program second." That is, allow the results of the planning analysis to determine the facility requirements and needs based on FAA-approved forecasts, then develop appropriate alternatives for airport development prior to selecting a preferred alternative to present in the ALP drawings. A phased planning approach to project development should be utilized for complex programs. In most instances, it is suggested that a more "outside of the box" thinking process be used to create a work program specific to the project, supporting a justified need and cost-effective alternatives to meet those needs.

To begin the process, it is recommended that a complete understanding of available information and the issues to be addressed be compiled before a scoping meeting is held. Once these initial data are available, a planning meeting can be conducted to discuss realistic expectations with all the involved parties and determine which tasks should be included in the statement of work, based on the issues and needs at a specific airport.

An important part of the planning process is community involvement, which should be planned for and accommodated throughout the entire planning effort. Community involvement from the initiation of a planning study is critical for its successful completion. A technical advisory committee should be established that is composed of representatives from airport users as well as the local community. Metropolitan planning organization (MPO) and state aviation agency inclusion is crucial on these committees. Committee meetings should be held regularly during the study, during which updates on planning tasks can be provided and input from the members can be sought. Bringing potential adversaries in early during the planning process to educate them on airport basics can be an effective technique for addressing potential opposition and may help with buy-in later. Using the Internet and developing a project web page to disseminate information about the planning process is recommended.

A typical planning process includes individual elements that provide a fairly linear method of assessing the facility and its needs to meet the goals for development. For example, the following elements provide the basic guide for building an airport master plan, and these elements are modified for each study depending on what the primary emphasis may be for a specific airport:

- Inventory of existing conditions and facilities,
- Forecasts of aviation demand,
- Operations,
- Number and/or type of based aircraft,
- Number of enplanements, where appropriate,
- Facility requirements,
- Alternatives for development,
- Recommended development,
- Environmental overview,
- 21 categories as outlined by the National Environmental Policy Act (NEPA),
- Financial feasibility,
- Cost estimates for development,
- Rates and fees for airport services,
- Airport layout plan,
- Cover page,
- Airport data sheet,
- Airport layout sheets,
- Aerial and topographic features sheet,

- Approach sheets,
- FAR Part 77 surfaces sheet,
- Airport property plan, and
- Air Traffic Control Tower (ATCT) line-of-site plan.

A sponsor should address the needs and goals for development of each element based on the airside (i.e., runways, taxiways, aprons, etc.), landside (i.e., terminals, parking areas, hangars, etc.), and facilities and services (i.e., FBO, fuel, rental cars, maintenance, etc.) for its specific airport needs.

As previously noted, a comprehensive public involvement process should be used to help develop individual goals for an airport as the goals relate to the aforementioned elements. Looking at the long-term growth of the airport facility is necessary to create an effective master plan document.

## Design Standards

The primary federal requirements for airport development, particularly design standards, are included in the Federal Aviation Regulations. The FAA publishes advisory circulars to assist airport sponsors in complying with the requirements. The majority of this information is available to airport sponsors and the public through the FAA's website.

A variety of federal and state agencies have regulatory authority over the multitude of issues that may affect airport design decisions, as well as land use and development near airports. In general, the FAA and the state aeronautics agency should be contacted when questions about airport design or development near an airport arise. In addition to contacting the FAA and the state, each airport and its host community should evaluate specific airport needs to identify other federal, state, or local agencies that may need to be consulted prior to the development of an airport master plan, ALP, land use plan, or construction project. The FAA design standards, which pertain to the physical layout of an airport, are the primary source of design criteria and lay the foundation for airport development using federal funds.

### *AC 150/5300-13, Airport Design*

Airport design standards, as defined by FAA AC 150/5300-13, *Airport Design,* are implemented for the safe and efficient operation of an airport (*10*). Many design requirements are contained in this advisory circular and its appendices, which cover a wide range of airport design issues, including

- Airport geometry;
- Runway and taxiway design, including safety areas;
- Surface gradients and line-of-sight standards;
- Site requirements for navigational aids and air traffic control facilities;
- Runway and taxiway bridge criteria;
- The effects and treatments for jet blasts;
- Wind analysis;
- Runway end siting requirements;
- Airport reference code calculations;
- Compass calibration pad specifications;
- Small airport buildings, airplane parking, and tie-down layouts;
- Metric conversions;
- ALP components and preparation recommendations;
- Runway and taxiway design rationale;
- Computer programs available for use;

- Airplane data for a sample of aircraft within the national fleet;
- Declared distance concepts;
- Methods for the transfer of electronic data;
- New instrument approach procedures; and
- Recommendations for minimum distances between airports and on-airport agricultural uses.

Safety areas—clear areas near the runway and the approach environs—should be evaluated as part of the master planning process, along with the other design standards, to provide adequate design measures to facilitate safe and efficient development of airport facilities. Several of the most critical of the airport design standards illustrate the importance of having these safety areas:

- **Runway protection zones** (**RPZs**), formerly known as clear zones, were originally established to define land areas below aircraft approach paths in order to prevent the creation of airport hazards or development of incompatible land use. First recommended in a 1952 report, *The Airport and Its Neighbors,* by the President's Airport Commission, the establishment of clear areas beyond runway ends was deemed worthy of federal management. These clear areas were intended to preclude the construction of obstructions potentially hazardous to aircraft and to control building construction for the protection of people on the ground. The U.S. Department of Commerce concurred with the recommendation on the basis that this area was "primarily for the purpose of safety for people on the ground." The FAA adopted clear zones with dimensional standards to implement the Commission's recommendation.

  RPZs are designed to protect people and property on the ground. They are located at the end of each runway and should ideally be controlled by the airport. Control is preferably exercised by acquisition of sufficient property interest to achieve and maintain an area that is clear of all incompatible land uses, objects, and activities.

  The RPZ is trapezoidal in shape and centered on the extended runway centerline. Dimensions for a particular RPZ are based on the type of aircraft and approach visibility minimums associated with the runway end. Unless noted by a special circumstance, the RPZ begins 200 feet beyond the end of the runway and has specific land use restrictions in order to keep the approach and departure areas clear of obstructions. Table 3 provides dimensional information for the various RPZ sizes. Figure 4 provides a graphic representation of the RPZ dimensions. The RPZ has two specific areas: the central portion of the RPZ, which is equal in width to the runway object-free area, and the controlled activity area, which is adjacent to the central portion of the RPZ.

**Table 3. RPZ dimensional requirements.**

| Approach Visibility Minimums | Facilities Expected to Serve | Dimensions | | | |
|---|---|---|---|---|---|
| | | Length [ft (m)] | Inner Width [ft (m)] | Outer Width [ft (m)] | RPZ acres |
| Not lower than 1 mile (1,600 m) | Small aircraft exclusively | 1,000 (300) | 250 (75) | 450 (135) | 8.035 |
| | Aircraft Approach Categories A & B | 1,000 (300) | 500 (150) | 700 (210) | 13.770 |
| | Aircraft Approach Categories C & D | 1,700 (510) | 500 (150) | 1,010 (303) | 29.465 |
| Not lower than ¾ mile (1,200 m) | All Aircraft | 1,700 (510) | 1,000 (300) | 1,510 (453) | 48.978 |
| Lower than ¾ mile (1,200 m) | All Aircraft | 2,500 (750) | 1,000 (300) | 1,750 (525) | 78.914 |

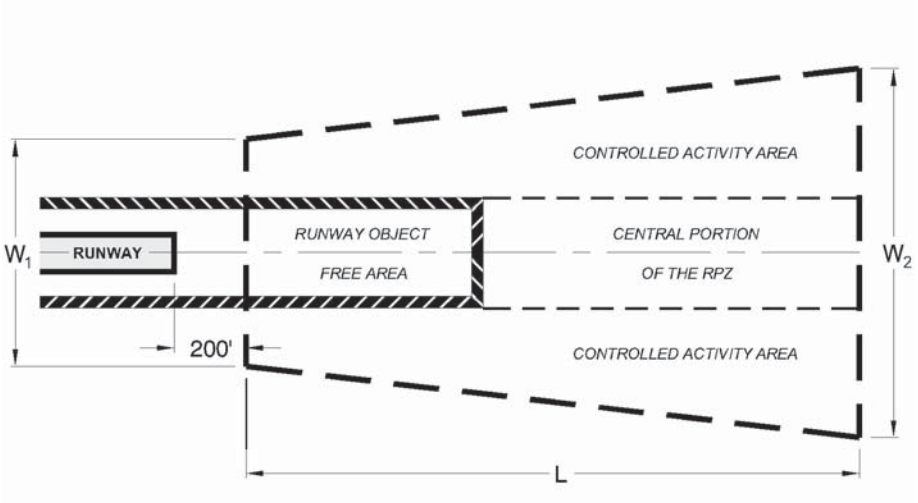


***Figure 4. Runway protection zone diagram.***

The RPZ dimensional standards are for the runway end with the specified approach visibility minimums. The departure RPZ dimensional standards are equal to or less than the approach RPZ dimensional standards. When an RPZ begins other than 200 feet (60 meters) beyond the runway end, separate approach and departure RPZs should be provided. Refer to FAA AC 150/5300-13 Change 11, Appendix 14, for approach and departure RPZs (*10*).

- **Runway safety areas** (**RSAs**) are rectangular, two-dimensional areas surrounding a runway. The FAA notes that RSAs should be cleared, graded, properly drained, and free of potentially hazardous surface variations. RSAs should also be capable of supporting snow removal, aircraft rescue and firefighting (ARFF) equipment, or an aircraft that overshoots the runway without causing damage to that aircraft. Taxiways also have similar safety area requirements. The actual size of an RSA is dependant upon the FAA classification of the runway (e.g., A-I, B-II, C-III).
- **Runway object-free areas** (**OFAs**) are two-dimensional ground areas surrounding runways where all above-ground objects must be removed unless fixed by their function, such as runway lights. FAA standards prohibit objects and parked aircraft from being located within the runway OFA. Taxiways also have OFAs.

RSAs and OFAs are almost always contained within airport property. However, RPZs can often extend beyond airport property. Therefore, from an off-airport land use compatibility perspective, the critical safety zone identified by FAA design standards is the RPZ. The FAA recommends that, whenever possible, the entire RPZ be owned by the airport and clear of all obstructions if practicable. Where ownership is impracticable, aviation easements are recommended to obtain the right to maintain the height of structures and vegetation within the RPZ footprint. Obtaining easements that are restrictive enough to limit building opportunities as well as height are often just as costly to procure as purchasing the property outright.

### *Other Supporting Documents*

Other supporting documents that offer information related to various design standards or FAA criteria useful for airport managers include the following:

- **AC 70/7460-1, *Obstruction Marking and Lighting.*** This advisory circular identifies obstruction marking and lighting requirements for any proposed construction or alteration that may affect the NAS.

- **AC 70/7460-2, *Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace.*** This advisory circular provides information regarding the erection or alteration of an object on or near an airport that may affect the navigable airspace as required in FAR Part 77. In addition, this advisory circular explains the process by which to petition for discretionary review, thereby providing the FAA the opportunity to
  - Recognize potential hazards and minimize the effects to aviation,
  - Revise published data and/or issue a NOTAM,
  - Recommend appropriate marking and lighting to make objects visible, and
  - Depict obstacles on aeronautical charts.

  The complete advisory circular is available online from the FAA Regulatory and Compliance Library (www.airweb.faa.gov/).
- **Form 7460-1, Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace, and Form 7460-2, Supplemental Notice of Actual Construction or Alteration.** These forms are required at all federally obligated airports to assess each proposed or temporary construction in the vicinity of the airport. The FAA conducts an aeronautical study and issues a determination to the proponent. The determination identifies whether the proposed development is a hazard to airspace. It is imperative that local planners be aware of the various critical safety considerations when developing around airports. The following requirements apply:
  - Form must be submitted at least 30 days prior to the date the construction or alteration is to begin.
  - Notice is required on or before the date an application for a construction permit is filed with the Federal Communication Commission (FCC), well in advance of the 30-day period.

  The complete documents can be found online at http://forms.faa.gov/forms.
- **FAR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports.*** This part of the FAR provides guidelines, procedures, and standards that should be used in determining what effect construction, alteration, activation, or deactivation of an airport will have on the safe and efficient use of the navigable airspace by aircraft. A notice does not need to be filed if the work is done under a federal-aid project. The complete document can be found on the FAA's Central Region website (www.faa.gov/airports_airtraffic/airports/regional_guidance/central/construction/part157/). (This guidance was developed by the FAA's Central Region ADO. Airport managers should verify the applicability of the information with their local FAA ADO.)
- **Form 7480-1, Notice of Landing Area Proposal.** This form works in conjunction with FAR Part 157, which requires a 90-day notification prior to any construction, alteration, deactivation, or change to the use of an airport. Notice is required for plans to
  - Construct or otherwise establish a new airport or activate an airport;
  - Construct, realign, alter, or activate any runway or other aircraft landing or takeoff area of an airport;
  - Construct, realign, alter, or activate a taxiway associated with a landing or takeoff area on a public-use airport;
  - Deactivate, discontinue using, or abandon an airport or any landing or takeoff area for a period of one year or more;
  - Deactivate, abandon, or discontinue using a taxiway associated with a landing or takeoff area on a public-use airport;
  - Change the status of an airport from private use to public use or from public use to another status;
  - Change the status from instrument flight rules (IFR) to visual flight rules (VFR) or VFR to IFR; or
  - Establish or change any traffic patterns or traffic pattern altitude or direction.

  The complete document can be found on the FAA website (http://forms.faa.gov).

## Project Justification

Justification for federal-aid projects continues to become more and more critical as funding options and competition for those funds increases. Consequently, establishing a solid foundation early in the planning process for recommended projects is important. The level of detail for justification often varies based on the type of project and the funding source. For example, as already has been noted, if an airport is included in the NPIAS, there is already a level of justification that is met by mere inclusion in the system. However, to maintain a competitive edge to garner additional funding, an airport will have to demonstrate a need for additional levels of funding that may come from a different source such as discretionary funds.

Essentially, the eligibility of a project is measured against the benefit of the project based on the individual airport's needs as well as the needs of the state and national system as a whole. For example, an airport may believe it needs funds to resurface an aircraft parking area that is deteriorating due to age and so requests a grant to rehabilitate the pavement. The FAA may feel that the higher priority at the airport is the lack of taxiway lighting on a parallel taxiway. Because the FAA's mission is to foster aviation facilities, the FAA could deny a grant request for the parking area rehabilitation and instead require the airport to develop a taxiway lighting project. While both projects would be eligible for AIP funding, the taxiway lighting may be deemed a higher priority, as it enhances the utility of the airport.

Documenting the need for specific projects often begins in the master planning process. Specific facility requirements and their associated methods of meeting the needs (alternatives) are identified and evaluated for feasibility. This process becomes the basis for the project justification. In some cases, this process can require additional documentation such as aircraft performance calculations to demonstrate specific runway length requirements. Because each airport has individual needs, an airport sponsor should work with the local state aviation agency and associated FAA office to determine the specific documentation that the FAA and state agency will require for individual federal-aid projects.

User surveys are often used in the project justification process to obtain airport-specific information. These surveys can cover a wide range of topics and can be distributed to a diverse audience depending on the information to be collected. For example, some airports conduct passenger surveys to assess the level of service being provided by a commercial air carrier, while a general aviation airport may conduct a survey of itinerant users to assess the level of services provided by the local FBO and learn if pilots are adequately provided for while they wait for their passengers. Runway length and facility needs can be assessed as well as the level of operations and types of use. A user survey can cover any number of issues and can be used to assist in project justification.

## Compatible Land Use Plans

Incompatible land uses and their impact on airport operations and development have escalated over the past 50 years. As decisions to allow incompatible land uses near airports threaten the nation's aviation system, implementation of compatible land use controls has become an industry priority. The primary tools available to local governments to prevent incompatible development include zoning and land use controls such as comprehensive plans, airport land use plans, and airport overlay zoning ordinances.

### *Definition of Compatible Land Uses*

One of the primary challenges with compatible land use is establishing a specific definition of what is considered either compatible or incompatible to an airport and aircraft operations. Airport-compatible land uses are defined as those developments that comply with generally accepted restrictions on location, height, and activity that provide for safe aircraft movement and

airport operations. Additionally, this definition includes the preservation of public health, safety, and welfare for those persons located in the surrounding airport environs.

This definition can appear vague, because no specific land use types are specified. The vagueness is intentional because nearly every type of land use can be both compatible and incompatible depending on the particular aspects of the land use, including the management of the land use, location of the land use relative to the airport, and ancillary types of impacts associated with the land use. For example, land uses typically considered to be compatible with airport operations include commercial, industrial, and agricultural activities. However, each of these may also contain aspects considered incompatible, because

- Commercial uses may have dense concentrations of people;
- Industrial operations often use tall smoke or ventilation stacks that generate smoke or steam, creating visual obstructions; and
- Agricultural operations can act as wildlife attractants.

Planners within the local municipality must assess the compatibility of the land use in greater detail as it relates to individual communities and airport operations. Land uses of concern to airports include those that attract high concentrations of people, those that use tall structures, those that create visual obstructions, and those that attract wildlife and birds.

### *Compatibility Plan*

A compatibility plan can be developed to guide land use decisions in the vicinity of an airport. A plan should include several elements to provide a comprehensive document, such as

- A land use manual, used as a resource document for land use compatibility concerns;
- A land use map; and
- A land use ordinance.

A compatibility plan is generally prepared to

- Assist in the preservation, continued development, and expansion of an airport;
- Protect the public health, safety, and welfare by identifying land use measures to be implemented in order to minimize the public's exposure to excessive noise and safety hazards within a specific area surrounding an airport;
- Protect the long-term economic viability of an airport by establishing compatible land uses within the airports environs;
- Promote the safety and well-being of the public through the adoption of land use regulations, which minimize exposure of persons to hazards associated with the operation of an airport;
- Provide an ordinance and criteria to help local municipalities (i.e., county, city, etc.) evaluate the compatibility of proposed local actions and determine the consistency of those proposed local actions to maintain compatible land uses in proximity to the airport; and
- Provide guidance to those persons presenting proposed local actions or developments.

Using a blend of the FAA criteria, airport-compatible land uses are defined as those developments that comply with generally accepted restrictions on location, height, and activity to provide for safe aircraft movement and airport operations as well as the preservation of public health, safety, and welfare for those persons located in the surrounding airport environs.

Examples of land uses typically considered compatible with airport operations include commercial, industrial, and agricultural activities. Land uses such as residential developments, schools, and hospitals are considered incompatible with airport operations. Each of these examples must be evaluated in detail as it relates to individual communities, because even those uses considered compatible can have instances where incompatibility can arise. Conversely, some incompatible uses can be considered compatible if managed properly.

## Zoning

Zoning that facilitates the preservation of an airport through compatible land use can take on many forms, from incorporation into a local municipal zoning ordinance to acting as a stand-alone ordinance that allows for the control of land use decisions near an airport. Planning documents (plans) provide the basis for the development of ordinances and regulations, which in turn provide structure for implementing land use controls. Ordinances are legal documents developed by municipalities to regulate land uses and associated activities with designated locations to protect, preserve, and enhance the quality of life for residents. Regulations are the tools that provide authority for the day-to-day implementation of an ordinance. The combination of all three of these techniques (i.e., plans, ordinances, and regulations) is necessary for effective land use planning.

Ordinances reflect what is written in a community's comprehensive plan and are effective tools to reduce incompatible land uses surrounding airports. When a local municipality undertakes the development of a zoning ordinance for land use compatibility, consideration should be given to current zoning and approval actions required by state agencies. A legal review of the proposed airport land use and height overlay zoning ordinance is suggested to determine if the ordinance is consistent with local and state regulations.

Zoning ordinances are used to specify any or all permitted, regulated, or restricted land uses that may endanger the health, safety, and welfare of citizens. Ordinances that regulate airport land use and height should be incorporated into a city's or county's comprehensive zoning ordinance, or both, to protect the safe operation of airports and movement of aircraft as well as the safety of people on the ground in proximity to airports.

One of the most common forms of zoning associated with airports is the development of an airport overlay-zoning ordinance (AOZO). An AOZO is an extraterritorial tool that promotes compatible land use and height limitations within the vicinity of an airport. The sponsoring party, typically the local municipality, or a state statute determines the specific distance governed by the AOZO. The AOZO is most often adopted according to

- Land use–related restrictions,
- Height-related restrictions, or
- Combination of height- and land use–related restrictions.

When feasible, it is recommended that the combination of height and land use restrictions be used when developing the AOZO in order to adequately protect the airport, safe movement of aircraft, and the persons on the ground within the vicinity of the airport. Overlay zoning applies additional conditions or restrictions to a specified area while retaining the existing base zoning classification underneath the overlay zoning districts.

The AOZO can be highly effective in addressing a number of potential incompatibilities related to airport operational areas. An AOZO may limit the height of objects surrounding an airport as well as restrict specific land uses that create conditions potentially hazardous to air navigation. Such limits may be essential for protecting the health, safety, and welfare of residents as well as maintaining safe aircraft movement and airport operational areas.

### *Land Use–Related Restrictions*

An AOZO that addresses land use issues supersedes the existing underlying zoning within specified zoning districts. It is adopted by city or county governments, or both, to prevent or mitigate potentially incompatible land uses such as noise sensitivity–related issues and safety-related issues (e.g., concentrations of people, tall structures, visual obstructions, and wildlife and bird attractants).

### *Height-Related Restrictions*

An AOZO that focuses on the safety of the airport and the public must include height restrictions for development beyond airport property lines. Multiple jurisdictions can fall within an airport's area of influence. Height limits should be placed on objects, structures, and natural vegetation within this area. This concept, known as "extraterritorial zoning," plays an important role in land use development in regions that have an airport or multiple airports. Used as part of an AOZO, height restrictions preserve navigable airspace. This restriction only applies in states that have legislation that allows these types of restrictions.

Legally mandated by the FAA in FAR Part 77, *Objects Affecting Navigable Airspace,* any object or structure that penetrates any of the "imaginary surfaces" is considered an obstruction to air navigation and forms the basis for height-restriction zoning ordinances. Details regarding specific height restrictions should be included in the AOZO and kept on file with the appropriate governmental agencies (e.g., county, office of aviation, FAA).

FAR Part 77 specifically requires that any person or organization intending to sponsor construction activities or alterations must notify the administrator of the FAA prior to construction for the following conditions:

- Any construction or alteration that exceeds 200 feet above ground level;
- Any construction or alteration:
  - Within 20,000 feet of a public-use or military airport that exceeds a 100:1 surface from any point on the runway of each airport, with at least one runway more than 3,200 feet;
  - Within 10,000 feet of a public-use or military airport that exceeds a 50:1 surface from any point on the runway of each airport, with its longest runway no more than 3,200 feet; or
  - Within 5,000 feet of a public-use heliport that exceeds a 25:1 surface;
- Any highway, railroad, or other traverse way for which the prescribed adjusted height would exceed the above-noted standards;
- When requested by the FAA; or
- Any construction or alteration located on a public-use airport or heliport regardless of height or location.

Notification to the FAA for off-airport development is done through the FAA Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) page (https://oeaaa.faa.gov/oeaaa/external/portal.jsp), which allows for electronic filing of the Notice of Proposed Construction or Alteration (FAA Form 7460-1). For a full discussion of FAA Form 7460-1, refer to the foregoing subsection "Other Supporting Documents" under "Design Standards."

There are a multitude of federal and state agencies with regulatory authority over a wide range of areas that could affect land use decisions near airports. Trying to identify each of these groups and the associated legislation would be a daunting task; consequently, it is suggested that each airport and its host community evaluate the specific needs of the airport and surrounding community to identify other agencies that may need to be consulted prior to development of a land use plan.

## Emerging Trends

Several items are expected to have an impact on the aviation industry over the next few years. These items include the introduction of very light jets (VLJs), the introduction of smaller aircraft (often called light sport aircraft), and advances in navigational aids.

### *Very Light Jets*

In 2006 the FAA certified the first VLJs to fly in the NAS. These new vehicles have sparked debate about the future of passenger travel and the aviation industry as a whole. This subsection will

describe what VLJs are and provide information about VLJ industry trends and expectations. The FAA defines a VLJ as an aircraft that weighs 10,000 pounds or less (maximum certified takeoff weight), is certified for single-pilot operations, and is priced below other business jets. In addition, VLJs possess at least one of the following features:

- Advanced cockpit automation, such as moving-map GPS and multifunctional displays;
- Automated engine and systems management; or
- Integrated auto-flight, autopilot, and flight guidance systems.

FAA officials have stated that procedures and policies are in place to successfully integrate VLJs into the NAS because they will operate similarly to other aircraft in the current fleet. However, the FAA is taking additional steps to specifically address any unique issues that might affect the product's integration.

In August 2007 the U.S. Government Accountability Office (GAO) published *Very Light Jets—Several Factors Could Influence Their Effect on the National Airspace System* (*11*). The report examines eight industry forecasts and estimates that roughly 3,000 to 7,600 VLJs will be delivered between 2016 and 2025. Several factors influence the variation in figures and dates—primarily the assumptions that were used (or not used). The forecasts tended to focus on development of the air taxi market, economic growth, production constraints, insurance and training requirements, and expected aircraft retirements, among other factors.

It is expected that VLJs will be used in ways similar to other types of general aviation aircraft—in corporate fleets and as business or personal aircraft. The FAA notes that the most critical and most speculative factor in the future of VLJ deliveries will be the extent to which a market for air taxi services using the jets develops.

The 2007 GAO report also examined commercial aviation service options for small communities and noted that current VLJ business models indicated operators would provide premium point-to-point service between cities larger than the communities eligible for the Essential Air Service (EAS) program (*11*). One company, DayJet, has already begun point-to-point air service in the Southeast and could prove to be a model for commercial VLJ operations.

Because of reliance on an emerging air taxi market, the future of VLJs appears volatile, but there is speculation that other factors will also affect plane deliveries:

- **Replacement market.** Customers may wish to upgrade their aircraft to a VLJ based on its technological capabilities. Also, a large number of aircraft are expected to be retired in the future, which would increase demand.
- **Number of aircraft models.** Many VLJ models are expected to be available to consumers. The range of capabilities and prices might strengthen demand.
- **Dissatisfaction with other forms of transportation.** Increased difficulty associated with commercial airline and automobile travel may lead to higher demand for VLJs.
- **Low purchase price and operating costs.** VLJs are relatively inexpensive compared to other models of turbine aircraft ($1.5 million to $3 million versus $5 million to $10 million).
- **Access to airports with appropriate infrastructure.** Manufacturers believe that VLJs will be able to use a relatively large number of private and public airports and perhaps increase demand. Conversely, infrastructure needs such as hangars and ground transportation at these facilities might limit access and hinder demand.
- **Training and insurance requirements.** Potential pilots may decide that the time and money needed to achieve acceptable levels of training and insurance prove burdensome, which may affect their willingness to fly VLJs.
- **Production constraints.** The ability of aircraft manufacturers to produce enough VLJs to meet demand may influence the number of aircraft delivered.

Despite wide speculation about VLJs and their sales, manufacturers and the FAA believe that integration into the market will be gradual. This gradual integration could prove beneficial, as any problems with the new jets and how they operate in the NAS could be dealt with in a timely and orderly fashion.

### *Light Sport Aircraft*

A new classification of aircraft called light sport aircraft (LSA) is entering the market. These aircraft give pilots the option of smaller, more economically feasible aircraft to purchase as well as build that do not require the same level of licensure to operate. These aircraft are likely to account for a small portion of the aviation industry; however, until more enter the market and there is more history from which to assess the situation, it is difficult to determine what effect these aircraft may have on the industry as a whole. Many businesses are providing designs for LSAs, which suggests a significant interest, although it is unlikely that all of the companies currently working on LSAs will survive.

The primary concern associated with LSAs is the ability of LSA owners to obtain insurance for the aircraft. In the high-cost market of aviation insurance today, some airports require specific levels of insurance for aircraft based at a particular facility, and this requirement may place limitations on the aircraft and the airports. Additionally, there are questions about the level of demand that will exist for training and sales associated with these aircraft.

### *Advances in Navigational Aids*

**Area Navigation (RNAV).** RNAV was developed to provide more lateral freedom and thus more complete use of available airspace. This method of navigation does not require a pilot to track directly to or from any specific radio navigation aid. It has three principal applications:

- A route structure can be organized between any given departure and arrival point to reduce flight distance and traffic separation;
- Aircraft can be flown into terminal areas on varied preprogrammed arrival and departure paths to expedite traffic flow; and
- Instrument approaches can be developed and certified at certain airports, without local instrument landing aids at that airport.

**Automatic Dependent Surveillance–Broadcast (ADS-B).** ADS-B is a technology that allows pilots in the cockpit and air traffic controllers on the ground to track aircraft traffic with more accuracy than other systems, specifically radar. ADS-B relies on the Global Navigation Satellite System to determine an aircraft's precise location. The position data are combined with other information such as aircraft type, speed, altitude, and flight number. The information is converted into a digital message and broadcast via a radio transmitter.

There are two components to the system. The first is an onboard transponder that emits a continuous signal. The second component is a ground-based transceiver that gathers location information and projects it onto a vehicle tracking/surface moving map used by pilots and air traffic controllers.

Proponents of the new technology point to several advantages:

- ADS-B improves safety by giving pilots and controllers reliable, accurate, real-time information about aviation traffic. The system can report aircraft positions to +/– 25 feet, more accurate than a quarter- to a half-mile for radar.
- Because the system has an effective range of 100 to 200 miles, ADS-B provides a greater margin to implement conflict detection and resolution than is currently available.
- ADS-B can signal while an aircraft is grounded. This ability provides safer, more efficient taxi operations and results in greater airport capacity.

- The system has proven to be successful at improving safety. ADS-B was first used in Alaska, where accidents declined by 40% after implementation.
- As part of its Next Generation Air Transportation System, the FAA has requested in its budget $85 million in 2008 and $564 million over the next five years for ADS-B infrastructure development, demonstration, and implementation.

Some key drawbacks have been identified with ADS-B:

- General aviation operations will be linked to the Universal Access Transceiver, while commercial operations will link with the 1090 MHz squitter. These frequencies are incompatible, which means to date the vehicle tracking/surface moving map might not depict both frequencies.
- The targeted implementation date for onboard avionic transponders is 2014 for commercial aircraft and 2020 for all aircraft. Because funding mechanisms for the system are unidentified at this time, it is questionable whether system-wide installation will be achieved by the target dates.
- The 1090 MHz frequency for commercial operations has been used in Europe. Based on experience with the same frequency, some officials there predict system overload in the early 2010s. Despite greater space across the United States, some remain skeptical.

## Consultant Selection

AC 150/5100-14, *Architectural, Engineering and Planning Consultant Services for Airport Grant Projects,* provides important guidance for the selection of a consultant. Use of this document is recommended to ensure appropriate steps are taken to procure the services of a qualified consultant to assist with planning, design, and construction projects. These federal regulations require a quality-based selection process for selecting consultants for projects funded with FAA AIP funds. This requirement includes consultant selection and procurement by sponsors, states, and the FAA Airports Division. All parties are encouraged to become familiar with the requirements of this AC and use the following guidelines:

- Advertise early enough to give consultants at least three weeks to respond;
- Properly identify the scope of work, required services, project schedule, project details, and selection criteria in all requests for qualifications (RFQs);
- Select a committee to establish a well-defined scoring system and rate the statements of qualifications (SOQs);
- Do not include requests for cost information, including hours or hourly rates, in the RFQ or anywhere in the selection process;
- Use interviews when a clear decision cannot be made on the submitted SOQs;
- Limit the interview short list to no more than three to five firms;
- Notify the consultants at least two weeks in advance of an interview and identify the interview format and expectations;
- Notify all parties of the final selection in a timely fashion;
- Request that the selected consultant develop a detailed work scope and corresponding fee estimate for negotiations;
- Include applicable federal provisions in all consultant contracts;
- Avoid any broad-form indemnity language in contracts; and
- Ensure that key project personnel identified during the consultant selection process are stipulated in the contract.

This process allows for the sponsor to select a qualified consultant and work to negotiate an appropriate fee for the individual needs for each project. Although they may disapprove of the selected consultant, scope of work, cost, or contract, the role of FAA personnel in the sponsor's or state's consultant selection process is advisory only.

## Development and Construction Standards

Projects funded under the AIP must be developed in accordance with the policies, standards, and specifications developed by the U.S.DOT. The FAA has the responsibility of determining whether all construction work accomplished under the AIP is in accordance with federal standards. This section will outline some of the standard procedures for airport facility development and discuss some of the accepted measures for conducting construction operations on an airport. Prior to design, an airfield development project must be shown on an approved airport layout plan. Prior to construction, proper environmental and stormwater clearances must be obtained as discussed in the previous section of this chapter.

### Design Development

#### *Predesign Conference*

Predesign conferences should be conducted to ensure that the sponsor, the engineer, airport staff, and airport users are aware of the design, safety, and construction requirements and understand their individual responsibilities. The predesign conference, convened and conducted by the sponsor or authorized agent, should be used to discuss various items relating to design parameters, airport safety, routing of aircraft and equipment, sequencing of construction operations, environmental considerations, and civil rights requirements.

The magnitude, type, and location of the project, as well as potential changes in airport use and operations due to the project, will determine the need for a predesign conference. A predesign conference is essential when a project is of sufficient complexity to affect airport operations during construction. Possible conflicts between construction activities and the operation of the airport should be resolved at this meeting.

Attendees of the predesign conference should include the sponsor's engineer, airport management, airport users including any airlines or FBOs, any applicable environmental agency representatives, any potentially affected utilities, and the representative from the FAA Airports Division.

The predesign conference should discuss the scope of work and the design parameters peculiar to the project, including items such as design aircraft, local conditions and materials, use of recycled materials, design options, use of FAA standards, and any materials furnished by others.

#### *Design Review Meetings*

Depending on the complexity of the project, additional design review meetings may be necessary to ensure that all aspects of the project have been incorporated into the plans, specifications, and estimate of cost. Design review meetings are generally held when the project is 30%, 60%, and 90% complete but should be scheduled as needed.

#### *Engineer's Report*

An engineer's report should be submitted with the plans and specifications and should detail the decisions of the design review meetings and some of the critical design factors. A typical engineer's report will include the following:

- Scope of proposed project;
- Design alternatives and the reason for the selected design;
- Pavement design: typical sections, allowable loadings, design aircraft, etc.;
- Drainage design computations;
- Lighting design and explanation of equipment;

- Explanation of any deviations from FAA standards;
- Reasons for any modifications to construction standards;
- Description of any non-federally funded work to be included in the contract;
- Engineer's estimate of construction/contract cost; and
- Provisions included in the plans and specifications to carry out environmental mitigation actions resulting from the environmental coordination process.

## Construction Plans

One of the most important keys to a successful construction project is to have a well-thought-out plan for construction. Following is a list of some typical components of an airport construction plan set:

- Title sheet and drawing index,
- Project site plan and survey control,
- Construction safety and operations plan,
- Phasing plan,
- Project quantities,
- Soil borings,
- Typical sections,
- Erosion control plan,
- Removals plan,
- Grading and drainage plan,
- Drainage details,
- Existing or proposed contours,
- Plan and profile sheets,
- Pavement marking plan and details,
- Cross sections,
- Electrical plans and details,
- Fencing plan, and
- Landscaping details.

## Construction Specifications

The project's specifications supplement the plans and describe in greater detail the requirements of the materials to be used, what testing and quality assurance methods are required, and how the work will be measured and accepted for payment. The project specifications should also state the time allowed for project completion, labor and wage rate requirements, civil rights requirements, and any other technical and legal requirements of the contract.

Projects funded under the AIP must conform to the guidelines established in FAA AC 150/5370-10A, *Standards for Specifying Construction of Airports.* As stated within this advisory circular, many of the standards are not to be incorporated verbatim, but rather are to provide options to the engineer when preparing a specification to ensure that sound engineering judgment is applied to consider the unique conditions of the project (*12*).

In certain instances, state specifications are implemented. On approval by the FAA, these state specifications may be incorporated in construction contracts by reference. The state specifications must be readily available to all parties interested in such contracts.

FAA airport field representatives, designated by regional offices, have the authority to approve modifications to standards if the modifications provide acceptable levels of safety, economy, durability, and workmanship and are necessary to meet local conditions.

## Construction Safety and Operations Plans/Safety Manuals

Airport expansion projects often require the presence and movement of construction labor and equipment near critical airport traffic areas. The proximity of construction activities and airport operations needs to be carefully considered during the planning of construction site layouts in order to minimize and eliminate all potential construction-related hazards to aviation safety. The FAA has issued guidance to airport operators in the form of AC 150/5370-2E, *Operational Safety on Airports During Construction* (*13*). Some of the highlights of this advisory circular are presented in this subsection.

### *Basic Safety Plan Considerations*

The airport operator should determine the level of complexity of the safety plan that is necessary for each construction project and its phases. Details for a specified safety plan, or requirements of a contractor-developed safety plan, should be discussed at the predesign and preconstruction conferences and should include the following items, as appropriate:

- Actions necessary before starting construction, including defining and assigning responsibilities;
- Basic responsibilities and procedures for disseminating instructions about airport procedures to the contractor's personnel;
- Means of separating construction areas from aeronautical-use areas;
- Navigational aid requirements and weather;
- Marking and lighting plan illustrations; and
- Methods of coordinating significant changes in airport operations with all the appropriate parties.

### *Safety Plan Checklist*

To the extent applicable, the safety plan should address the following:

- Scope of work to be performed, including proposed duration of work;
- Runway and taxiway marking and lighting;
- Procedures for protecting all runway and taxiway safety areas, obstacle-free zones, object-free areas, and threshold-citing criteria, including limits on equipment height and stockpiled material;
- Areas and operations affected by the construction activity, including possible safety problems;
- NAVAIDs that could be affected, especially critical-area boundaries;
- Procedures and equipment, such as barricades (identify type), to delineate closed construction areas from the airport operational areas, as necessary;
- Limits on construction;
- Required compliance of contractor personnel with all airport safety and security measures;
- Location of stockpile construction materials, construction site parking, and access and haul roads;
- Radio communication procedures with the ATCT or other parties;
- Vehicle identification;
- Trenches and excavations: distances from pavements, cover, and slope requirements;
- Procedures for notifying RFF personnel if water lines of fire hydrants must be deactivated or if emergency access routes must be rerouted or blocked;
- Emergency notification numbers and procedures for medical and police response;
- Use of temporary visual aids;
- Wildlife management;
- Foreign object debris (FOD) control provisions;
- Hazardous material management;
- NOTAM issuance; and
- Procedures for locating and protecting existing underground utilities.

### *Safety and Security Measures*

Airport operators are responsible for closely monitoring tenant and construction contractor activity during the construction project to ensure continual compliance with all safety and security requirements. Airports subject to 49 CFR 1542, *Airport Security,* must meet standards for access control, movement of ground vehicles, and identification of construction contractor and tenant personnel. Some keys areas of consideration for safety and security are

- Vehicle operation, marking, and pedestrian control;
- Construction vehicle equipment parking;
- Radio communication training;
- Fencing and gates; and
- Traffic control.

### *Notification of Construction Activities*

To maintain the desired levels of operational safety on airports during construction activities, the safety plan should contain the following notification actions:

- NOTAMs. The airport operator must provide information on closed or hazardous conditions on airport movement areas to the FSS so it can issue a NOTAM. The airport operator must coordinate with tenants and the local air traffic facility the issuance, maintenance, and cancellation of NOTAMs about airport conditions resulting from the construction activities. Only the airport operator or an authorized representative may issue or cancel NOTAMs on airport conditions. (The airport owner/operator is the only entity that can close or open a runway.) The airport operator must file and maintain this list of authorized representatives from the FSS. Any person having reason to believe that a NOTAM is missing, incomplete, or inaccurate must notify the airport operator.
- ARFF Notification
- Notification to the FAA

## Airport Construction Activities

### *Preconstruction Conference*

A preconstruction meeting, convened and conducted by the sponsor or an authorized agent, should be used to discuss various items including operational safety, testing, quality control, security, safety, labor requirements, and environmental factors. This meeting, among all parties affected by the construction, should help anticipate potential problems that may result from the project construction and develop solutions to avoid or minimize them.

Participants will vary according to the effect that the proposed construction will have on the operation of the airport. As applicable, the sponsor should invite the sponsor's engineer, the resident engineer, airport management, the responsible testing company, the prime contractor and subcontractors, airport users such as FBOs and pilot associations, affected utilities, applicable environmental agencies, and representation from the FAA.

General discussion topics at the preconstruction meeting will consist of the following:

- The scope of the project and the sequence of operations;
- The relationship of the resident engineer to the sponsor and the authority of the resident engineer to suspend operations, wholly or in part, when safety violations or nonconformance to contract specifications are noted;
- The relationship between the FAA and the sponsor;
- Identification of the contractor's superintendent and his or her authority and responsibility;
- Work schedule, the need to perform certain items at various stages of the project, and operational or safety problems that might arise because of the proposed construction;

- Issuance of the notice to proceed and contract completion requirements;
- Safety and security requirements during construction (as discussed previously); and
- The need for continuing vigilance for potential or existing hazards relative to any of the following items:
  - Open trenches and settlement of backfill adjacent to pavements,
  - Pavement "drop-offs" or "lips" at tie-in areas,
  - The obliteration, inadvertent relocation, or disturbance of the marking and/or lighting of a displaced threshold or marking or lighting of closed runways and taxiways,
  - Damages to existing lighting, markings, or NAVAIDs by construction forces,
  - Spillage from vehicles on active airport pavements,
  - Temporary stockpiling of material for an extended period of time,
  - Contractor vehicular traffic through restricted critical areas of NAVAID facilities and the airport operating areas, and
  - Dust and erosion control and other environmental factors.

### *FAA Form 7460-1*

FAA Form 7460-1, Notice of Proposed Construction or Alteration, must be submitted to the FAA to give notification of construction proposed on airports that are open to the public. Form 7460-1 must also be filed for any construction or alteration proposed on an airport that is available for public use.

Once the form has been submitted to the FAA, a determination will be made as to whether the proposed construction or alteration is acceptable.

Generally, the notification must be sent to the FAA regional/airports district office 30 days before the start of construction or the filing of a construction permit, whichever occurs first. The FAA will do an aeronautical case study to evaluate the impact to the airport and, once completed, will issue its determination. The possible outcomes of the aeronautical case study are as follows:

- **No Objection.** The subject construction did not exceed obstruction standards and marking/lighting is not required.
- **Conditional Determination.** The proposed construction/alternation would be acceptable contingent upon implementing mitigation measures (marking and lighting, etc.)
- **Objectionable.** The proposed construction/alteration is determined to be a hazard and is thus objectionable. The reasons for this determination are outlined to the proponent.

### *Quality Control*

The FAA has issued guidance for quality control of airport grant construction projects in the form of AC 150/5370-12A (*14*). This AC establishes guidelines and standards for construction projects and states the responsibilities of the sponsor, engineer, and FAA project manager.

Typically, general aviation airports do not have the staff or expertise to perform the construction supervision and testing required for determining acceptability and quality of construction. Most general aviation airports will retain a consulting engineering firm to represent the sponsor and have the responsibility for reporting on the acceptability and quality of the work. During construction, this responsibility is typically that of the resident engineer. The resident engineer must have field experience in the type of work to be performed; be fully qualified to make interpretations, decisions, field computations, and the like; and have the knowledge of testing requirements and procedures. The resident engineer must have the authority to reject both unsatisfactory workmanship and unsatisfactory materials. The primary duties of the resident engineer are to

- Check activities to ensure compliance with the plans and specifications, and inform the contractor of any work that is in noncompliance.

- Ensure that all testing required by the specifications is performed. All commercially produced products, such as pipe and reinforcing steel, that are used on the project should be accompanied by numerical test results or a certification from the manufacturer that the material meets the applicable standards.
- Visit the testing laboratory to determine if it has the equipment and qualified personnel necessary to conduct the tests required by the specifications.
- Ensure that tests are performed at the frequency stated in the specifications. Determine when and where tests will be taken and witness tests. If not indicated in the specifications, a sufficient number of tests should be taken to verify that the construction is acceptable.
- Review test reports and certifications for conformance to the specifications. Each test report for material in place should, at a minimum, contain the following:
  - Test performed and date,
  - Applicable standard or project specification,
  - Test location,
  - Test result,
  - Action taken on failing tests, and
  - Locations and adjusted contract price when statistical acceptance procedures are specified or when provisions allow for reduced payment.
- Maintain a file of test reports and certifications.
- Inform the contractor of deficiencies so corrections can be made and retesting performed prior to covering any substandard work with additional material.
- Document quantities of materials used on the project by actual measurements and computations in a field book or on computer printouts retained in a folder.
- Maintain a set of drawings that can be used to document "as constructed" conditions.
- Review payment requests from the contractor.
- Review and inspect construction conformance to erosion control plan. Document any problems and communicate corrective actions necessary to contractor.
- Maintain a project diary that documents work, location, weather, equipment, personnel, and other related details.
- Handle change orders, time extensions, payments, and liquidated damages.

### *Labor and Civil Rights Requirements*

Labor requirements on federally funded airport improvements include such items as

- Minimum wage rates,
- Employee classification and submittal of payroll reports, and
- Review of payroll submittals for conformance to federal and state wage rates.

Civil rights requirements on federally funded airport improvements include such items as

- A determined goal for percentage of the work to be completed by a Disadvantaged Business Enterprise,
- Equal Employment Opportunity, and
- Certification of non-segregated facilities.

### *Project Completion and Closeout*

Once the construction project has reached substantial completion, a final inspection is generally scheduled with the sponsor, engineer, contractor, airport management, and applicable FAA representatives. The final inspection should give all parties an opportunity to walk the project and identify any final corrective actions that must be completed in the development of a punch list. Upon substantial completion, it is also necessary to flight-check any new or adjusted navigational aids and to test the operation of lighting and other visual aids.

The sponsor or authorized representative may elect to release or reduce any monies retained to the contractor, depending on the work identified for completion on the final inspection.

The contractor is generally required to submit an affidavit of wage-rate compliance. The engineer should develop a list of variations in quantities (with explanations) and a materials book that documents the testing of materials and certifications received during construction.

## Environmental Considerations

Prior to any undertaking, the airport is responsible for ensuring that it is in compliance with applicable environmental regulations. This section of the guidebook is intended to provide a brief summary of applicable regulations for airport actions and to familiarize an airport with the environmental process. It is intended to provide general guidance. In addition to FAA requirements associated with federal actions, there are other federal, state, and local regulations that airports should be aware of and consider prior to starting a project. It is recommended that airports consult with the FAA airports district office, state aviation office, or environmental professionals for specific project guidance. In general, the goal is for an airport to be aware of resources that may have special regulations associated with them. Conducting baseline environmental studies can identify environmental constraints. The better informed the airport is about these issues, the greater likelihood that planning and project implementation will go smoothly.

### *Regulatory Overview*

**Federal Regulatory Process.** The FAA Office of Airports is responsible for analyzing the environmental effects of proposed airport actions, verifying that the evaluation process complies with NEPA, and implementing regulations issued by the Council on Environmental Quality. Prior to the FAA issuing grants or other approvals, documentation that the project complies with the governing acts and regulations is required. The FAA has issued the following three documents for guidance and instruction:

- FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures.* FAA, Washington, D.C., FAA, June 2004.
- FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Actions.* FAA, Washington, D.C., FAA, April 2006.
- *Environmental Desk Reference for Airport Actions.* FAA, Washington, D.C., October 2006.

NEPA may require three types of documentation. In order of simplest to most complex level of analysis required, the three types of NEPA documents are

1. Categorical exclusion,
2. Environmental assessment, and
3. Environmental impact statement.

FAA Orders 1050.1E and 5050.4B describe these documents as well as when they are required. The FAA has identified several types of projects and federal actions that can be categorically excluded. Even if the project is on this list, however, verification is still required that special circumstances that would trigger the need for an environmental assessment do not exist.

In addition to NEPA, other federal environmental regulations such as the Clean Air Act and Clean Water Act must be adhered to. FAA Order 1050.1E and the FAA *Environmental Desk Reference* provide instruction on how to comply with these various laws. The following subsections provide basic information on these issues. This document is not intended to be all-inclusive. Please refer to both FAA Order 1050.1E and the *Environmental Desk Reference* for more complete guidance.

**State Regulatory Process.** States vary in how they implement NEPA and other environmental regulation for airports. The FAA has delegated its NEPA processing oversight and other specific responsibilities for non–air-carrier airports to states with block grant programs. The states are then charged with providing oversight and guidance on the environmental process to ensure it complies with FAA regulation. The FAA still has ultimate responsibility for the final decision or finding on the environmental document, depending on the specific block grant agreement.

In addition to these block grant programs, states may also have their own state Environmental Policy Act regulations that airports must adhere to in addition to the FAA requirements. Examples include California, with its California Environmental Quality Act process, and Minnesota, with an environmental quality board overseeing this process. Sometimes these state and federal processes can be completed concurrently; at other times the requirements of each are different and do not lend themselves to this parallel process. It is important that an airport be aware that additional state processes may be applicable to it.

**Local Regulatory Process.** The previous two subsections identified federal and state processes originating from NEPA. Cities, townships, and counties may have jurisdiction and regulatory oversight over certain airport activities. It is recommended that airports establish relationships with these local jurisdictions and contact them at the onset of projects and studies as appropriate to familiarize them with the airport, gain their input, and determine if any local permits or approvals are applicable or required.

### *Water Resources*

Many airport activities have the potential to affect water resources. Resources include surface water and groundwater quality and quantity. Both temporary impacts, such as those created during construction, and long-term ones, such as those associated with increased pavement and deicing systems, should be considered. The following subsections present a brief overview.

**Federal and State Regulations.** The Clean Water Act is the principal statutory framework for considering water quality. States and local municipalities have adopted regulations that allow them to enforce this federal law. These regulations include the issuance of Water Quality Certificates (WQC) from either the U.S. EPA or from a state if the state has been delegated Clean Water Act oversight. A WQC is required for any dredging or filling activities that require a Section 404 permit (described in the "Wetlands" subsection later in the chapter).

**State and Local Regulation and Ordinances.** As previously noted, some states provide WQCs. Many local jurisdictions also have stormwater ordinances that airports must comply with. These ordinances typically include design standards for new projects.

**Floodplains.** If a flooding source such as a creek, river, or lake exists on or in the vicinity of airport property, a determination must be made as to whether any proposed actions could affect this floodplain. The Federal Emergency Management Agency (FEMA) has issued Flood Insurance Rate Maps and Flood Hazard Maps, available from the FEMA website (www.fema.gov/hazard/flood/info.shtm), which should be reviewed. If a project would affect a floodplain, alternatives should be developed that minimize the impact. Executive Order 11988 is the primary regulation, with DOT Order 5650.2, *Floodplain Management and Protection,* and FEMA guidance also applicable.

**Stormwater Management.** It is important that airports manage runoff from their facilities—both the quantity and quality. The National Pollutant Discharge Elimination System (NPDES) program requires NPDES permits for facilities that have a point source discharge into a navigable waterway. These permits (or notices of intent) are required when more than one acre of ground disturbance is planned. These permits are typically issued by the same entity that can

issue WQCs. Many smaller airports are currently covered under general NPDES permits, while larger airports may have an individual permit. Airport managers should keep informed of regulatory developments in the NPDES area to ensure that their permits are current and valid.

Coverage by these permits requires that airports have a stormwater pollution prevention plan. This plan requires periodic monitoring of stormwater facilities, which in many cases is conducted by airport staff, and documentation of stormwater management practices currently in place. Some stormwater practices, such as wet detention (permanent wet ponds) for water quality, provide wildlife attractants and are therefore discouraged at airports.

### *Air Quality*

**Regulations.** The Clean Air Act and NEPA are the two regulations to be considered. Many airport actions are too small to require detailed air quality analysis under NEPA.

**General Conformity, State Implementation Plans.** The EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. States are responsible for identifying or "designating" areas that are in attainment, nonattainment, or maintenance for each of these six pollutants. States are required to develop EPA-approved state implementation plans to achieve or maintain the NAAQS.

Airports should verify the designation of the area in which they are located. If an airport is in a nonattainment or maintenance area, it is recommended that the airport contact its local air agency to confirm what analysis or permits are required for projects. In some states, permits may be required for indirect sources such as boilers.

### *Noise*

The noise from airports, particularly aircraft noise, can be a source of controversy for any airport. FAA guidance requires a noise analysis be conducted for general aviation–related actions if, during the period the environmental document covers, the projects would involve more than

- 90,000 annual piston-powered aircraft operations (257 average daily operations) in approach categories A through D, or
- 700 annual jet-powered aircraft operations (about two average daily operations).

Under FAR Part 150, local jurisdictions can prepare and submit to the FAA a noise exposure map for the airport's environs and a noise compatibility plan. This voluntary program applies to all publicly owned, public-use airports included in the NPIAS.

Other provisions established by FAR Part 150 include

- Making the decibel A-weighted (dBA) scale the universal noise measurement tool,
- Making the Day-Night Level (DNL) the universal noise contour measure, and
- Defining acceptable land uses for areas within each DNL noise contour.

### *Hazardous Materials*

The potential of contamination and pollution from hazardous materials should be assessed and each state's regulations complied with.

### *Due Diligence Environmental Audits*

If the airport is planning to acquire land or disturb areas of land, a due diligence audit should be conducted and FAA guidance should be sought. This audit reviews historic and current use of land and obtains known pollutant sources (records search) to assess the potential for the lands to be contaminated.

### *Spill Prevention Countermeasure and Control Plans*

Airports should have a current spill prevention countermeasure and control plan completed that could be implemented in case of a spill.

### *Wetlands*

**Applicable Regulation.** Wetlands are regulated under Executive Order 11990, *Protection of Wetlands;* the Clean Water Act, Section 404; the Rivers and Harbors Act, Section 10; and the Fish and Wildlife Coordination Act. Agencies with regulatory authority include the EPA, U.S. Corps of Engineers, U.S. Fish and Wildlife Service, and state environmental agencies.

**Airport Responsibilities.** Airports are responsible for activities occurring in wetlands within their property. The most common activities are filling or dredging within wetlands under the jurisdiction of the U.S. Corps of Engineers or the state. Tree clearing, if clearing and grubbing is involved, is also considered a regulated activity. It is recommended that airports have wetland delineations performed to verify the extent, type, value, and function of wetlands in areas of potential disturbance. The amount of fill or dredging determines the type of permit. Efforts must be made to try to avoid the impact by looking at other alternatives. If avoidance is not possible, then efforts must be made to minimize the impact and mitigate the effects. On-site mitigation is generally not desirable because of the potential for affecting wildlife. Many states have wetland mitigation bank programs to help with mitigation. If a special or unique resource is affected, regulatory agencies may request site-specific mitigation. The USDA Animal and Plant Health Inspection Service helps the FAA review mitigation plans for wildlife conflicts.

### *Fish, Wildlife and Plants*

Consideration must be given to the flora and fauna in the vicinity of an airport. Endangered or threatened species or their habitats are protected by the Endangered Species Act with oversight by the U.S. Fish and Wildlife Service. Additionally, states may have a state list, often found in a National Heritage Inventory. Airports should learn if such special species exist in their vicinity so that this information can be considered in airport plans.

### *Farmlands*

**Farmland Protection Policy Act.** The intent of this regulation is to protect prime farmland from being converted into non-agricultural uses. The Natural Resource Conservation Service oversees this program locally. Airports should contact this agency if there is the potential to acquire or convert farmland. Additionally, states and local jurisdictions may have programs that place encumbrances on property associated with agricultural use. Prior to conversion, the existence of such encumbrances should also be determined.

**Possible Conflicts with Wildlife.** FAA AC 150/5200-33B, *Hazardous Wildlife Attractants on or near Airports,* Section 2, identifies the potential for conflict from the proximity of agricultural land to airports because the land can attract wildlife. Many airports have undertaken wildlife assessments, the results of which are used to develop a site-specific wildlife management plan. Recommendations may include taking land from agricultural use or planting it with certain crops.

### *Historical, Architectural, and Cultural Significance*

The FAA *Environmental Desk Reference for Airport Actions* defines a historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior (36 CFR

Section 800.16(I)). Properties or sites having traditional religious or cultural importance to Native American tribes and Hawaiian organizations may qualify."

Section 106 of the National Historic Preservation Act is the implementing regulation that applies to activities that may affect such properties.

Airports should be aware that such a regulation exists. Compliance with this regulation involves consultation with a state historic office. Depending on the state, either the FAA office or state aviation office will contact the state historic office.

### *Sustainable Development*

Sustainable development marries two important themes: that environmental protection does not preclude economic development and that economic development must be ecologically viable now and in the long run. Common use of the term "sustainability" began with the 1987 publication of the World Commission on Environment and Development report, *Our Common Future.* Also known as the Brundtland Report, this document defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (*15*). This concept of sustainability encompasses ideas, aspirations, and values that continue to inspire public and private organizations to become better stewards of the environment and that promote positive economic growth and social objectives. The principles of sustainability can stimulate technological innovation, advance competitiveness, and improve our quality of life.

Examples of sustainable concepts include

- Passive lighting,
- Reduced emissions,
- Improved air quality (in hangars and buildings),
- Hydrant in-ramp fueling,
- Recycling,
- Buildings designed to Leadership in Energy and Environmental Design (LEED) certification standards, and
- Energy-efficient fixtures.

A good resource for aviation-related concepts is the Airports Council International–North America (ACI–NA) Airport Sustainability Committee website (www.sustainableaviation.org).

**Leadership in Energy and Environmental Design.** LEED is a program that provides certification for implementing sustainable features, although it is geared more toward buildings and associated development.

**The Airport Sustainability Committee.** The Airport Sustainability Committee, which consists of members of the ACI–NA joint Environmental and Technical committees, was formed to develop a plan of action for sustainability, including quantifying and promoting sustainable benefits for airports of all sizes and demographics. Its goals include helping airports document and quantify these efforts and providing support. Airport sustainability considers the economic viability, operational efficiency, natural resource conservation, and social responsibility of an airport for developing a holistic approach to managing an airport.

Initiatives will continue to develop for practicing sustainability at airports. The Airports Sustainability Committee recognizes that sustainability applies not only to new facilities and construction but also to business practices including operations, maintenance, component renewal costs, and life-cycle costs. Airports should consider a business model that includes sustainability as an initiative.

## Airspace and Approaches

The purpose of this section is to provide guidance on issues pertaining to airspace clearing and obstruction standards including a review of 14 CFR Part 77, *Objects Affecting Navigable Airspace;* TERPS; and airspace right-of-way and easements.

### 14 CFR Part 77, Objects Affecting Navigable Airspace (FAR Part 77)

FAR Part 77 establishes the standards for determining obstructions to navigable airspace and describes the notification requirements for any construction or alteration potentially affecting navigable airspace surrounding airports.

#### *Standards*

**Imaginary Surfaces.** The navigable airspace areas governed by FAR Part 77 are referred to as "imaginary surfaces." The size and shape of imaginary surfaces are dependent on the size of airplanes that use the airport, the approach visibility minimums, and the runway type (e.g., paved or turf). Figure 5 illustrates dimensions for some of the imaginary surfaces. The FAA Obstruction Evaluation/Airport Airspace Analysis page of the FAA website (https://oeaaa.faa.gov/oeaaa/external/portal.jsp) provides a link to FAR Part 77 dimensional requirements and illustrations for imaginary surfaces as well as other information relating to the process for reviewing airspace issues. The five types of imaginary surfaces are

- **Primary Surface.** A primary surface is a surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway; when the runway has no specially prepared hard surface, or planned hard surface, the primary surface ends at each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of a primary surface is
  - 250 feet for utility runways having only visual approaches or
  - 500 feet for utility runways having nonprecision instrument approaches.

  For other than utility runways, the width is
  - 500 feet for visual runways having only visual approaches;
  - 500 feet for nonprecision instrument runways having visibility minimums greater than three-fourths of a statute mile; or
  - 1000 feet for precision instrument runways, and for nonprecision instrument runways having a nonprecision instrument approach with visibility minimums as low as three-fourths of a statute mile.

  The width of the primary surface of a runway will be that width prescribed for the most precise approach existing or planned for either end of that runway.
- **Transitional Surface.** The transitional surface extends outward and upward at right angles to the runway centerline and extends at a slope of 7 feet horizontally for each 1 foot vertically (7:1) from the sides of the primary and approach surfaces. The transitional surfaces extend to the point at which they intercept the horizontal surface at a height of 150 feet above the established airport elevation. For precision approach surfaces that project through and beyond the limits of the conical surface, the transitional surface also extends 5,000 feet horizontally from the edge of the approach surface and at right angles to the runway centerline.
- **Horizontal Surface.** The horizontal surface is a horizontal plane located 150 feet above the established airport elevation that encompasses an area from the transitional surface to the conical surface. The perimeter is constructed by generating arcs from the center of each end of the primary surface and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc for all runway ends designated as utility or visual is 5,000 feet and 10,000 feet for precision and nonprecision runway ends.

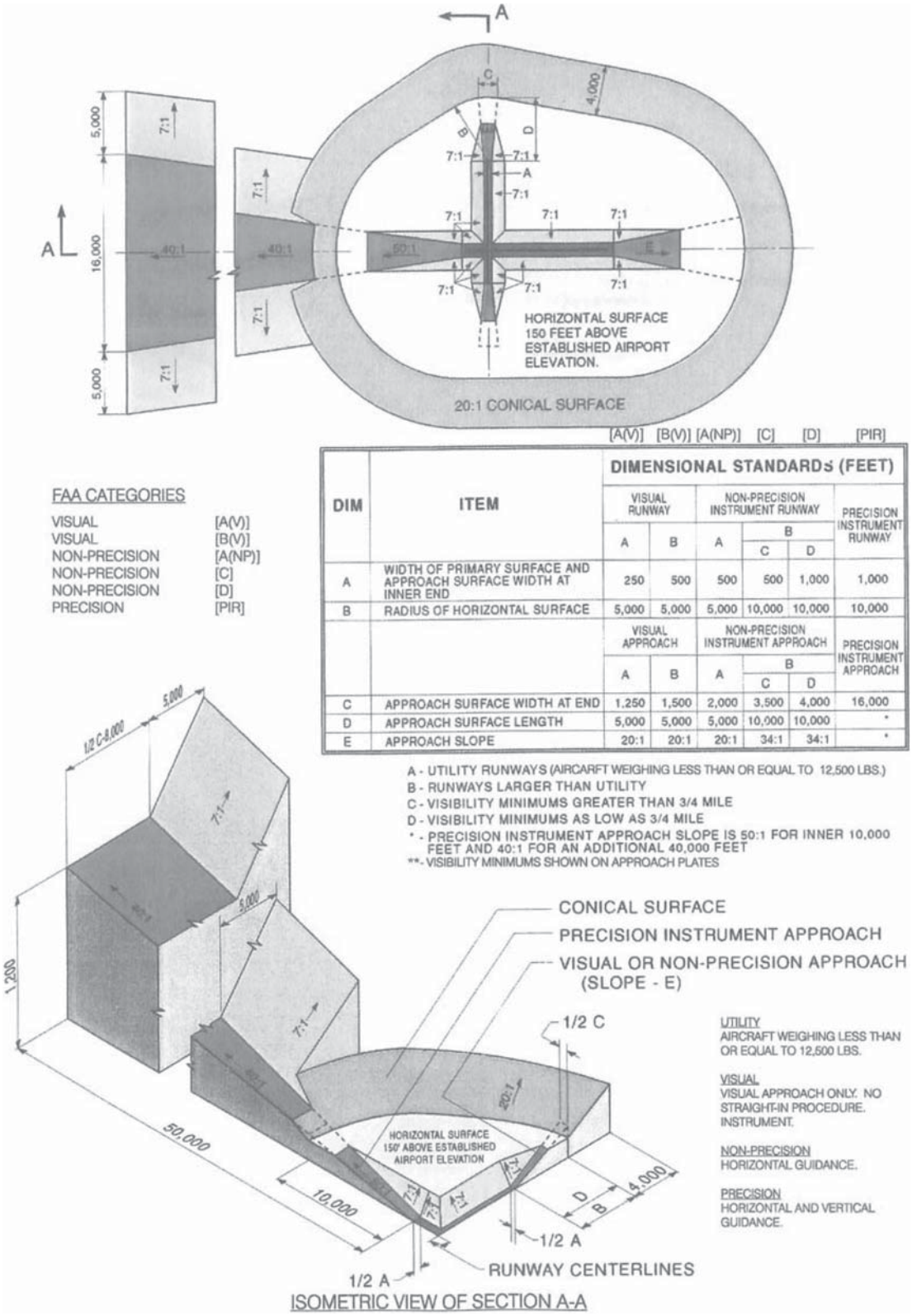


***Figure 5. FAR Part 77 imaginary surfaces.***

- **Conical Surface.** The conical surface extends upward and outward from the periphery of the horizontal surface at a slope of 20 feet horizontally for every 1 foot vertically (20:1) for a horizontal distance of 4,000 feet. Height limitations for the surface range from 150 feet above the airport reference elevation at the inner edge to 350 feet at the outer edge.
- **Approach Surface.** The approach surface is longitudinally centered on the extended runway centerline and extends outward and upward from the end of the primary surface. The approach slope of a runway is a ratio of 20:1, 34:1, or 50:1 depending on the approach type.

With the recent development of new approach procedures such as GPS, RNAV, and Lateral Precision with Vertical Guidance approaches, there is a greater degree of flexibility in the definition of nonprecision and precision instrument approaches. The FAA has not altered the text related to FAR Part 77 to reflect these changes to date.

**Aeronautical Study.** Under FAR Part 77, the FAA is authorized to undertake an aeronautical study to determine whether a structure or vegetation is or could be a hazard to air navigation. A hazard determination may result in a change to one or more instrument operating procedures (e.g., raising the instrument approach/departure minimums to maintain the required obstacle clearance) or other changes, such as displaced thresholds. However, the FAA is not authorized to regulate tall structures nor is there specific authorization in any statute that permits the FAA to limit structure heights or determine which structures should be lighted or marked. In fact, in every aeronautical study determination, the FAA acknowledges that state or local authorities control the appropriate use of property beneath an airport's airspace. For this reason local land use controls are needed to support the findings of the FAA.

### *Notification Requirements*

The proponent of construction activities or alterations must notify the FAA by completing FAA Form 7460 as outlined in the "Other Supporting Documents" subsection of "Design Standards" in this chapter. In addition, many states impose notification or restriction requirements to areas surrounding airports, which are tied to the imaginary surfaces defined in Part 77.

## TERPS

FAA flight procedure specialists design protected airspace corridors in accordance with FAA Order 8260.3B, *United States Standards for Terminal Instrument Procedures,* and related FAA orders, commonly referred to as "TERPS." Simply put, TERPS employ a concept of "required obstacle clearance" for determining minimum altitudes along various flight segments. The amount of required obstacle clearance is dependent on the type of flight segment (e.g., en route, transition, circling, initial, intermediate, final approach, missed approach) and the accuracy and integrity of the electronic navigational aids being used. TERPS clearance surfaces can be flat (such as an en route airway) or sloping (such as during departure or a missed approach). Required obstacle clearance is reduced during the approach and departure phases. This reduced separation necessitates maximum navigational accuracy for continued operations during inclement weather.

In most cases, protecting against penetrations of the civil airport imaginary surfaces defined in FAR Part 77 is sufficient airspace planning. However, FAR Part 77 does not encompass offset approaches (i.e., those not aligned with the centerline), missed approaches, aircraft climb gradients, or instrument departures. Therefore, it is possible for an object to penetrate a TERPS clearance surface, causing an increase in the departure minimums (for example, without penetrating an imaginary surface of Part 77). This possibility is why the notification requirements of Part 77 are more stringent than the identification (a.k.a. charting) requirement. Increasingly, airport sponsors, local governments, and state governments are incorporating TERPS surfaces and other surfaces when developing easements, zoning, or land use policies surrounding airports.

### Other Clearance Surfaces

FAA AC 150/5300-13, *Airport Design* (Appendix 2), includes a description of landing threshold and runway-end siting requirements (*16*). Runway threshold markings identify the beginning of the runway available for landing. The threshold may be displaced from the runway end for purposes of clearing an object in the approach area, reducing noise over a sensitive site, or increasing the runway safety area available in the event of an undershoot. The threshold siting requirements are separate from those for Part 77 and TERPS surfaces described in the preceding paragraphs. The size, shape, and slope of the threshold siting surface depend on a variety of factors including type of approaches available (e.g., visual, circling, straight-in, precision, or nonprecision), whether nighttime approaches are restricted, airplane size, and airplane approach speed.

Other clearance surfaces include NAVAID critical areas and visual aid critical areas (e.g., visual approach slope indicator and approach lights).

Lastly, instrument departure operations and runway ends supporting air carrier operations require special consideration. Aircraft takeoff and climb performance is increasingly becoming a limiting factor at airports. Standard TERPS instrument departure surfaces are relatively flat (40:1) to protect for a variety of aircraft and flight conditions in a single procedure. Penetrations to the standard departure surface will result in limitations (e.g., increased departure minimums and/or climb requirements). Commercial operators flying multiengine aircraft also develop engine-inoperative routes in the event of an engine failure on takeoff for each type of aircraft and runway they operate. In these cases, it is best for an airport to establish stringent notification and review processes involving individual air carriers.

### Airspace (or Avigation) Easements and Rights-of-Way

An airspace (or avigation) easement is the right granted to the airport's sponsor to use the airspace above another's real property to permit regular takeoffs, landings, and overflight by aircraft (or similar wording), and to cause the associated interferences on the ground. Often it limits the height of obstacles that can be constructed or allowed to grow on the property and permits the airport's sponsor to remove existing obstructions. Occasionally, certain uses such as smoke and dust generation, and light and electromagnetic emissions, are also included in avigation easements. Most important, the easement is prepared against the title of the real property and is often the best means of protecting critical airspace besides direct airport ownership. There is also a point at which a fee simple acquisition becomes more cost-effective than an easement.

## Additional Resources

Note: FAA advisory circulars are available online at www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars.

*Notices to Airmen (NOTAMs) for Airport Operators,* FAA AC 150/5200-28B.

Khalafallah, A., and K. El-Rayes, Minimizing Construction-Related Hazards in Airport Expansion Projects. *Journal of Construction Engineering and Management,* Vol. 132, No. 6., 2006, pp. 562–572.

*Predesign, Prebid, and Preconstruction Conferences for Airport Grant Projects,* FAA AC 150/5300-9A.

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CHAPTER 5

# Public Relations

## Marketing and Advertising

Developing public relations is one of the most important aspects of the job of an airport manager. An airport is a valuable community resource and economic driver for the community. Promoting it in the community and building relations on and off the airport is critical to its successful operation. Whether communicating facility goals and vision, dealing with negative opinions about the airport, or addressing emergency situations, the public relations component of managing an airport cannot and should not be avoided. This chapter will address the public relations process and marketing as it relates to small airport management.

### Developing a Marketing Plan

#### *Objective*

A marketing plan can be a powerful tool for developing public relations and providing strategic direction for an airport. Formal marketing plans benefit airport managers in that they evaluate opportunities and problems, identify customers, assess competition, set priorities, and measure successes. This section will provide a general overview of some of the components essential to the development of a small airport marketing program.

Identifying the objectives of a small airport marketing plan is an important first step. Objectives may vary between airports and are tied closely to overall organization goals and airport vision. Examples of objectives might be to increase overall utilization of the airport facility, create an image, or attract businesses to the airport. In general, meeting the objectives of successful marketing plans will usually require that the airport administration and businesses at the airport be marketing oriented and focused on the customer.

#### *Market Analysis*

Conducting a market analysis for the purpose of developing a small airport marketing plan includes evaluating airport products, services, and facilities; assessing competition; and identifying target markets. The plan should take careful inventory of the airport and what differentiates it from neighboring facilities that might be considered competitors. A part of this evaluation should examine the role of the airport in the community and the vision and mission established through strategic planning of the airport.

The analysis might identify the airport's customers, including tenants, transient aircraft pilots, tourists, or the local community. The marketing plan might also identify segments of the market to focus efforts on, such as business customers, recreational customers, or the community. Within these segments, desirable attributes or preferences can be identified and careful consideration given to how the airport now serves these segments of the market. As an example, if the analysis

identifies business aviation as a market segment, desirable attributes might include having excellent instrument approaches or even clean restrooms. The airport manager can then assess current conditions or set priorities based on identified attributes.

A good marketing plan will also allow for a detailed examination of the strengths, weaknesses, opportunities, and threats (SWOT) of the airport. It may be helpful to organize this assessment in relation to the identified target markets. As in the previous example, if business aviation is a target market, then the SWOT analysis should break down how the airport currently serves this market and list the strengths, weaknesses, opportunities, and threats to serving the business aviation segment.

### Developing Marketing Strategies and Priorities

Marketing strategies for small airports vary widely, from simple to complex depending on the resources available to a particular airport. An airport marketing plan should identify and list these strategies, which may include materials such as brochures, tours, print advertising, events, press releases, direct mailings, or a website. These are just a few potential airport marketing strategies but by no means the limit. Airport managers should be innovative and list all potential ideas, focusing on attributes of the airport, community, or geographical region that may lead to new strategies.

After compiling the potential marketing strategies it is important to prioritize these efforts and their frequency. For example, if the plan identifies the strategy of publishing an airport newsletter, the airport manager can rate this as a high marketing priority to be disseminated quarterly. Developing marketing strategies, prioritizing, and determining frequency of application will assist the airport manager in implementing the plan toward effectively meeting plan objectives.

Small airport budgets do not usually allow for nor is it normally practical to implement all potential marketing strategies identified in a small airport marketing plan. Prioritizing strategies and scheduling implementation will help managers phase in marketing techniques and adjust budgets accordingly. Often there are few costs involved and techniques are ongoing.

### Measuring Success

It is typically very difficult to measure the effectiveness of a small airport's marketing program. A good marketing plan, however, will attempt to measure the effectiveness of implementing marketing strategies and how effective these strategies are toward meeting objectives. A system of monitoring and surveying customers about these programs may be helpful. Other indicators of success can be measured, such as monitoring changes in the number of based aircraft or operations. Determining these indicators depends largely on what strategies are implemented to reach which target market. An airport manager should also review plan implementation and effectiveness periodically to assess any changes in objectives or overall marketing goals of the airport.

## Community Relations

An airport is an important part of any community, and as part of the public relations effort, airport managers must understand the needs of the community and build relationships with the community as a customer and stakeholder in the facility. Airport representatives should provide open communication not only with primary users of the airport and tenants but also with community groups, political leaders, neighbors, and others.

When communicating the benefit of the airport to citizens of a community, it is important to describe the elements of the airport that make it valuable. The community should be made aware

of the many valuable uses of the airport such as air ambulance, firefighting, aerial agricultural spraying, search and rescue, and law enforcement. Other commitments to the community might include the safe operation of the airport, support of a full range of aviation activities including medical transport, business access, cost-effective management of the airport, and community compatibility. Airport management should be aware of community needs and strive for environmental stewardship by minimizing the impacts and intrusion of noise, planning for compatible land use development, and being a "good neighbor." An airport can enhance the image of the community by providing first-class facilities.

An airport manager should actively engage in community outreach. Presenting an airport program to local civic organizations is an excellent opportunity to interact with the community and instill pride in the community about the many benefits of the airport. Another way to reach out to the local community is through the schools. Bringing young people to the airport for tours or other aviation programs is a rewarding way to educate the community. Other activities should be explored as well, such as holding an Aviation Career Day at the local high school.

## Media Relations

An airport public relations program must address dealing with a variety of media sources. Airport representatives may benefit from establishing a liaison with local print, television, and radio media outlets. The airport manager is the ideal point of contact with the media and will likely be the most informed and authoritative speaker on airport issues.

It may be advantageous to be proactive with the media in reporting airport news. A positive relationship with media representatives and reporters through personal contact will help the airport manager deliver publicity to the public and determine what is newsworthy. Preparing press releases for a newsworthy event or action will generate interest and help ensure that accurate news is reported. In preparing news releases, the airport manager should be factual and concise.

The AOPA has a variety of guidance materials and examples of press releases available.

## Public Relations

Public relations is primarily about communication. Marketing, advertising, and community relations are all linked to communicating what the airport is and does that may affect the public interest. Understanding the airport's role in the community and the social and economic impacts of the airport will help the airport manager communicate with the public. Effective public relations programs will communicate the mission, vision, goals, and values of the airport.

### Perception of the Airport in the Community

A positive perception of the airport in the community is a valuable thing. Airport managers should take time to research the community's opinions about the facility. All too often vocal opponents of the airport will view it as a place for hobbyists. Community leaders and elected officials will sometimes view the airport as a noise-generating "playground" for recreational users, and therefore expensive and unneeded. A solid public relations program that involves the community will help educate the public on the value of the airport to the entire community and will help counter negative public opinions.

Public relations should not only focus on public opinion but also on political action. Elected local, state, and federal officials often make decisions on issues that affect airports. Building

relationships with political officials and keeping them informed and apprised of airport positions is important. Such communication can be accomplished with direct, concise correspondence or with personal meetings. An elected official may or may not have any knowledge of or interest in airport issues. Airport representatives should provide facts that will help guide informed decision making.

### Public Events

Inviting the public out to the airport for various events can be an effective way of building support for an airport. Hosting airport tours, events, and air shows helps raise community awareness and foster goodwill. It is common for small airports to host an annual fly-in breakfast. Airport management will often support this activity, which may be put on by an airport-based user group such as a flying club, civil air patrol, or experimental aircraft association chapter.

Air show events are quite popular with the public and can attract thousands of visitors to an airport. These shows often include aircraft aerobatic performances, aircraft static displays, and other ground events. Air shows will generally require an FAA waiver coordinated through the local FAA flight standards district office. Airport management should always have on hand an up-to-date copy of any FAA waiver affecting the operation of the airport.

Every air show is organized differently but clearly takes an immense amount of time and coordination to plan, organize, and conduct. Air show sponsors will need to coordinate all activities with the airport manager. The primary consideration of any public event or air show should be public safety. The required planning and coordination for an air show will take at least 12 months. Some of these operational considerations include

- Safety and security,
- Aircraft parking,
- Filing of NOTAMs,
- Air traffic control,
- Airspace requirements,
- Automobile parking,
- Pedestrian flow of traffic,
- Emergency planning,
- Communications, and
- Waiver provisions.

## Additional Resources

The ACRP is funding several projects related to airport marketing including Project 01-04, "Marketing Techniques for Small Airports," which will be published in 2009. In addition, the American Association of Airport Executives (AAAE) offers a wide range of publications pertaining to airport marketing and community relations through the information library on its website (www.aaae.org). Online access to the publications is limited to AAAE members, although nonmembers may purchase the documents. The AOPA also offers several community relations–oriented documents through its website (www.aopa.org). Accessing the AOPA publications online is not restricted to AOPA members.

CHAPTER 6

# Commercial Service

## History and Overview

### Airmail

The first commercial aviation service was established in May 1918 with the implementation of the first regular airmail route between New York City and Washington, D.C. Initially this service was a joint arrangement between the U.S. War and Post Office Departments, with the planes, pilots, and operational and maintenance needs supplied by the War Department and the sorting, loading, and discharging of the mail effort supplied by the Post Office. By August 1918 the Post Office took over the entire responsibility of the operation, including the development of mail service on a larger scale.

### Commercial Passenger Service

Although the first commercial passenger flight is documented to have occurred about the same time as the start of regular airmail service, scheduled air service as we know it today was not under way until the 1920s and 1930s. The Ford Trimotor of the 1920s and the Boeing 247 and Douglas DC-3 of the 1930s are credited as being the first successful passenger service aircraft. Scheduled air service experienced continued growth from its inception until the beginning of World War II.

After World War II the demand for passenger and cargo service grew steadily. Advancements in aircraft technology developed for military aircraft during the war provided an impetus for this demand by providing pressurized aircraft, better aircraft reliability, greater speed (which reduced travel time), and many other modern-age amenities. The introduction of the first jet airliners in the late 1950s and 1960s combined improved reliability, speed, and other passenger enhancements, and the demand for air service increased.

The 1970s saw the introduction of the first "jumbo jets" with the McDonnell Douglas DC-10, the Lockheed L-1011, and the Boeing 747 aircraft. These "wide-bodied" aircraft with greater speed, comfort, and cargo capacity became widely popular with the airlines, the flying public, and cargo carriers.

A new type of airline service was introduced in the 1980s and 1990s that was dubbed "low cost" because it offered dramatically lower airfares. The low-cost airlines accomplished this by using non-union employees, thus paying lower wages than the legacy carriers, and by offering fewer amenities to their passengers. Those amenities such as meals, advanced seating, frequent flyer programs, and other items that had been promoted to win customer loyalty and support by legacy carriers were simply not offered by these new low-cost carriers. These carriers have been hugely successful in winning passengers away from traditional carriers—so successful, in fact,

that it has led to industry consolidation among some of the weaker carriers and a revamping of the legacy carriers' business models in most cases so that they could stay competitive.

Developed during this same time frame was the regional airline. Although it could be argued that this type of service goes back to the beginning of commercial air service, regional service has traditionally been local air service or small airlines operating smaller passenger aircraft serving smaller communities in a particular region of the country. During the 1980s and 1990s this type of airline service flourished as legacy carriers withdrew much of their jet service from smaller markets and fostered the development of regional airlines to help feed their respective hub-and-spoke systems. Over the last several years aircraft used by regional airlines have evolved from 20-seat turboprops into 50-seat jets. The situation is further evolving, such that only 22 turboprop aircraft have been ordered by airlines for the future, and those are for 70-seat (or more) aircraft. Additionally, the 50-seat jet aircraft are being replaced with 70- to 90-seat jets. These regional carriers are equipping themselves with aircraft that can carry larger numbers of passengers and travel beyond regional boundaries, in some cases serving coast-to-coast markets.

## Positives of Air Service for a Community

Even though the aviation industry, especially the airlines, has experienced many growing pains during its history, it is still a huge economic generator nationally, internationally, and locally for a community and its surrounding area. Some of the benefits that air service brings to a community are transportation to virtually anywhere in the world, new business development, market expansion possibilities for all businesses, increased local employment, and tourism. Air service also brings many benefits to a community that are not readily noticed by the public at large, such as enhanced medical and educational facilities and timely delivery of goods and services, which contribute to an enhanced quality of life.

Airport management at smaller airports should be aware of what air service can do for the community, even if there is no commercial service at the airport or if the service offered is minimal. Except in the smallest of communities, elected officials, business owners, and others will have questions about bringing air service to the community and what that entails. What it takes for a community to attract air service is not necessarily a straightforward answer, and for each community it will differ somewhat. This guide is not meant to cover that issue in detail; however, airport management can find several good references listed in the appendices to help explain the intricacies of air service and how a community can determine if air service is realistic for its situation. However, some of the federal requirements, physical facilities, and administrative duties that go along with accommodating air service are briefly highlighted in the following subsection.

## 14 CFR Part 139, Airport Certification

Scheduled commercial aircraft with 10 or more seats cannot operate at an airport unless the airport has an airport operating certificate issued by the FAA. This certificate is a requirement of FAR Part 139. These operating certificates ensure safety in air transportation. To obtain a certificate, an airport must agree to meet certain airport management, operational, and safety standards.

To comply with Part 139 regulations, each certificate holder (airport) must create, adopt, and comply with an airport certification manual (ACM). This manual details compliance regulations for Part 139 and must be kept current at all times. A certificate is issued when the applicant

- Submits written documentation that an airline will begin service on a certain date;
- Submits an application, including the ACM, that meets FAA requirements; and
- Is found, after investigation by the administrator, to be properly and adequately equipped and able to provide a safe airport operating environment.

This certification may require additional investment in safety and security measures as well as upgraded facilities to meet initial certification guidelines. Certification may also require facility enhancement over time to meet demand or to maintain compliance with all rules and regulations. These operational requirements concern

- Records and personnel,
- Paved surfaces,
- Unpaved surfaces,
- Safety areas,
- Snow and ice control,
- Handling and storing of hazardous substances and materials,
- Traffic and wind direction indicators,
- Airport emergency plan,
- Self-inspection program,
- Pedestrian and ground vehicles,
- Obstructions,
- Protection of NAVAIDs,
- Public protection,
- Wildlife hazard management,
- Airport condition reporting,
- Identification, marking, and lighting of construction and other unserviceable areas,
- Noncompliance conditions,
- Inspections,
- Aircraft rescue and firefighting, and
- Airport security requirements (49 CFR Chapter XII Subchapter C).

## Community Compatibility

Airports offer increased accessibility to communities and provide economic growth opportunities in the cities and regions where they are located. The accessibility and opportunities usually result in additional commercial, residential, and tourism development. This growth can lead to conflicts between community development and the airport—which may have been the catalyst that started growth in the first place.

Quite often, local community officials are not aware of the special requirements regarding land use that airports require, such as building height limitations, aircraft approach and departure corridors, and runway safety zones. Additionally, they may not appreciate the need for zoning to restrict residential or other incompatible land uses in proximity to the airport.

Airport management should work with community officials to ensure that the airport, including its current and future needs, are considered and are a part of the community's comprehensive plan. The benefit of such planning can

- Minimize noise, light, and vehicle traffic impacts on the community,
- Maximize aviation safety and functionality,
- Preserve property values even while the airport expands, and
- Ensure compatibility with local community goals.

In most cases the airport manager will be responsible for educating the community and its leaders on airport and aviation issues. This education will include participating in community planning to ensure that the airport and the community it serves will continue to be compatible with and complementary to each other as they both grow.

## Master Planning Issues

At the local level, the airport master plan is the document that charts the proposed development of the airport to meet future needs. Master planning is covered in more detail in Chapter 4, "Airport Planning and Development."

## Essential Air Service Program

### History

The 1958 Federal Aviation Act provided commercial air service to small communities authorizing air carriers to receive compensation when such communities would not otherwise receive such service. The Airline Deregulation Act of 1978 significantly changed the airline market, making the EAS program even more important to small communities. The deregulation act stated that any community receiving scheduled air service from a certificated air carrier on October 24, 1978, was an eligible EAS community. Today, the EAS program serves approximately 140 rural communities that may not otherwise receive scheduled airline service. The EAS program continues to be funded through congressional reauthorization and, as of 1998, operates under a permanent funding mechanism of $50 million.

### Guidelines

EAS in the lower 48 states typically involves two reasonably scheduled round trips, six days a week, using, at a minimum, a 15-seat passenger twin aircraft. The flights must operate from the EAS airport to a hub airport. The U.S.DOT will normally select an air carrier to provide the service for two years.

To be eligible as an EAS community, a community must have been served by a certificated air carrier on October 24, 1978. To remain eligible, the community must be farther than 70 highway miles from an FAA-designated medium- or large-hub airport. The passenger subsidy may not exceed $200 per passenger. However, an exception allows the passenger subsidy to exceed $200 if the community is located more than 210 highway miles from the nearest medium- or large-hub airport.

The EAS process begins when the airline operator applies to the U.S.DOT and proposes service for the EAS airport. The department then contacts the EAS community and solicits comments concerning the proposal. Upon approval, the U.S.DOT may continue to solicit comments from the community on the level of service provided by the air carrier. Designation as an EAS community does not guarantee air service forever. There are provisions for the air carrier to terminate, suspend, or modify the service by filing a 90-day notice to the U.S.DOT and the community. The U.S.DOT can prohibit the air carrier from ending service until replaced by another qualified carrier.

## Airline Use Agreements

### Relationships Between the Airport and Airlines

Once a community is on the road to securing air service from an airline, airport management will need to focus on a contract or lease agreement with the respective airline(s) that will be agreeable to both parties. This legally binding agreement is commonly termed an "airport use agreement" and it defines the roles, responsibilities, and risks of each party.

Today, more and more leases reflect a partnership arrangement rather than a landlord/tenant relationship. Although airport and airline management quite often disagree about issues, as well as the need and timing for various facilities at an airport, their shared goal is to serve the traveling public. To do so they need to work together both operationally and financially. The overall goal of airport management should be to secure a positive working relationship with its airline partner(s) that is good for the airline, the airport, and the community in which it serves. In addition to an operational plan that provides for the timely needs of the respective airlines, a mechanism is needed that defines the financial arrangement between the parties. Many variations exist in the types of services and facilities that are included in the cost assessment.

The most common financial mechanisms used to obtain a revenue stream from airlines are a square footage charge for rented space and a landing fee based on aircraft weight. Airports have traditionally used a compensatory or a residual ratemaking methodology, or a combination of both, to cover different financial aspects of the relationship. These rates may be calculated to (1) recover the airport's specific costs for providing facilities to the airlines (compensatory approach) or (2) balance the airport's overall budget after revenues from non-airline sources are subtracted from the total expense (residual approach). More detailed definitions of the various financial mechanisms in use by airports are described in *Airport Planning and Management* (*6*).

## Standard Lease Requirements

Lease agreements between an airport and airlines vary considerably from airport to airport. This variation is due to factors such as the size and complexity of the airport, its view on long-term versus short-term commitments, and the community's or airport authority's view on what items are important beyond the basics. Space does not allow the inclusion of sample lease agreements in this guidebook. The next section of this chapter will provide the reader with sources to find lease information. However, the following outline example of an airport–airline lease may provide some insight into the items normally included in such a lease:

- Preamble
- Article I. Definitions
- Article II. Term
- Article III. Grant of Rights
- Article IV. Airline Premises
- Article V. Calculation of Rates and Charges
- Article VI. Identification and Allocation of Revenues and Expenses
- Article VII. Payment of Airline Fees and Charges
- Article VIII. Principles Relating to Rates and Charges
- Article IX. Not Utilized
- Article X. Maintenance, Operation, Use and Condition of Premises
- Article XI. No Other Charges
- Article XII. Indemnity and Insurance
- Article XIII. Quiet Enjoyment
- Article XIV. Inspection by Airport/Community
- Article XV. Rules and Regulations
- Article XVI. Assignment and Sublease
- Article XVII. Surrender of Possession and Holding Over
- Article XVIII. Taxes
- Article XIX. Default and Cancellation
- Article XX. Damage and Destruction
- Article XXI. Prohibited Uses
- Article XXII. Improvements

- Article XXIII. Federal Grants and Non-Discrimination
- Article XXIV. Condemnation
- Article XXV. Miscellaneous Provisions

Additional resources for writing leases and agreements are available from

- Airports Council International–North America,
- American Association of Airport Executives,
- Federal Aviation Administration,
- Financial consultants,
- Law firms, and
- State departments of transportation.

## Additional Resources

Hoerter, S. *The Airport Management Primer,* 2nd ed. S. Hoerter, Mount Pleasant, S.C., 2001.

Office of Aviation Analysis. *What is Essential Air Service?* U.S. Department of Transportation, Washington, D.C., May 1, 1998.

Standard Form 04-001A, Airport Use and Lease Agreement. Palm Springs International Airport, July 1, 2004.

Many state aeronautics departments and airports have sample leases on their websites. Two that do are the Wisconsin Department of Transportation (www.dot.state.wi.us/modes/air.htm) and the Texas Department of Transportation at (www.txdot.gov/services/aviation).

For more information regarding air service development, please refer to ACRP Project 03-08, "Passenger Air Service Development Techniques," on the TRB website (www.trb.org/CRP/ACRP/ACRPProjects.asp).

Also, the ACRP has published many additional documents regarding air service information that the reader may find helpful.

CHAPTER 7

# Airport Education and Training

## Developing a Training Program

A successful staffing transition for any organization involves a well-structured orientation and training program. For an airport, this includes management, employee staff, airport tenants, contractors, and others utilizing the airport on a daily basis.

Management should be introduced to and well versed in the airport's policies and procedures that outline the leadership responsibilities for daily management. Copies of any legislative acts, statutes, ordinances, bylaws, employee contracts, and any other guidance should be close at hand for review. This documentation should also include the airport's operating plans—such as the airport emergency, security, snow removal, and safety plans—that may require swift and effective action during an incident.

Management will also need to be familiar with the airport's layout and airport tenants' operating requirements. Because circumstances may cause both of these to change, a successful airport manager spends time on the airport's property and frequently communicates with the tenants to provide strong management practices to meet changing demands.

Introduction to the airport's financial structure is important as well. Management should understand the revenue and expense resources and how the airport has historically met these demands. The airport's capital improvement program and future planning thoughts should be explained as part of the manager's initial education process.

The airport owner or operator is also required to properly orient and train his or her employees. As part of the initial human resources process, the employee should be provided copies and explanations of the airport's policies and procedures, which typically cover harassment, drug/alcohol use, safety policies, and employment agreements.

Employees will need to be introduced to the airport's layout and tenant structure and operating requirements. Because the airport operating plans provide the basis for an employee's job description, providing written copies and explanations of the procedures is imperative to ensure effective performance. Once procedures have been explained, the next step is to provide for efficient on-the-job training. The airport environment is unique due to site-specific conditions, aircraft communications, high-voltage electrical systems, and specialized airfield maintenance equipment. A new employee should be provided a structured training program that is guided by an experienced individual for each particular area. Besides relying on airport staff, other training resources may include the state aeronautics department, the AAAE, and neighboring airports.

As an airport owner or operator enters into a lease or contract agreement with a tenant or contractor, special provisions should be made for airport property orientation and familiarization

with operating procedures. A common mistake is to provide this only to those signing the agreement, with no assurance that it will trickle down to the employees who also require the same education. Airport operating boundaries, communications, safety and security procedures, and vehicle and personnel requirements should be included in a concise educational program to ensure safe and efficient airport operations.

## Developing an Airport Orientation Program

Generally, smaller airports are governed by elected officials or by individuals who have volunteered to assist with the airport's leadership and management decision-making process, or both. Often these individuals do not have a great deal of airport management expertise and may not be familiar with the specific operations at the airport. Each airport owner or operator should prepare a concise airport orientation program to welcome and educate these individuals who will be involved with processing key decisions.

The orientation program should cover the airport governance structure, include a diagram of the management structure and governing authority that clearly shows the airport's chain of command, and describe the airport's history and how it was established. Copies of any legislative acts, local statutes, ordinances, bylaws, and board members' responsibilities should be included as well.

The orientation program should invite the new members on a brief tour of the airport to provide first-hand familiarization with facilities; point out the physical property boundaries of the airport, the runway layouts, and special airport assets pilots find attractive; educate the members on the use of the buildings and the tenants that use the airport; and point out the reasons tenants prefer this airport and why those reasons are important to the vitality of the airport's long-term operation.

The orientation program should also detail the airport's financial status; explain the current budget, revenue and expense sources, and the capital improvement program; and provide any relevant airport policies and procedures that will help with this education and future decision-making process.

## Performance Measurement and Benchmarking

Airport managers are continually faced with the ongoing challenge of improving performance. Across the country, they are discovering new approaches to increasing efficiencies within their own airports. Benchmarking is a tool that identifies "best practices" by making process comparisons both inside and outside an airport.

Competitive factors are driving the growth of benchmarking. No longer is it acceptable to do one's best, or to do it better than before. This section will discuss benchmarking and how it can be used by airports to track progress and note improvements.

Using benchmarking techniques, airports can share nonpublic performance information to identify the operational processes that really work for them. They begin by measuring each other's operating data, identifying the best performer in a group, then adopting the practices that improve their performance the most. Benchmarking provides the participants with the guidance they need to make informed business decisions.

In addition to using benchmarking for improvement, managers can use it to understand the techniques they are using and their effectiveness. Benchmarking can create a nonthreatening environment to review all the possible areas for improvement.

Benchmarking is both a project and a process. As a project, it is a one-time event, but as a process it is continual and integrated into the daily operations of the airport. Every airport will have some activities that fall short of highest performance. Measuring performance is the first step in benchmarking. By identifying the gap between a particular airport's performance and that of others, processes can be identified to make improvements and measure progress.

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# Glossary of Terms

## A

**Above Ground Level (AGL):** Altitude expressed as feet above terrain or airport elevation (see Mean Sea Level).

**Advisory Circular (AC):** A series of external FAA publications consisting of all nonregulatory material of a policy, guidance, and informational nature.

**Aeronautical Chart:** A representation of a portion of the earth, its culture and relief, specifically designated to meet the requirements of air navigation.

**Aeronautical Information Manual (AIM):** A primary FAA publication with the purpose of instructing airmen about operating in the national airspace system of the United States. It provides basic flight information, air traffic control procedures, and general instructional information concerning health, medical facts, factors affecting flight safety, accident and hazard reporting, and types of aeronautical charts and their use.

**Air Carrier:** A legal entity that undertakes directly by lease or other arrangements to provide air transportation.

**Air Carrier, Certificated Route:** An air carrier holding a Certificate of Public Convenience and Necessity, issued by the U.S.DOT under Part 121 of the Federal Aviation Regulations, to conduct scheduled services over specified routes and a small number of nonscheduled operations.

**Air Carrier, Commuter:** An air taxi operator who, under FAR Part 135, (1) performs at least five round trips per week between two or more points and publishes flight schedules that specify the times, days of the week, and places between which such flights are performed or (2) transports mail by air pursuant to a contract with the U.S. Postal Service.

**Air Route Traffic Control Center (ARTCC):** An FAA facility established to provide air traffic control to aircraft operating on an instrument flight rule flight plan within controlled airspace, principally during the en route phase of flight.

**Air Taxi:** Operations performed by operators of aircraft holding an air taxi certificate under Part 135 of the Federal Aviation Regulations. This category includes commuter airline operations (excluding certificated commuter airlines), mail carriers under contract with the U.S. Postal Service, and operators of nonscheduled air taxi services. Typically, air taxis do not utilize aircraft with a payload capacity over 7,500 pounds or capable of carrying more than 30 passengers.

**Air Traffic Control (ATC):** The FAA service providing separation services to participating airborne traffic and clearances to land, take off, or taxi at airports with a control tower.

**Aircraft Accident:** An occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, and in which any person suffers death or serious injury as a result of being in or upon the aircraft or by direct contact with the aircraft or anything attached thereto, or in which the aircraft receives substantial damage.

**Aircraft Classes:** For the purposes of Wake Turbulence Separation Minima, air traffic control classifies aircraft as heavy, large, and small as follows:

- **Heavy**—Aircraft capable of takeoff weights of 300,000 pounds or more, whether or not they are operating at this weight during a particular phase of flight.
- **Large**—Aircraft of more than 12,500 pounds maximum certificated takeoff weight, up to 300,000 pounds.
- **Small**—Aircraft of 12,500 pounds or less maximum certificated takeoff weight.

**Aircraft Parking Line Limit (APL):** A line established by the airport authorities beyond which no part of a parked aircraft should protrude.

**Airfield Capacity:** The maximum number of aircraft operations (landings or takeoffs) that can take place on an airfield in one hour under specific conditions.

**Airline Transport Pilot (ATP):** The most advanced of all pilot certificates, requiring the highest skill and experience levels. Requires a minimum of 1,500 hours flight experience, ATP written exam, and flight test. Mandatory for captains of FAR Part 121 major scheduled airlines, regional carriers, Part 125 scheduled commuter airlines, and some FAR Part 135 operations. A hiring requirement for many pilot positions in corporate and commercial general aviation flying.

**Airport:** An area of land or water that is used or intended to be used for the landing and taking off of aircraft, including its buildings and facilities, if any.

**Airport Elevation:** The highest point of an airport's usable runways, measured in feet above mean sea level.

**Airport Environs:** The area surrounding an airport directly affected by the presence and operation of that airport.

**Airport Hazard:** Any structure or natural object located on or in the vicinity of a public airport, or any use of land near such airport, that obstructs the airspace required for the flight of aircraft landing, taking off, or taxiing at the airport.

**Airport Improvement Program (AIP):** A program that provides financial grants-in-aid for airport development projects such as runways, taxiways, aircraft parking aprons, terminal buildings, and land acquisition associated with airport development including runway protection zones and approach protection.

**Airport Layout Plan (ALP):** A plan (drawings) for an airport showing boundaries and proposed additions to all areas owned or controlled by the sponsor for airport purposes, the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed nonaviation areas and improvements thereon.

**Airport Master Plan:** An assembly of appropriate documents and drawings covering the development of a specific airport from a physical, economic, social, and political jurisdictional perspective. The airport layout plan is a part of this plan.

**Airport Noise Compatibility Planning Study:** A study designed to increase the compatibility of land and facilities in the areas surrounding an airport that are most directly affected by the operation of the airport. The specific purpose is to reduce the adverse effects of noise as much as

possible by implementing both on-airport noise control measures and off-airport land use control programs. Under FAR Part 150, local jurisdictions can prepare and submit to the FAA a noise exposure map for the airport's environs and a noise compatibility plan.

**Airport Radar Service Area (ARSA):** (Obsolete—See Class C Airspace)

**Airport Sponsor:** A public agency or tax-supported organization, such as an airport authority, that is authorized to own and operate an airport; to obtain property interests; to obtain funds; and to be legally, financially, and otherwise able to meet all applicable requirements of the current laws and regulations.

**Airport Surveillance Radar (ASR):** Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the ASR can extend up to 60 miles.

**Airport Traffic Area:** Unless otherwise specifically designated in FAR Part 93, that airspace within a horizontal radius of 5 statute miles from the geographical center of any airport at which a control tower is operating, extending from the surface up to, but not including, an altitude of 3,000 feet above the elevation of an airport. Unless otherwise authorized by air traffic control, no person may operate an aircraft within an airport traffic area except for the purpose of landing at or taking off from an airport within that area. ATC authorizations may be given as individual approval of specific operations or may be contained in written agreements between airport users and the tower concerned (See Class D Airspace).

**Airways:** Corridors of sky usually linking very high frequency (VHF) omnidirectional ranges or nondirectional radio homing beacons. Aircraft using airways are protected by internationally agreed-upon rules of separation.

**Altimeter:** A highly sensitive barometer that shows an aircraft's altitude above mean sea level by measuring atmospheric pressure.

**Altimeter Setting:** A value related to local barometric pressure, usually provided to pilots by air traffic control. Used as a reference setting so that the aircraft altimeter indicates an accurate altitude. Above 18,000 feet, all pilots use a standard setting of 29.92 inches of mercury.

**Approach (Departure) Control:** Radar-based air traffic control that provides traffic separation services outside the local immediate airport area to a distance of about 40 miles.

**Apron/Ramp:** A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading passengers or cargo, refueling, parking, or maintenance.

**Automated Flight Service Station (AFSS):** A non-ATC FAA facility providing pilots with weather briefing and flight-plan filing by radio and telephone and in person. Monitors flight plans for overdue aircraft and initiates search and rescue services. "Automated" refers to telephone call–handling equipment and computer information systems aiding pilot briefers.

**ATA:** (Obsolete—See Class D Airspace)

**Automated Surface Observation System (ASOS):** The primary surface weather observation system in the United States, supporting aviation operations and weather forecasting. Automated sensors record wind direction and speed, visibility, cloud ceiling, precipitation, etc. Data are sent automatically to the National Weather Service. At many locations, a computer-generated voice broadcasts minute-by-minute weather reports to pilots on a discrete radio frequency.

**Automated Terminal Information System (ATIS):** A continuous broadcast on a separate air traffic control frequency of an airport's current weather (updated at least hourly). Eliminates controller requirement to read local weather data to each landing or departing aircraft.

**Automated Weather Observation System (AWOS):** A system that provides automated airport weather observations to pilots on a discrete radio frequency via a computer-generated voice. Less sophisticated than automated surface observation system, usually installed using state funds.

**Automatic Direction Finding (ADF):** A basic guidance mode providing aircraft with lateral guidance to an aviation radio station. ADF equipment provides the pilot with a directional bearing to an aviation radio station that is relative to the user's current location.

**Auxiliary Flight Service Station (XFSS):** A local-service flight service station facility retained where special operational or weather conditions mandated an exception from consolidation. Provides only airport advisories and weather observations. Twenty of the 46 XFSSs are in Alaska.

**AVGAS:** Aviation gasoline used by piston-powered aircraft.

**Avigation Easement:** A type of acquisition of an interest in land or property that involves less-than-fee purchase. One form of avigation easement grants an airport the right to perform aircraft operations over the designated property, including operations that might cause noise, vibration, and other effects. A stronger form of easement is a deed restriction that may include (1) the right to perform aircraft operations on the property and (2) public acquisition of a landowner's rights restricting future development of the property for any use more intensive than that existing at the time of the transaction. This easement may also include specific prohibitions on the uses for which the property may be developed. Maximum heights of structures and other objects may also be specified.

## B

**Base:** The leg perpendicular to the final leg of the traffic pattern to the landing runway.

**Base Leg:** (See Base)

**Based Aircraft:** Aircraft stationed at an airport on a long-term or permanent basis, usually by some form of agreement between the aircraft owner and airport management.

**Biometric Identification/Security:** A mechanism utilized to identify and verify persons for security purposes. The most common type of biometrics are fingerprint scanners.

**Blast Fence:** A barrier used to divert or dissipate jet or propeller blast.

**Building Restriction Line (BRL):** A line established with respect to the runway centerline to assure that structures will not project above the imaginary surfaces required by Federal Aviation Regulations, Part 77, Obstruction Clearance Criteria.

**Business Aviation:** The sector of general aviation (as defined by the International Civil Aviation Organization) that concerns the operation of aircraft by companies for carrying passengers or goods as an aid to conducting their business, flown for purposes generally considered not for public hire, and piloted by individuals having at the minimum a valid commercial pilot license with an instrument rating.

## C

**Center:** One of 24 FAA air route traffic control centers providing radar surveillance and traffic separation to participating en route traffic above and outside airspace handled by approach and departure control.

**Certificated Flight Instructor (CFI):** A pilot holding a commercial pilot certificate who, after passing two written tests and a practical flight exam, is FAA rated to give flight instruction. The flight instructor rating is specific as to type of instruction authorized, e.g., single-engine airplane, multiengine airplane, instrument flying (CFII), or helicopter.

**Class A Airspace:** Airspace between 18,000 and 60,000 feet mean sea level over the conterminous United States. Instrument flight rule clearances are required for all aircraft operating in Class A airspace. Formerly called the positive control area.

**Class B Airspace:** Airspace area around the busiest U.S. hub airports, typically to a radius of 20 nautical miles and up to 10,000 feet above ground level. Operations within Class B airspace require an air traffic control clearance and at least a private pilot certificate (local waivers available), radio communication, and an altitude-reporting (Mode C) transponder. Formerly called terminal control area.

**Class C Airspace:** Airspace area around busy U.S. airports (other than Class B). Radio contact with approach control is mandatory for all traffic. This includes an area from the surface to 1,200 feet above ground level out to five miles, and from 1,200 to 4,000 feet AGL to 10 miles from the airport. Formerly called airport radar service area.

**Class D Airspace:** Airspace around an airport with an operating control tower, typically to a radius of five miles from the surface to 2,500 feet above ground level. Radio contact with the control tower required prior to entry. Formerly called airport traffic area.

**Class E Airspace:** General controlled airspace comprising control areas, transition areas, Victor airways, the Continental Control Area, etc.

**Class F Airspace:** International airspace designation not used in the United States.

**Class G Airspace:** Uncontrolled airspace, generally the airspace from the surface up to 700 or 1,200 feet above ground level in most of the United States, but up to as high as 14,500 feet in some remote western and sparsely populated areas.

**Clearance:** Formal instructions from air traffic control authorizing a specific route or action (e.g., climb or descend, or enter controlled airspace). Pilots may deviate from an ATC clearance in an emergency or when compliance would threaten the safety of a flight.

**Commercial Pilot:** Holder of an FAA commercial pilot certificate, requiring a minimum of 250 flight hours (and other sub-requirements), a commercial written test, and a commercial flight test. The pilot certificate to fly for compensation or hire, often in a wide variety of commercial general aviation operations including sight-seeing, aerial application, glider towing, and flight instruction. It does not necessarily imply flying for a scheduled airline. (See Airline Transport Pilot. Note: More than 40% of general aviation pilots are licensed as commercial or airline transport pilots, whether they fly for a living or not.)

**Common Traffic Advisory Frequency (CTAF):** The radio frequency, sometimes called the UNICOM frequency, used by all traffic at an airport without an operating control tower to coordinate approaches, landings, takeoffs, and departures. Pilots announce their positions, intentions, and actions in the traffic pattern for the benefit of other traffic.

**Controlled Airspace:** A generic term including all airspace classes in which air traffic control services are available. Does not imply that all flight is under air traffic control. Visual flight rule aircraft may operate without air traffic control contact in most controlled airspace as long as weather conditions will permit them to see and avoid other aircraft.

## D

**Day-Night Equivalent Sound Level (DNL):** An environmental noise indicator for annoyance. It is derived from the average sound energy level over the day, evening, and night periods for one year based on energy equivalent noise level (Leq) with a penalty of 10 decibels (dBA) for nighttime noise and an additional penalty of 5 dBA for evening noise.

**Deicing:** Removing ice and snow from an aircraft. The use of liquids, chemicals, and heating equipment are used in cooler climates to reduce the effects of snow and ice.

**Deplanements:** Passengers leaving an aircraft (see Enplanements).

**Deregulation Act:** Airline regulatory reform act of 1978. Designed, among other things, to encourage competition among domestic air carriers, the act allows an air carrier greater freedom to enter and leave any given market.

**Displaced Threshold:** A runway landing threshold located at a point other than the designated beginning of the runway (where departures would begin).

**Distance Measuring Equipment (DME):** Aircraft equipment that provides pilots with a readout of the distance between the DME facility (airport) and the aircraft.

**Direct User Access System (DUATS):** A system that permits pilots with a personal computer to obtain preflight weather data and flight plans. Toll-free service available to all pilots with a current medical certificate.

**Disadvantaged Business Enterprise (DBE) Program:** A federal program developed to ensure firms owned and controlled by minorities may take part in contracts supported with federal funds.

**Downwind Leg:** A flight path parallel to the landing runway in the direction opposite the landing direction.

## E

**Emergency Locator Transmitter (ELT):** A radio transmitter activated automatically by the impact of an accident. Emits a warbling tone on the international emergency frequencies of 121.5 MHz, 243 MHz, and (for newer models) 406 MHz. ELT signals can be received by nearby FAA facilities, aircraft overhead, and search and rescue (SARSAT) satellites.

**En Route Flight Advisory Service (EFAS):** A flight service station priority handling of real-time weather information to airborne flights (rather than for preflight planning) on a single national radio frequency of 122.0 MHz (low altitude).

**Engine Run-Up Area:** An area on an airport where aircraft engines are serviced or tested. The noise from such servicing or testing can affect neighborhoods adjacent to the airport.

**Enplaned/Deplaned Passengers:** The volume of passengers outbound from an airport (enplaned) or inbound to an airport (deplaned). The annual passenger volume of an airport is the total enplaned and deplaned passengers.

**Enplanements:** Passengers boarding an aircraft (see Deplanements).

**Environmental Assessment (EA):** An assessment of the environmental effects of a proposed action for which federal financial assistance is being requested or for which federal authorization is required. The EA serves as the basis for the FAA's environmental impact statement or finding of no significant impact, as specified in FAA Orders 1050.1D and 5050.4.

**Environmental Impact Statement (EIS):** A document prepared under the requirements of the National Environmental Policy Act of 1969, Section 102(2)(c). The EIS represents a federal agency's evaluation of the effect of a proposed action on the environment. New regulations relating to the preparation of an EIS are published in FAA Orders 1050.1D and 5050.4.

**Essential Air Service (EAS):** A federal program developed under the 1958 Federal Aviation Act to ensure air service to small communities throughout the United States.

## F

**FAA Order:** An internal FAA directive that sets standards, procedures, and guidelines for the FAA to execute its various regulatory and grant administration mandates.

**FAR Part 36:** Federal Aviation Regulations Part 36, which establishes noise standards for the civil aviation fleet. Some extensions for compliance are included in the Aviation Safety and Noise Abatement Act of 1979.

**FAR Part 77:** Federal Aviation Regulations Part 77, which establishes standards for identifying obstructions to aircraft in navigable airspace.

**FAR Part 77 Surfaces:** Imaginary surfaces established with relation to each runway of an airport. There are five types of surfaces: (1) primary, (2) approach, (3) transitional, (4) horizontal, and (5) conical.

**FAR Part 91:** Federal Aviation Regulations Part 91, which establishes criteria for general operating and flight rules.

**FAR Parts 121 and 135:** The parts of Federal Aviation Regulations that specify certification and operational requirements for commercial operators of large aircraft and air taxis, respectively.

**FAR Part 139:** Federal Aviation Regulations Part 139, which specifies certification and operational requirements for airports serving air carrier aircraft.

**FAR Part 150:** Effective February 28, 1982, Federal Aviation Regulations Part 150 implements the noise compatibility standards and provisions contained in the Aviation Safety and Noise Abatement Act of 1979. FAR Part 150 prescribes procedures for airport sponsors who wish to develop noise exposure maps and airport noise compatibility plans to identify and mitigate airport–land use compatibility problems. FAR Part 150 was published in the *Federal Register* in amended form September 14, 1993.

**Federal Aviation Administration (FAA):** The United States Department of Transportation's agency for aviation. In addition to regulating airports, aircraft manufacturing and parts certification, aircraft operation, and pilot certification ("licensing"), the FAA operates air traffic control, purchases and maintains navigation equipment, certifies airports, and aids airport development, among other activities.

**Federal Aviation Regulations (FAR):** Regulations established by the FAA. These regulations are the rules that govern the operation of aircraft, airways, and airmen.

**Final:** The last leg of the traffic pattern when the aircraft is aligned to fly straight in to the landing runway.

**Finding of No Significant Impact (FONSI):** An administrative determination by the FAA that a proposed action by the airport sponsor will have no significant impact (on the environment). Specific guidelines for the preparation of a FONSI report (see Environmental Assessment) are included in FAA Orders 1050.1D and 5050.4A.

**Fixed-Base Operator (FBO):** (1) A business operating at an airport that provides aircraft services to the general pubic, including but not limited to sale of fuel and oil; aircraft sales, rental, maintenance, and repair; parking and tie-down or storage of aircraft; flight instruction; air taxi/charter operations; and specialty services, such as instrument and avionics maintenance, painting, overhaul, aerial application, aerial photography, aerial hoists, or pipeline patrol. (2) The owner of such an operation.

**Flight Information Display System (FIDS):** A display of real-time updates of flight information for all passengers through technology such as plasma television screens and liquid crystal displays (LCDs).

**Flight Plan:** Filed by radio, telephone, computer, or in person with flight service stations, a record of aircraft number, type, and equipment; estimated time of departure and time en route; route and altitude to be flown; amount of fuel and number of persons aboard; home base and contact phone number; and other information.

- **Visual Flight Rules Flight Plan**—Voluntary filing for cross-country flights under visual flight rules. For search and rescue use only, with no role for air traffic control.
- **Instrument Flight Rules Flight Plan**—Mandatory filing (at least one-half hour) before a flight under instrument flight rules. Based on flight plan information, air traffic control can issue (immediately before departure) an instrument flight rules clearance to enter clouds or low-visibility conditions for instrument rather than visual flight.

**Flight Service Station (FSS):** FAA facilities that provide pilot briefings on weather, airports, altitudes, routes, and other flight planning information. More specifically, FSS facilities also provide en route communications and visual flight rules search and rescue services, assist lost aircraft and aircraft in emergency situations, relay air traffic control clearances, originate Notices to Airmen, broadcast aviation weather and national airspace system information, receive and process instrument flight rules flight plans, and monitor navigational aids. In addition, at selected locations, FSSs provide en route flight advisory service (Flight Watch), take weather observations, issue airport advisories, and advise customs and immigration of transborder flights.

**Flight Standards District Office (FSDO):** An FAA field office serving an assigned geographic area and staffed with flight standards personnel who serve the aviation industry and the general public on matters relating to the certification and operation of air carrier and general aviation aircraft. Activities include general surveillance of operational safety, certification of airmen and aircraft, accident prevention, investigation, and enforcement.

**Flight Watch:** (See En Route Flight Advisory Service)

**Foreign Object Damage/Debris (FOD):** Surface contaminants such as sand, rocks, and litter that contribute to hazards if ingested into engines or projected by engine blast.

## G

**General Aviation (GA):** All civil aviation (excluding military) except that classified as air carrier or air taxi. The types of aircraft typically used in general aviation activities vary from multi-engine jet aircraft to single-engine piston aircraft.

**General Aviation Operations:** Operations performed by all civil aircraft not classified as air carrier, military, or air taxi aircraft.

**Glideslope:** An angle approach to a runway utilizing the glideslope antenna of an instrument landing system.

**Global Positioning System (GPS):** Satellite-based navigation system operated by the Department of Defense, providing extremely accurate position, time, and speed information to civilian and military users. Based on a "constellation" of 24 satellites, GPS will replace ground-based navigation systems (e.g., VHF omnidirectional range, instrument landing system) as the primary worldwide air navigation system in the 21st century.

**Ground Power Unit (GPU):** A ground equipment support device that provides electrical aircraft power.

## H

**Hangar:** A large building at an airport where planes can be stored and maintained.

## I

**Incompatible Land Use:** Residential, public, recreational, and certain other noise-sensitive land uses that are designated as unacceptable within specific ranges of cumulative (Ldn) noise exposure as set forth in Table 2 of Appendix A of FAR Part 150.

**Inner Marker:** Innermost marker beacon on an instrument landing system (ILS).

**Instrument Flight Rules (IFR):** A set of regulations and procedures permitting qualified and current IFR pilots to penetrate clouds and low-visibility conditions. Aircraft must be equipped with radio and navigation instruments operating under air traffic control flight plans and clearances. Flights are monitored and traffic separated by ATC, usually by radar. (See Visual Flight Rules).

**Instrument Landing System (ILS):** A precision instrument approach system utilizing radio transmitters at the runway ends that provide precise descent and course guidance to the runway, permitting aircraft to land during periods of low ceilings or poor visibility.

**Itinerant Operation:** An arrival or departure performed by an aircraft from or to a point beyond the local airport area. Also defined as all aircraft arrivals and departures other than local operations.

## K

**Knot (nautical mile per hour):** Most common measure of aircraft speed. 100 knots equals 115 statute miles per hour. (For mph, multiply knots by 1.15.)

## L

**Land Use Compatibility:** The compatibility of land uses surrounding an airport with airport activities, particularly with the noise from aircraft operations.

**Local Area Augmentation System (LAAS):** An enhancement of the Global Positioning System providing greater navigation accuracy and system integrity.

**Local Operation:** An aircraft operation that remains no more than 25 nautical miles from the departure point, or that terminates at the point of departure, or that does not include a stop of a duration greater than 15 minutes. Touch-and-go operations are local operations.

**Local Traffic:** Aircraft operating in the traffic pattern or within sight of the tower, aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the airport.

**Localizer (LOC):** Part of an instrument landing system that provides lateral deviations from a preset course.

**Low Approach:** An approach over an airport or runway following an instrument approach, or a visual flight rules approach including the go-around maneuver in which a pilot intentionally does not make contact with the runway.

## M

**Magnetic Heading:** Heading of the aircraft relative to magnetic north; a magnetic heading sensor provides this heading data.

**Magnetic Variation (MVAR, MAGVAR):** Difference between true north and magnetic north, varying with position. Magnetic variation drifts with time.

**Mean Sea Level (MSL):** Altitude expressed as feet above sea level, rather than above local terrain (i.e., AGL). To ignore varying terrain elevations, all navigational altitudes and barometric altimeters are based on height above MSL. Only radar altimeters, which measure the distance between the aircraft and the ground at low altitudes, indicate actual height above the ground.

**Microwave Landing System (MLS):** An advanced electronic system of ground-based devices and aircraft avionics that provides the aircraft with lateral, longitudinal, and vertical guidance necessary for an instrument landing. In the United States, MLS technology has been supplanted by GPS.

**Middle Marker:** Marker beacon located where the center of the glideslope is 200 feet above the runway utilized in some instrument landing systems.

**Military Operation:** Operations performed by military groups such as the Air National Guard, U.S. Air Force, U.S. Army, U.S. Marine Corps, or U.S. Navy.

**Military Operations Area (MOA):** An airspace established outside of Class A airspace to separate or segregate certain nonhazardous military activities from instrument flight rules traffic and to identify for visual flight rules traffic where these activities are conducted.

**Minimums:** Weather condition requirements established for a particular operation or type of operation—e.g., instrument flight rules takeoff or landing, alternate airport for instrument flight rules flight plans, etc.

**Missed Approach:** A maneuver conducted by a pilot when an instrument approach cannot be completed for a landing. The route of flight and altitude are shown on instrument approach procedure charts. A pilot executing a missed approach prior to the missed approach point (MAP) must continue along the final approach to the MAP. The pilot may climb immediately to the altitude specified in the missed approach procedure.

**Missed Approach Point (MAP):** A point prescribed in each instrument approach procedure at which a missed approach procedure will be executed if the required visual reference does not exist.

**Mitigation Measure:** An action that can be planned or taken to alleviate (mitigate) an adverse environmental impact.

**Major Airport Development:** Airport development on such a scale as to require shifts in patterns of population movement and growth, public service demands, and changes in business and economic activity.

**Mode A:** The operating mode of onboard radar transponders that transmits a return radio signal to enhance an aircraft's radar return and identify it with one of 4,096 controller-assigned numerical codes.

**Mode C:** The transponder operating mode that also reports aircraft altitude by transmitting data from an encoding altimeter

**Mode S:** Type of secondary surveillance radar (SSR) equipment that provides Mode A and Mode C interrogations, discrete address (Mode S) interrogations from the ground or air, and a data link capability

## N

**N-Numbers:** Federal government aircraft registration numbers. U.S.–registered aircraft numbers begin with "N," Canadian numbers with "C" or "CF," German numbers with "D," United Kingdom numbers with "G," French numbers with "F," Japanese numbers with "JA," etc.

**National Plan of Integrated Airport Systems (NPIAS):** Public-use airports considered necessary to provide a safe, efficient, and integrated system of airports to meet the needs of civil aviation, national defense, and the U.S. Postal Service. (Previously called the National Airport System Plan.)

**National Transportation Safety Board (NTSB):** The independent federal agency charged with investigating and finding "probable cause" of transportation accidents.

**Nautical Mile:** Most common distance measurement in aviation, equivalent to 1.15 statute (standard U.S.) miles.

**Navigation Aid (NAVAID):** A device or process to help with navigation, such as a VHF omnidirectional range station or a position update.

**Noise Contours:** Lines drawn on a map that connect points of equal noise exposure values. They are usually drawn in 5 dB intervals, such as DNL 75 dB values, DNL 70 dB values, DNL 65 dB values, and so forth.

**Noise Control Plans:** Documentation by the airport sponsor of actions to be taken by the sponsor to reduce the effect of aviation noise. These actions are to be taken by the sponsor either alone or in cooperation with the FAA, airport users, and affected units of local government, with appropriate comments from affected citizens. Alternative actions should be considered, particularly where proprietary use restrictions on aircraft operations are involved.

**Nondirectional Beacon (NDB):** An older radio navigation system in which an automatic direction finder points to the beacon, thus providing a relative bearing.

**Nonprecision Approach Procedure:** A standard instrument approach procedure in which no electronic glideslope is provided, such as with a VHF omnidirectional range, Global Positioning System, or localizer.

**Nonprecision Instrument Runway:** A runway with an instrument approach procedure utilizing air navigation facilities, with only horizontal guidance, or area-type navigation equipment, for which a straight-in nonprecision instrument approach procedure has been approved or planned, and no precision approach facility or procedure is planned.

**Nontowered Airport:** An airport without a control tower. The majority of America's 13,000 airports are nontowered (only 680 airports have control towers). Nontowered airports are far from being "uncontrolled." Pilots follow traffic pattern procedures and self-announce positions and intentions using the common traffic advisory frequency, usually called the UNICOM frequency.

**Notice to Airmen (NOTAM):** A notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment of, condition of, or change in any component (facility, service, or procedure) of, or hazard in, the national airspace system, the timely knowledge of which is essential to personnel concerned with flight operations.

## O

**Obstacle:** An existing object, object of natural growth, or terrain, at a fixed geographical location, or which may be expected at a fixed location within a prescribed area, with reference to which vertical clearance is or must be provided during flight operation.

**Obstacle Free Zone (OFZ):** A volume of space above and adjacent to a runway and its approach lighting system, if one exists, free of all fixed objects except FAA-approved frangible aeronautical equipment and clear of vehicles and aircraft in the proximity of an airplane conducting an approach, missed approach, landing, takeoff, or departure.

**Obstruction:** An object that exceeds a limiting height or penetrates an imaginary surface described by current Federal Aviation Regulations (Part 77).

**Operation:** A takeoff or a landing.

**Outer Marker:** Marker beacon located 5 to 7 miles from the end of the runway, and a component of incompatible land use.

## P

**Pilot Controlled Lighting (PCL):** A remote system controlled by a pilot to initiate and operate the runway lights. It is typically located at a nontowered airport.

**Pilot Weather Report (PIREP):** Voluntary pilot observation of in-flight weather conditions radioed to air traffic control or a flight service station. Information is used by other pilots to avoid adverse weather and by the National Weather Service to amend or update forecasts.

**Positive Control Area:** (See Class A Airspace)

**Precision Approach Path Indicator (PAPI):** A lighting system that provides the pilot with a safe and accurate glide slope on final approach to the runway.

**Precision Approach Procedure:** A standard instrument approach procedure in which an electronic glideslope/glidepath is provided—e.g., instrument landing system, microwave landing system, and precision approach radar.

**Precision Instrument Procedure:** A standard instrument procedure for an aircraft to approach an airport in which an electronic glideslope is provided—e.g., an instrument landing system or military precision approach radar.

**Precision Instrument Runway:** A runway with an instrument approach procedure utilizing an instrument landing system, microwave landing system, precision approach radar, or Global Positioning System.

**Preferential Runway Use (Program):** A noise abatement action whereby the FAA Air Traffic Division, in conjunction with the FAA Airports Division, assists the airport sponsor in developing a program that gives preference to the use of a specific runway(s) to reduce overflight of noise-sensitive areas.

**Private Pilot:** A certificate that allows a pilot to fly passengers for personal transportation and business. It requires the pilot to be at least 17 years old, have a minimum of 40 hours of flight experience and training (35 hours under Part 141), and pass at least a third-class medical exam, a written exam, and flight test. A private pilot may not "fly for hire or compensation" but may share expenses equally with passengers.

**Prohibited Area:** An airspace area for which flight is prohibited except by prior arrangement with the controlling agency. An example is the P-56 area over downtown Washington, D.C., which prohibits flight over the White House.

## R

**Recreational Pilot:** A pilot certificate requiring less training than a private certificate. Privileges are limited according to flight within 50 nautical miles of base, carrying no more than one passenger; using nontowered airports; and flying during daylight hours only unless restrictions are removed through further training. A recreational pilot may not share expenses. Few new pilots currently choose the recreational certificate.

**Reliever Airport:** An airport serving general aviation aircraft that might otherwise use a congested air carrier airport.

**Restricted Area:** Airspace that (when "active" or "hot") usually excludes civilian aircraft. Examples include airspace for rocket flights, air-to-air combat practice, or ground-based artillery practice. Temporary restricted areas are established for events such as forest fires, natural disasters, or major news stories. Flight through a restricted area may be authorized by the "controlling agency" or by the FAA.

**Rotating Beacon:** A rotating light providing visual guidance for the airport between sunset and sunrise and during times when the reported ceiling or visibility is below basic visual flight rules minimums.

**Runway (RWY):** A defined rectangular area on a land airport prepared for the landing and takeoff run of aircraft along its length. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees, e.g., Runway 01, Runway 25.

**Runway Edge Lights:** Lights used to define the lateral limits of a runway.

**Runway End Identifier Lights (REILs):** Two synchronized flashing lights, one on each side of the runway threshold, that provide a pilot with a rapid and positive visual identification of the approach end of a particular runway.

**Runway Heading:** The magnetic direction indicated by the runway number. When cleared to "fly/maintain runway heading," pilots are expected to comply with the air traffic control clearance by flying the heading indicated by the runway number without applying any drift correction—e.g., Runway 4, 040O magnetic heading; Runway 20, 200O magnetic heading.

**Runway Protection Zone (RPZ):** A trapezoidal area at ground level for which the perimeter conforms to the projection on the ground of the innermost portion of the approach surface as defined in Federal Aviation Regulations Part 77. The RPZ is centered on the extended runway centerline and begins at the end of the FAR Part 77 primary surface, terminating below the line where the approach surface reaches a height of 50 feet above the elevation of the runway end. FAA regulations require that RPZs be kept free of obstructions and any uses that might cause an assemblage of persons.

**Runway Safety Area (RSA):** A cleared, drained, graded, and preferably turfed area symmetrically located about the runway which, under normal conditions, is capable of supporting snow

removal, firefighting, and rescue equipment and of accommodating the occasional passage of aircraft without causing major damage to the aircraft.

**Runway Threshold:** The beginning of that portion of a runway usable for landing or takeoff.

**Runway Visual Range (RVR):** Visibility along a runway. At major airports it is measured automatically by transmissometer.

## S

**Special-Use Airspace (SUA):** All airspace for which restrictions or prohibitions to flight are imposed for military or government needs (See Military Operations Area, Restricted Area, Prohibited Area).

**Specialized Aviation Service Operation (SASO):** Similar to a fixed-base operator but generally providing a single-service or specialized aeronautical service as opposed to full service or multi-aeronautical service.

**Standard Instrument Departure (SID):** A planned instrument flight rules air traffic control departure procedure printed for pilot use in graphic and/or textual form. SIDs provide transition from the terminal to the appropriate en route structure.

**Standard Terminal Arrival Route (STAR):** A planned instrument flight rules air traffic control arrival route published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

**Stopway:** An area beyond the takeoff runway, no less wide than the runway and centered upon the extended centerline of the runway, able to support the aircraft during an aborted takeoff without causing structural damage to the aircraft, and designated by the airport authorities for use in decelerating the aircraft during an aborted takeoff.

**Stormwater Pollution Prevention Plan (SWPPP):** A stormwater management plan addressing stormwater discharge from the airport that incorporates best management practices.

**Straight-In Instrument Approach:** An instrument approach wherein final approach is begun without first having executed a procedure turn, and not necessarily completed with a straight-in landing or made to straight-in landing weather minimum.

**Student Pilot:** A pilot training for a private pilot certificate, either before or after the first solo. A student must obtain a third-class medical certificate through an examination by an FAA-designated aviation medical examiner before being allowed to fly solo in a powered aircraft. The medical certificate for a student pilot has a student "license" printed on the back.

**Surface Movement Guidance and Control (SMGC):** A combination of signage, lighting, and markings that allow safer airport operations in low-visibility and normal weather conditions.

## T

**Taxi:** The movement of an airplane under its own power on the surface of an airport; also, the surface movement of helicopters equipped with wheels.

**Taxilane:** The portion of the aircraft parking area used for access between taxiways, aircraft parking positions, hangars, storage facilities, etc.

**Taxiway (TWY):** A defined path, from one part of an airport to another, selected or prepared for the taxiing of aircraft.

**Terminal Area:** A general term used to describe the space of the building used to provide passenger service to the traveling public.

**Terminal Control Area (TCA):** (See Class B Airspace)

**Terminal Instrument Procedures (TERPS):** Procedures for instrument approach and departure of aircraft to and from civil and military airports. There are four types of terminal instrument procedures: (1) precision approach, (2) nonprecision approach, (3) circling, and (4) departure.

**Terminal Radar Service Area (TRSA):** Radar service that assists with traffic sequencing in some Class D airspace. Pilot participation is voluntary.

**Threshold:** The beginning of that portion of the runway usable for landing.

**Touch-and-Go Operation:** A practice maneuver consisting of a landing and a takeoff performed in one continuous movement: the aircraft lands and begins takeoff roll without stopping. A touch-and-go is considered two operations.

**Traffic Pattern:** A standard rectangular flight pattern around the landing runway at an airport. It includes 45-degree or crosswind entry to the rectangle, with downwind, base, and final legs as sides of the rectangle. Standard are 90-degree left turns around the rectangle (a nonstandard right-hand traffic pattern is noted in airport facility directories) with downwind flown at a specified altitude, usually 1,000 or 1,500 feet above the airport elevation. At airports with a control tower, the pattern may be modified or short cut according to air traffic control instructions.

**Transient Aircraft:** Aircraft not based at the airport.

**Transponder:** A special onboard 1090 MHz radio transmitter to enhance and code an aircraft's radar return. When interrogated by ground radar, it transmits a return signal that controllers can use to identify and tag the flight on their computerized video display radar screen. Paired with an altitude encoder, Mode C transponders also transmit the aircraft's altitude. All aircraft flying in Class B airspace or higher than 10,000 feet are required to have Mode C transponders.

**Transport Airport:** An airport designed, constructed, and maintained to serve airplanes having approach speeds of 121 knots or higher.

**True Heading:** Heading of the aircraft relative to true north.

**TSR Part 1452:** Federal transportation security regulation for airports.

**Turbojet Aircraft:** An aircraft having a jet engine in which the energy of the jet operates a turbine that in turn operates the air compressor.

**Turboprop:** An airplane using a turboprop engine, a jet rather than piston engine connected to a propeller. Such aircraft can be single-engine or multiengine. Turboprop engines are increasingly used when more horsepower is needed for speed or payload than the 300 to 400 horsepower available from current light-aircraft piston engines.

**Turboprop Aircraft:** An aircraft having a jet engine in which the energy of the jet operates a turbine that drives the propeller.

## U

**Ultralight Vehicle:** An aeronautical vehicle operated for sport or recreational purposes that does not require FAA registration, an airworthiness certificate, or pilot certification. An ultra-

light vehicle is primarily a single-occupant vehicle, although some two-place vehicles are authorized for training purposes. Operation of an ultralight vehicle in certain airspace requires authorization from air traffic control.

**Uncontrolled Airport:** (see Nontowered Airport)

**UNICOM:** A common, multipurpose radio frequency used at most nontowered airports as the common traffic advisory frequency. The Aircraft Owners and Pilots Association (AOPA) coined the term (derived from the words "universal communications") in the 1950s. UNICOM is also used by a fixed-base operator for general administrative uses, including fuel orders, parking instructions, etc. Originally 122.8 MHz universally, it now includes 122.7, 123.0, and other frequencies.

**Urban Growth Management (UGM):** The identification and management of the demands on municipal facilities, improvements, or services created by any proposed residential, commercial, industrial, or other type of development. UGM is intended to (1) provide the means for satisfying such demands; (2) identify any harmful effects of development; and (3) protect the jurisdictions and their residents against such harmful effects by minimizing the costs of municipal facilities, improvements, and services. The intent of UGM is usually not to prevent development or growth, but rather to avoid free or disorganized development or growth in the UGM area, which is generally located in and around the fringe of an urban area. The UGM area is usually either relatively undeveloped or predominantly agricultural and lacks most, if not all, municipal facilities, improvements, or services.

**Utility Airport:** An airport designed, constructed, and maintained to serve airplanes having approach speeds less that 121 knots.

## V

**VHF Omnidirectional Range (VOR):** A type of radio beacon on which a tried and tested radio navigation system is largely based. It broadcasts 360 radial signals like spokes in a wheel; equipment on the aircraft determines which of these radials the aircraft is on to provide direction to and from an airport or given location.

**Victor Airway:** A control area or portion thereof established in the form of a corridor, the centerline of which is defined by VHF omnidirectional range.

**Visibility:** The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and prominent lighted objects by night. Visibility is reported as statute miles, hundreds of feet, or meters.

- **Flight Visibility**—The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.
- **Ground Visibility**—Prevailing horizontal visibility near the earth's surface as reported by the United States National Weather Service or an accredited observer.

**Visual Approach:** An approach to an airport wherein an aircraft on an instrument flight rules flight plan, operating in visual flight rules conditions under the control of a radar facility and having an air traffic control authorization, may deviate from the prescribed instrument approach procedure and proceed to the airport of destination, served by an operational control tower, by visual reference to the surface.

**Visual Approach Slope Indicator (VASI):** A system of lights arranged to provide visual descent guidance information during the approach to a runway (see also Precision Approach Path Indicator).

**Visual Flight Rules (VFR):** A defined set of FAA regulations covering operation of aircraft primarily by visual reference to the horizon (for aircraft control) and see-and-avoid procedures (for traffic separation). VFR weather minimums for controlled airspace require at least a 1,000-foot ceiling and three miles visibility except for "special VFR" clearances to operate "clear of clouds."

- **Marginal VFR**—Weather of less than 3,000-foot ceiling and five miles visibility but above the required "1,000 and three" (see Instrument Flight Rules).

**Visual Runway:** A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan.

**VORTAC:** Collocation of VHF omnidirectional range (VOR) and UHF tactical air navigation aid (TACAN) providing distance and bearing to a station; a basic guidance mode, providing lateral guidance to a set of a VOR station and a TACAN station that are collocated.

## W

**Wake Turbulence:** Turbulent air condition caused by small, tornado-like horizontal whirlwinds trailing an aircraft's wingtips (wingtip vortices). Wake turbulence associated with larger aircraft flying at slow speeds (as on takeoff or landing approach) is the most severe and can cause loss of control for smaller aircraft following close behind. Controllers use defined separation standards to avoid the problem for takeoff, landing, approach, and departure operations. The term includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash, and rotor wash, both on the ground and in the air.

**Wide Area Augmentation System (WAAS):** An enhancement to the Global Positioning System providing greater navigation accuracy and system integrity and permitting GPS to be used for precision instrument approaches to most airports.

**Wind Shear:** Large changes in either wind speed or direction at different altitudes that can cause sudden gain or loss of airspeed. Wind shear is especially hazardous when aircraft airspeeds are low on takeoff or landing.

## Z

**Zoning:** (See Zoning Ordinances)

**Zoning Ordinances:** Ordinances that divide a community into zones or districts according to the present and potential use of properties for the purpose of controlling and directing the use and development of those properties. Zoning is concerned primarily with the use of land and buildings, the height and bulk of buildings, the proportion of a lot that buildings may cover, and the density of population of a given area. As an instrument of plan implementation, zoning deals principally with the use and development of privately owned land and buildings. The objective of zoning legislation is to establish regulations that provide locations for all essential uses of land and buildings and to ensure that each use is located in the most appropriate place. In FAR Part 150 planning, zoning can be used to achieve two major aims: (1) to reinforce existing compatible land uses and promote the location of future compatible uses in vacant or undeveloped land and (2) to convert existing noncompatible uses to compatible uses over time.

# Acronyms

| | |
|---|---|
| **A/A** | Air/Air |
| **A/C** | Aircraft |
| **A/G** | Air to Ground |
| **A/I** | Accident(s)/Incident(s) |
| **AAAE** | American Association of Airport Executives |
| **AAE** | Accredited Airport Executive |
| **AALS** | Advanced Approach and Landing System |
| **AASR** | Airways and Airport Surveillance Radar |
| **ABT** | About |
| **ABV** | Above |
| **AC** | Advisory Circular |
| **ACAD** | Auto Computer Aided Design (Operator-Input+Display System) |
| **ACE** | Army Corps of Engineers |
| **ACI** | Airports Council International |
| **ACID** | Aircraft Identification (ICAO) |
| **ACI-NA** | Airports Council International–North America |
| **ACIP** | Airports Capital Improvement Plan |
| **ACL** | Altimeter Check Location |
| **ACM** | Airport Certification Manual |
| **ACPT** | Accept or Accepted |
| **ACR** | Air Carrier |
| **AD** | Airworthiness Directive |
| **ADF** | Automatic Direction Finding |
| **ADM** | Administrative/Administration |
| **ADO** | Airports District Office |
| **ADPG** | ATM Data Processing Sub-Group |
| **ADS-B** | Automatic Dependent Surveillance–Broadcast |
| **ADZ** | Advise |
| **ADZD** | Advised |
| **ADZY** | Advisory |
| **AEP** | Airport Emergency Plan |
| **AFB** | Air Force Base |
| **AFSS** | Automated Flight Service Station |
| **AGL** | Above Ground Level |
| **AIM** | Aeronautical Information Manual |
| **AIP** | Airport Improvement Program |
| **ALP** | Airport Layout Plan |
| **ALPA** | Air Line Pilots Association |
| **ALRT** | Alert |

| | |
|---|---|
| **ALS** | Approach Lighting System |
| **ALT** | Alternate |
| **ALT** | Altitude |
| **AMGR** | Airport Manager |
| **AOA** | Airport Operations Area |
| **AOCI** | Airport Operators Council International |
| **AOPA** | Aircraft Owners and Pilots Association |
| **AOZO** | Airport Overlay Zoning Ordinance |
| **AP** | Airport |
| **APAPI** | Abbreviated Precision Approach Path Indicator |
| **APCH** | Approach |
| **APL** | Aircraft Parking Line Limit |
| **APLGT** | Airport Lighting |
| **APP** | Approach Center/Control (office/service) |
| **APRT** | Airport |
| **APT** | Airport(s) |
| **APV** | Approach with Vertical Guidance (for GPS approaches) |
| **ARP** | Airport Reference Point |
| **ARFF** | Airport Rescue and Firefighting |
| **ARINC** | Aeronautical Radio Incorporated (a nonprofit corporation owned by member airlines to define form, fit, and functions of avionics equipment) |
| **ARSA** | Airport Radar Service Area |
| **ARTCC** | Air Route Traffic Control Center |
| **ARTS** | Automated Radar Terminal System |
| **ASMGCS** | Advanced Surface Movement Guidance and Control Systems |
| **ASOS** | Automated Surface Observation System |
| **ASPH** | Asphalt |
| **ASR** | Airport Surveillance Radar |
| **ATA** | Air Transport Association (of America) |
| **ATA** | Actual Time of Arrival |
| **ATC** | Air Traffic Control |
| **ATCT** | Airport Traffic Control Tower |
| **ATIS** | Automated Terminal Information System |
| **ATP** | Airline Transport Pilot |
| **AUTH** | Authority |
| **AUTH** | Authorized or Authorization |
| **AUTOCAD** | Automatic Computer-Aided Design |
| **AVAIL** | Available |
| **AVBL** | Available |
| **AVG** | Average |
| **AVGAS** | Aviation Gasoline |
| **AWOS** | Automated Weather Observation System |
| **BA** | Breaking Action |
| **BA FAIR** | Braking Action Fair |
| **BA NIL** | Braking Action Nil |
| **BA POOR** | Braking Action Poor |
| **BASE** | Cloud Base |
| **BASH** | Bird Aircraft Strike Hazard |
| **BC** | Patches (meteo) |
| **BCFG** | Fog Patches |
| **BCN** | Beacon |
| **BECMG** | Becoming (meteo) |

| | |
|---|---|
| **BKN** | Broken (meteo) |
| **BL** | Blowing (meteo) |
| **BRL** | Building Restriction Line |
| **BYD** | Beyond |
| **CAP** | Civil Air Patrol |
| **CAT** | Clear Air Turbulence |
| **Cat** | Category |
| **CAT I** | Facility providing operation down to 200 feet decision height and runway visual range not less than 2,600 feet |
| **CAT II** | Facility providing operation down to 100 feet decision height and runway visual range not less than 1,200 feet |
| **CAT II a** | Facility providing operation with no decision height limit to and along the surface of the runway, with external visual reference during final phase of landing, and with a runway visual range not less than 700 feet |
| **CAT x** | Category x Precision Approach (I, II, or III) |
| **CCTV** | Closed Circuit Television |
| **CFI** | Certified Flight Instructor |
| **CFR** | Code of Federal Regulations |
| **CIG(s)** | Ceiling(s) |
| **CIP** | Capital Improvement Program |
| **CLD** | Cloud |
| **CMSND** | Commissioned |
| **COM** | Communications (ICAO) |
| **CON** | Continuous |
| **CONC** | Concrete |
| **CONDAR** | Conflict Detection and Resolution |
| **CONDOR** | Confidential Direct Occurrence Report |
| **CONF** | Conflict |
| **CONFACP** | Conflict Accept |
| **CONOPS** | Concept of Operations of Mode S in Europe |
| **CONP** | Connection Oriented Network Protocol |
| **CONS** | Continuous |
| **CONST** | Construction or Constructed |
| **CTAF** | Common Traffic Advisory Frequency |
| **dB** | Decibel |
| **DBE** | Disadvantaged Business Enterprise |
| **DEL** | Delete |
| **DEP** | Depart, Departure |
| **DIS** | Distance |
| **DME** | Distance Measuring Equipment |
| **DNL** | Day-Night Equivalent Sound Level |
| **DOT** | Department of Transportation |
| **DR** | Low drifting (followed by DU SA or SN) |
| **DS** | Dust Storm (meteo) |
| **DSPLCD** | Displaced |
| **DTG** | Distance-to-go |
| **DU** | Dust (meteo) |
| **DUATS** | Direct User Access System |
| **DW** | Dual Wheels |
| **DZ** | Drizzle |
| **EA** | Environmental Assessment |
| **EAA** | Experimental Aircraft Association |

| | |
|---|---|
| **EAS** | Essential Air Service |
| **EFAS** | En Route Flight Advisory Service |
| **EIS** | Environmental Impact Statement |
| **ELT** | Emergency Locator Transmitter |
| **END** | Stop-end (related to RVR) |
| **EPA** | Environmental Protection Agency |
| **EST** | Estimated |
| **ETA** | Estimated Time of Arrival/Estimating Arrival |
| **ETD** | Estimated Time of Departure |
| **ETE** | Estimated Time of Entry |
| **FAA** | Federal Aviation Administration |
| **FAR** | Federal Aviation Regulations |
| **FBO** | Fixed-Base Operator |
| **FCC** | Federal Communications Commission |
| **FEMA** | Federal Emergency Management Agency |
| **FG** | Fog (meteo) |
| **FIDS** | Flight Information Display System |
| **FLD** | Field |
| **FLT** | Flight |
| **FLT/PLN** | Flight Plan |
| **FOD** | Foreign Object Damage (Debris) |
| **FONSI** | Finding of No Significant Impact |
| **FRONT** | Front (relating to weather) |
| **FRQ** | Frequent |
| **FRZN** | Frozen (meteo) |
| **FSDO** | Flight Standards District Office |
| **FSL** | Full Stop Landing |
| **FSS** | Flight Service Station |
| **FU** | Smoke (meteo) |
| **FZ** | Freezing (meteo) |
| **FZDZ** | Freezing Drizzle |
| **FZFG** | Freezing Fog |
| **FZRA** | Freezing Rain |
| **G** | Gusts (meteo) |
| **G/G** | Ground / Ground |
| **GA** | General Aviation |
| **GAMA** | General Aviation Manufacturers Association |
| **GMT** | Greenwich Mean Time |
| **GND** | Ground Level |
| **GOVT** | Government |
| **GP** | Glide Path |
| **GPS** | (Satellite Navigation and) Global Positioning System/Geographical Paging System, a technique for deriving location from space-based assets |
| **GPU** | Ground Power Unit |
| **GR** | Hail > 5 mm (meteo) |
| **GRASS** | Grass Landing Area |
| **GRVL** | Gravel |
| **GS** | Glide Slope Indicator |
| **GS** | Small Hail or Snow Pellets (meteo) |
| **GW** | Gross Weight |
| **HDG** | Heading |
| **HIRL** | High Intensity Runway Lights |

| | |
|---|---|
| **HURCN** | Hurricane |
| **HVY** | Heavy |
| **IAAE** | International Association of Airport Executives |
| **IC** | Ice Crystals (meteo) (very small; also know as diamond dust) |
| **ICAA** | International Civil Airport Association |
| **ICAO** | International Civil Aviation Organization |
| **ICE** | Icing |
| **IFR** | Instrument Flight Rules |
| **ILS** | Instrument Landing System |
| **IM** | Inner Marker |
| **INOP** | Inoperative |
| **INSTR** | Instrument |
| **INTST** | Intensity |
| **IR** | Ice on Runway |
| **LAA** | Local Airport Advisory |
| **LAAS** | Local Area Augmentation System |
| **LAHSO** | Land and Hold Short Operations |
| **LCTD** | Located |
| **LDA** | Landing Distance Available |
| **LDI** | Landing Direction Indicator |
| **LEED** | Leadership in Energy and Environmental Design |
| **LF** | Low Frequency |
| **LGT** | Light or Lighting |
| **LGTD** | Lighted |
| **LIH** | Light Intensity High |
| **LIL** | Light Intensity Low |
| **LIM** | Light Intensity Medium |
| **LLWAS** | Low Level Windshear Alert System |
| **LOA** | Letter of Agreement |
| **LOC** | Localizer (part of an ILS system) |
| **LNAV** | Lateral Navigation (for GPS approaches) |
| **LPV** | Localizer Performance with Vertical Guidance (for GPS approaches) |
| **LSA** | Light Sport Aircraft |
| **LVL** | Level |
| **LVP** | Low-Visibility Procedure |
| **LYR** | Layer or Layered |
| **MAG** | Magnetic |
| **MAGVAR** | Magnetic Variation |
| **MAINT** | Maintenance |
| **MALS** | Medium Intensity Approach Light System |
| **MALSF** | Medium Intensity Approach Light System with Sequenced Flashers |
| **MALSR** | Medium Intensity Approach Light System with Runway Alignment Indicator Lights |
| **MAP** | Missed Approach Point/Military Airport Program |
| **Mb** | Millibars |
| **MDA** | Minimum Descent Altitude |
| **MET** | Meteorological or request METAR |
| **MET** | Meteorological (office) |
| **METAR** | Meteorological Aviation Routine Weather Report/Actual Report |
| **MHVDF** | Medium, high, and very high frequency direction-finding station (at the same location) |
| **MHz** | Megahertz |

| | |
|---|---|
| **MID** | Mid-point (related to RVR) |
| **MIL** | Military |
| **MIN** | Minimum |
| **Min** | Minutes |
| **MLS** | Microwave Landing System |
| **MM** | Middle Marker |
| **MN** | Magnetic North |
| **MOA** | Military Operations Area |
| **MOD** | Moderate (used to indicate the intensity of weather phenomena, interference, or static reports, e.g., MOD RA = moderate rain) |
| **MOGAS** | Motor Gasoline |
| **MOS** | Minimum Operating Strip |
| **MOU** | Memorandum of Understanding |
| **MPH** | Statute Miles per Hour |
| **MPO** | Metropolitan Planning Organization |
| **MSL** | Mean Sea Level |
| **MTOW** | Maximum Takeoff Weight |
| **MUNI** | Municipal |
| **MVAR** | Magnetic Variation |
| **NAAQS** | National Ambient Air Quality Standards |
| **NAS** | National Airspace System |
| **NAS-Plan** | National Airspace Plan |
| **NASA** | National Aeronautics and Space Administration (U.S.) |
| **NASAO** | National Association of State Aviation Officials |
| **NAV** | Navigation |
| **NAVAID** | Navigation(al) Aid |
| **NBAA** | National Business Aircraft Association |
| **NDB** | Nondirectional Beacon |
| **NEPA** | National Environmental Policy Act |
| **NFPA** | National Fire Protection Association |
| **NM** | Nautical Mile = 1.1508 statute miles |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NONSTD** | Nonstandard |
| **NOSIG** | No Significant Change (Used in trend-type landing forecasts) |
| **NOTAM** | Notice to Airmen |
| **NOTAMC** | NOTAM Cancelling another NOTAM |
| **NOTAMN** | New NOTAM |
| **NOTAMR** | NOTAM Replacing another NOTAM |
| **NPA** | Nonprecision Approach |
| **NPDES** | National Pollution Discharge Elimination System |
| **NPE** | Non-primary entitlement |
| **NPIAS** | National Plan of Integrated Airport Systems |
| **NPRM** | Notice of Proposed Rule Making (FAA) |
| **NTAP** | Notice to Airmen Publication |
| **NTSB** | National Transportation Safety Board (U.S.) |
| **NWS** | National Weather Service |
| **OBSC** | Obscured, Obscure, or Obscuring |
| **OBST** | Obstacle, Obstruction |
| **OBSTL** | Obstruction Lights |
| **OE/AAA** | Obstruction Evaluation/Airport Airspace Analysis |
| **OFA** | Object-Free Area |
| **OFZ** | Obstacle Free Zone |

| | |
|---|---|
| **OJT** | On-the-Job Training |
| **OPLAN** | Operational Plan |
| **OPS** | Operations |
| **OTS** | Out of Service |
| **OVC** | Overcast (meteo) |
| **OVR** | Over |
| **PA** | Precision Approach |
| **PAPI** | Precision Approach Path Indicator |
| **PAT** | Pattern |
| **PAX** | Passengers |
| **PCL** | Pilot Controlled Lighting |
| **PE** | Ice Pellets |
| **PFC** | Passenger Facility Charges |
| **PIREP** | Pilot Weather Report (ICAO) |
| **PNR** | Prior Notice Required |
| **PPR** | Prior Permission Required |
| **PRKG** | Parking |
| **PRL** | Pilot Request, Level (service) |
| **PRM** | Precision Runway Monitor |
| **PROP** | Propeller |
| **R** | Right (runway identification) |
| **RADAR** | Radio Detecting and Ranging |
| **RAG** | Runway Arresting Gear |
| **RAI** | Runway Alignment Indicator |
| **RAIL** | Runway Alignment Indicator Lights |
| **RAPCON** | Radar Approach Control Facility |
| **RCL** | Runway Center Line |
| **RCLL** | Runway Center Line Lights |
| **RCR** | Runway Condition Reading |
| **REDL** | Runway Edge Light(s) |
| **REIL** | Runway End Identifier Lights |
| **RENL** | Runway End Light(s) |
| **RESA** | Runway End Safety Area (ICAO) |
| **RF** | Radio Frequency |
| **RFF** | Rescue and Firefighting |
| **RFI** | Request For Information |
| **RFQ** | Request for Qualifications |
| **RL** | Runway Lights |
| **RMK** | Remark(s) |
| **RNAV** | Area Navigation (generic acronym for any device capable of aircraft guidance between pilot-defined waypoints) |
| **RPZ** | Runway Protection Zone |
| **RQRD** | Required |
| **RSA** | Runway Safety Area |
| **RTE** | Route |
| **RTHL** | Runway Threshold Light(s) |
| **RTN** | Return or Returned or Returning |
| **RTO** | Reduced Takeoff and Landing |
| **RTS** | Return to Service |
| **RVR** | Runway Visual Range |
| **RVRM** | Runway Visual Range Midpoint |
| **RVRR** | Runway Visual Range Rollout |

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| **RVRT** | Runway Visual Range Touchdown |
| **RW** | Runway |
| **RWEWP** | Runway End Waypoint |
| **RWIWP** | Runway Intercept Waypoint |
| **RWY** | Runway |
| **RWY WP** | Runway Waypoint |
| **SA** | Sand (meteo) |
| **SASO** | Specialized Aviation Service Operation |
| **SG** | Snow Grains (meteo) |
| **SID** | Standard Instrument Departure (Route) |
| **SID/STAR** | Standard Instrument Departure/Standard Arrival Route |
| **SIGMET** | Significant Meteorological Information (broadcast warnings of weather hazards) |
| **SIGWX** | Significant Weather |
| **SIR** | Packed or Compacted Snow and Ice on Runway(s) |
| **SMGC** | Surface Movement Guidance and Control |
| **SMO** | FAA System Management Office |
| **SN** | Snow (meteo) |
| **SNOWTAM** | A special series NOTAM noting the presence or removal of hazardous conditions due to snow, ice, slush, or standing water associated with snow, slush, and ice on the movement area, by means of a specific pro forma. |
| **SOP** | Standard Operating Procedures |
| **SOQ** | Statements of Qualifications |
| **SRE** | Snow Removal Equipment |
| **SS** | Sand Storm (meteo) |
| **STA** | Sequence/Scheduled Time of Arrival |
| **STA** | Straight in Approach |
| **STAR** | Standard Terminal Arrival Route |
| **STD** | Scheduled Time of Departure |
| **STD** | Standard (altimeter setting) |
| **STN** | Station |
| **STOL** | Short Takeoff and Landing |
| **SUA** | Special Use Airspace |
| **SVC** | Service (message) |
| **SVCBL** | Serviceable |
| **SVFR** | Special VFR |
| **SWOT** | Strength, Weaknesses, Opportunities, and Threats |
| **SWPPP** | Stormwater Pollution Prevention Plan |
| **SWY** | Stopway (ICAO) |
| **T** | Temperature |
| **T/O** | Takeoff |
| **TA** | Traffic Advisory (ACAS/TCAS) |
| **TACAN** | UHF Tactical Air Navigation Aid (Azimuth and DME) |
| **TAS** | Traffic Advisory System |
| **TBA** | To Be Advised |
| **TBD** | To Be Determined (Defined) |
| **TCA** | Terminal Control Area |
| **TCAS** | Traffic Alert and Collision-Avoidance System |
| **TDZ** | Touchdown Zone |
| **TDZ LGT** | Touchdown Zone Lights |
| **TDZL** | Touchdown Zone Lights |
| **TEMP** | Temperature |

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|---|---|
| **TERPS** | Terminal Instrument Procedures |
| **TFR** | Temporary Flight Restriction |
| **TGL** | Touch and Go Landing |
| **THDG** | True Heading |
| **TLOF** | Touchdown and Lift-off Area |
| **TN** | True North |
| **TO** | Takeoff |
| **TODA** | Takeoff Distance Available (ICAO) |
| **TRSA** | Terminal Radar Service Area |
| **TSA** | Transportation Security Administration |
| **TSR** | Transportation Security Regulation |
| **TWS** | Terminal Weather Service (ICAO) |
| **TWY** | Taxiway |
| **TWYL** | Taxiway Lights |
| **UFN** | Until Further Notice |
| **UFO** | Unidentified Flying Object |
| **UGM** | Urban Growth Management |
| **UHF** | Ultra-High Frequency |
| **UNAVBL** | Unavailable |
| **UNL** | Unlimited |
| **UNLGT** | Unlighted |
| **UNMKD** | Unmarked |
| **UNMNT** | Unmonitored |
| **USDA** | U.S. Department of Agriculture |
| **USFWS** | U.S. Fish and Wildlife Services |
| **UTC** | Universal Time Coordinates |
| **VASI** | Visual Approach Slope Indicator |
| **VDP** | Visual Descent Point |
| **VFR** | Visual Flight Rules |
| **VHF** | Very High Frequency |
| **VIS** | Visibility |
| **VLJ** | Very Light Jet |
| **VNAV** | Vertical Navigation (for GPS approaches) |
| **VOL** | Volume |
| **VOR** | VHF Omnidirectional Range |
| **VOR-DME** | VHF Omnidirectional Range/Distance Measurement Equipment |
| **VORTAC** | Combined VOR and TACAN |
| **VOR-TACAN** | See VORTAC |
| **VOR/TAC** | See VORTAC |
| **VSB** | Visibility |
| **VTOL** | Vertical Takeoff and Landing |
| **WAAS** | Wide-Area Augmentation System |
| **WAC** | World Aeronautical Chart |
| **WAFS** | World Area Forecast System |
| **WILCO** | Will Comply |
| **WINDMG** | Wind Magnitude |
| **WINDR** | Wind Direction |
| **WKN** | Weaken or Weakening |
| **WND** | Wind |
| **WPT** | Waypoint |
| **WQC** | Water Quality Certificate |
| **WRNG** | Warning |

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|---|---|
| **WS** | Wind Shear |
| **WSPD** | Wind Speed |
| **WSR** | Wet Snow on Runway(s) |
| **WT** | Weight |
| **WTR** | Water on Runway(s) |
| **WTWS** | Wind Shear and Turbulence Warning System |
| **WWW** | World Wide Web (Internet) |
| **WX** | Weather |
| **X-BAND** | Frequency Range Between 8000 and 12500 MHz |
| **X-Wind** | Crosswind |
| **XFSS** | Auxiliary Flight Service Station |
| **XMIT** | Transmit |
| **XX** | Heavy (used to qualify weather such as rain; e.g., heavy rain = XXRA) |
| **Z** | Zulu (Greenwich Mean Time) |

# Annotated Bibliography

## ACRP Publications


Ludwig, D.A., C.R. Andrews, N.R. Jester-Ten Veen, and C. Laqui. *ACRP Report 1: Safety Management Systems for Airports, Volume 1: Overview.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

This report explains what a safety management system (SMS) is and how a systems approach to safety management will benefit both the safety and business aspects of airports. The implementation of SMS represents a change in the safety culture of an organization. In this regard, airport directors and members of their governing boards will find this document particularly useful, because the successful implementation of SMS is dependent on the commitment of the highest levels of management.

Muia, M.J. ACRP *Synthesis of Airport Practice 4: Counting Aircraft Operations at Non-Towered Airports.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

This synthesis report identifies and evaluates the different methods used by states, airports, and metropolitan planning organizations (MPOs) of counting and estimating aircraft operations at nontowered airports with the goal of identifying best practices. Also identified are new technologies that can be used for these counts and estimates. Information used in this study was acquired through a literature review; a survey distributed to all 50 state aviation agencies and selected airports and MPOs; contacts with manufacturers of counting equipment and aviation trade organizations; and follow-up telephone interviews and e-mail correspondence, where appropriate.

Nichol, C. *ACRP Synthesis of Airport Practice 1: Innovative Finance and Alternative Sources of Revenue for Airports.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

This synthesis report is intended to inform airport operators, stakeholders, and policymakers about alternative financing options and revenue sources currently available or that could be available in the future in the United States. The report provides a brief overview of common capital funding sources used by airport operators, a review of capital financing mechanisms used by airports, descriptions of various revenue sources developed by airport operators, and a review of privatization options available to U.S. airport operators. Information used in this study was acquired through a review of the literature and interviews with airport operators and industry experts.

Spitz, W., and R. Golaszewski. ACRP *Synthesis of Airport Practice 2: Airport Aviation Activity Forecasting.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

This synthesis report reviews current practices and methods in airport activity forecasting in the United States. The study addresses how airport forecasts are used and identifies common aviation metrics, aviation data sources, issues in data collection and preparation, and special data issues at nontowered airports.

Williams, C. *ACRP Synthesis of Airport Practice 3: General Aviation Safety and Security Practices.* Transportation Research Board of the National Academies, Washington, D.C., 2007.

This synthesis report identifies current practices in safety and security at general aviation airports. It reviews resources used by the general aviation community in the development of safety and security programs, funding sources, and issues that determine the amount of money spent on such programs and describes current practices that general aviation airports use to keep their facilities safe and secure.

## Books

Albers, S. *Strategic Management in the Aviation Industry.* Ashgate Publishing, Ltd., Burlington, Vt., 2004.

This book looks at the strategic challenges facing the aviation industry, in various sectors of aviation management, including but not restricted to passenger planes. It combines views from economic, business, and academic professionals to examine "conceptual predispositions with regard to the industry, the economic and institutional environment, as well as the underlying strategy" of strategic issues relevant to aviation management.

de Neufville, R., and A. Odoni. *Airport Systems: Planning, Design, and Management,* 1st ed. McGraw-Hill Professional, 2003.

This book reviews the operations of large- and medium-sized commercial airports. The book is principally targeted toward urban and regional planners and concerns the development impacts of airport expansion on environmental health and fiscal implications. The text covers all aspects of airport planning, design, and management and is intended for planning practitioners and academic use.

Eckrose, R. A., and W. H. Green. *How to Assure the Future of Your Airport: Principles of Airport Management and Administration,* 3rd ed. Applied Research Associates, Inc., Madison, Wis., 2002.

This book discusses 21 topics related to administering a local general aviation airport that is neither large enough nor profitable enough to have a professional staff. The third edition includes chapters on security and land use.

Gesell, L. E. *The Administration of Public Airports,* 4th ed. Coast Aire Publications, Chandler, Ariz., 1999.

The "blue book" is intended to prepare students for careers in aviation management and serve as a reference for professional airport managers. The fourth edition contains significant revisions that reflect the changing nature of managing airports in the public sector over the past 20 years.

Gesell, L. E. *Aviation and the Law,* 4th ed. Coast Aire Publications, Chandler, Ariz., 2005.

This book provides a basic understanding of law and legal systems and of how the principles of law may be applied to the many aspects of air commerce and air transportation. The fourth edition includes updates on the federal aviation security provisions since September 2001, as well as important court cases decided since the previous edition.

Green, W. H. *Beginner's Guide to Airport Administration.* Hilldale Press, Inc., Madison, Wis., 2002.

Based on the book *How to Assure the Future of Your Airport*, this pocket-sized book provides individuals new to airport management a brief overview of 20 airport administration topics.

Hoerter, S. *The Airport Management Primer,* 2nd ed. S. Hoerter, Mount Pleasant, S.C., 2001.

This book focuses on foundational information needed by decision makers and emphasizes strategic concepts rather than day-to-day tactics.

Horonjeff, R., and F. X. McKelvey. *Planning and Design of Airports,* 4th ed. McGraw-Hill Professional, New York, 1994.

A guide to the planning, engineering, and design of airports. Includes geometric design information for airfields as well as statistical and legislative data relating to the development of airports.

Rodwell, J. F. *Essentials of Aviation Management: A Guide for Aviation Service Businesses.* Kendall/Hunt Publishing Company, Dubuque, Iowa, 2003.

This text introduces small business theory and practices for basic managerial training and fixed-base operations for the U.S. aviation industry service centers. The book reviews business planning, marketing, financial strategies, and human resources, among other topics. The book also details flight lines, flight operations, and aviation maintenance activities along with the regulatory reviews associated with the industry.

Shahin, M. Y. *Pavement Management for Airports, Roads, and Parking Lots.* Springer, New York, 2006.

This book reviews cost-effective methods for evaluating pavements in addition to describing repair and maintenance techniques. While the book examines the budgetary aspects and practices of pavement management, the text also discusses measuring friction and physical conditions of pavements under stress.

Sheehan, J. *Business and Corporate Aviation Management: On Demand Air Travel.* McGraw-Hill Companies, New York, 2003.

This text reviews methods for establishing and operating an aviation operation, particularly targeted toward business and corporate clienteles. The book reviews how companies use aircraft for business, what types of aircraft are most appropriate for certain types of business activities, regulations, scheduling, maintenance, and other necessary operations.

Singer, J. *Small Airport Management Handbook.* Carl Vinson Institute of Government, University of Georgia, Athens, Ga., 1985.

This book provides an overview of small airport operations and services. The text examines the issues confronted by small airports from an economic perspective.

Wells, A., and S. Young. *Airport Planning and Management,* 5th ed. McGraw-Hill Companies, New York, 2004.

This book offers strategic guidance on airport design, access issues, financing, laws and regulations, technology, and other concerns essential to the development and management of airports. The text reviews changes to the airline industry in the post–September 2001 era, focusing on how airports have adapted to the new regulations imposed.

Wiley, J. R. *Airport Administration and Management.* Eno Foundation for Transportation, Inc., Westport, Conn., 1986.

This report provides real-world perspectives on airport operations, explores the expanded role of today's airport manager resulting from changing conditions and expectations, and presents problem-solving skills to meet present and future service needs.

## FAA Publications

### Advisory Circulars

FAA advisory circulars can be found online at the FAA website (www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars).

*Accounting Records Guide for Airport Aid Program Sponsors,* AC 150/5100-10A. FAA, Washington, D.C., April 13, 1976.

Sets forth recordkeeping requirements imposed on sponsors of Airport Development Aid Program (ADAP) and Planning Grant Program (PGP) projects funded by the Airport and Airway Development Act of 1970, as amended. In addition, federal regulations require a sponsor to establish and maintain a financial management system that meets the standards set forth in Part 152, Appendix K. This circular provides detailed explanations of these requirements.

*Aircraft Fuel Storage, Handling, and Dispensing on Airports,* AC 150/5230-4A. FAA, Washington, D.C., June 18, 2004.

Identifies standards and procedures for storage, handling, and dispensing of aviation fuel on airports.

*Airport Design,* AC 150/5300-13 (and Change 11). FAA, Washington, D.C., March 28, 2007.

Contains the FAA's standards and recommendations for airport design.

*Airport Emergency Plan,* AC 150/5200-31A. FAA, Washington, D.C., September 30, 1999.

Provides guidance for the preparation and implementation of emergency plans at civil airports.

*Airport Master Plans,* AC 150/5070-6B. FAA, Washington, D.C., July 29, 2005.

Provides guidance for the preparation of airport master plans that range in size and function from small general aviation to large commercial service facilities.

*Airport Pavement Management Program,* AC 150/5380-7A. FAA, Washington, D.C., September 1, 2006.

Discusses the Airport Pavement Management System (APMS) concept, its essential components, and how it can be used to make cost-effective decisions about pavement maintenance and rehabilitation.

*Airport Safety Self-Inspection,* AC 150/5200-18C. FAA, Washington, D.C., April 23, 2004.

Provides information to airport operators about airport self-inspection programs and identifies what should be included in such programs.

*Airport Snow and Ice Removal Equipment,* AC 150/5220-20. FAA, Washington, D.C., March 31, 1994.

Provides guidance to airport operators on the procurement of snow and ice control equipment for airport use.

*Airport Winter Safety and Operations,* AC 150/5200-30A. FAA, Washington, D.C., October 1, 1991, amended February 3, 2005.

Provides guidance to help airport owners/operators develop an acceptable airport snow and ice control program and implement appropriate field condition reporting procedures.

*Architectural, Engineering, and Planning Consultant Services for Airport Grant Projects,* AC 150/5100-14D. FAA, Washington, D.C., September 30, 2005.

Provides guidance for airport sponsors in the selection and employment of architectural, engineering, and planning consultants under FAA airport grant programs.

*Citizen Participation in Airport Planning,* AC 150/5050-4. FAA, Washington, D.C., September 26, 1975.

Provides guidance for citizen involvement in airport planning. Although not mandatory for airport grant programs, it explains the need for early citizen participation.

*Civil Rights Requirements for the Airport Improvement Program,* AC 150/5100-15A. FAA, Washington, D.C., March 31, 1989.

Encompasses the basic civil rights requirements for the Airport Improvement Program (AIP). The AC is intended for sponsors using program assistance and for contractors and subcontractors working on projects under the program.

*Debris Hazards at Civil Airports,* AC 150/5380-5B. FAA, Washington, D.C., July 5, 1996.

Discusses problems of debris at airports, gives information on foreign objects, and tells how to eliminate such objects from operational areas. It also addresses the acquisition of power sweepers for foreign object damage/debris (FOD) control at airports.

*Exclusive Rights at Federally Obligated Airports,* AC 150/5190-6. FAA, Washington, D.C., January 4, 2007.

Provides basic information about the FAA's prohibition on the granting of exclusive rights at federally obligated airports. This prohibition is one of the obligations assumed by the airport sponsors of public airports that have accepted federal assistance in the form of grants or property conveyances. This AC cancels AC 150/5190-5 (Change 1), *Exclusive Rights and Minimum Standards for Commercial Aeronautical Activities,* dated June 10, 2002.

*Fire Department Responsibility in Protecting Evidence at the Scene of an Aircraft Accident,* AC 150/5200-12B. FAA, Washington, D.C., September 3, 1999.

Furnishes general guidance for an airport, employees, airport management, and other personnel responsible for firefighting and rescue operations at the scene of an aircraft accident.

*Ground Vehicle Operations on Airports,* AC 150/5210-20. FAA, Washington, D.C., June 21, 2002.

Contains guidance to airport operators on developing ground vehicle operation training programs.

*Guide for Airport Financial Reports Filed by Airport Sponsors,* AC 150/5100-19C. FAA, Washington, D.C., January 15, 2003, amended April 19, 2004.

Provides airport sponsors with guidance for complying with the airport financial reporting requirements.

*Guidelines and Procedures for Maintenance of Airport Pavements,* AC 150/5380-6A. FAA, Washington, D.C., July 14, 2003.

Provides guidelines and procedures for maintenance of rigid and flexible airport pavements.

*Hazardous Wildlife Attractants on or near Airports,* AC 150/5200-33A. FAA, Washington, D.C., July 27, 2004.

Provides guidance on locating certain land uses that have the potential to attract hazardous wildlife to or in the vicinity of public-use airports.

*Labor Requirements for the Airport Improvement Program (AIP)*, AC 150/5100-6D. FAA, Washington, D.C., October 15, 1986.

Encompasses the basic labor and associated requirements for the airport grant program. It is intended for sponsors using program assistance and for contractors and subcontractors working on projects under the program.

*Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects*, AC 150/5100-17. FAA, Washington, D.C., November 7, 2005.

Provides guidance to sponsors of airport projects developed under the Airport Improvement Program (AIP) to meet the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646, as amended) and the Regulations of the Office of the Secretary of Transportation, 49 CFR Part 24.

*Maintenance of Airport Visual Aid Facilities*, AC 150/5340-26A. FAA, Washington, D.C., April 4, 2005.

Provides recommended guidelines for maintenance of airport visual aid facilities.

*Minimum Standards for Commercial Aeronautical Activities*, AC 150/5190-7. FAA, Washington, D.C., August 28, 2006.

Provides basic information about the FAA's recommendations on commercial minimum standards and related policies. Although minimum standards are optional, the FAA highly recommends their use and implementation as a means to minimize the potential for violations of federal obligations at federally obligated airports. This AC cancels AC 150/5190-5 (Change 1), *Exclusive Rights and Minimum Standards for Commercial Aeronautical Activities*, dated June 10, 2002.

*A Model Zoning Ordinance to Limit Height of Objects Around Airports*, AC 150/5190-4A. FAA, Washington, D.C., December 14, 1987.

Provides a model zoning ordinance to be used as a guide to control the height of objects around airports.

*Noise Control and Compatibility Planning for Airports*, AC 150/5020-1. FAA, Washington, D.C., August 5, 1983.

Provides general guidance for noise control and compatibility planning for airports as well as specific guidance for preparation of airport noise exposure maps and airport noise compatibility programs by airport operators for submission under Code of Federal Regulations, Title 14, Part 150, and the Aviation Safety and Noise Abatement Act of 1979. Contains an expanded Table of Land Uses Normally Compatible with Various Levels of Noise.

*Notices to Airmen (NOTAMs) for Airport Operators*, AC 150/5200-28C. FAA, Washington, D.C., July 24, 2006.

Provides guidance on using the NOTAM system for airport condition reporting.

*Operational Safety on Airports During Construction*, AC 150/5370-2E. FAA, Washington, D.C., January 17, 2003.

Provides guidance on operational safety on airports: with special emphasis on safety during periods of construction activity: to assist airport operators in complying with FAR Part 139, Certification of Airports.

*Painting, Marking, and Lighting of Vehicles Used on an Airport*, AC 150/5210-5B. FAA, Washington, D.C., July 11, 1986.

Provides guidance, specifications, and standards in the interest of airport personnel safety and operational efficiency for painting, marking, and lighting of vehicles operating in the airport air operations areas.

*Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace*, AC 70/7460-2K. FAA, Washington, D.C., March 1, 2000.

Provides information to persons proposing to erect or alter an object that may affect the navigable airspace. It also explains the requirement to notify the FAA before construction begins and the FAA's responsibility to respond to these notices in accordance with Code of Federal Regulations, Title 14, Part 77, Objects Affecting Navigable Airspace. Additionally, the AC explains the process by which to petition the FAA's administrator for discretionary review of the determinations issued by the FAA.

*Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports Without Operating Control Towers*, AC 90/66A. FAA, Washington, D.C., August 26, 1993.

Calls attention to regulatory requirements and recommended procedures for aeronautical operations at airports without operating control towers. It recommends traffic patterns and operational procedures for aircraft, lighter than air, glider, parachute, rotorcraft, and ultralight vehicle operations where such use is not in conflict with existing procedures at those airports.

*Reporting Wildlife Aircraft Strikes*, AC 150/5200-32A. FAA, Washington, D.C., December 22, 2004.

Explains the importance of reporting collisions between aircraft and wildlife, more commonly referred to as wildlife strikes. It also covers recent improvements in the FAA's Bird/Other Wildlife Strike Reporting System, how to report a wildlife strike, what happens to the wildlife strike report data, how to access the FAA National Wildlife Aircraft Strike Database, and the FAA's Feather Identification program.

*Standards for Airport Markings*, AC 150/5340-1J. FAA, Washington, D.C., April 29, 2005.

Describes the standards for markings used on airport runways, taxiways, and aprons.

*Standards for Airport Sign Systems,* AC 150/5340-18D. FAA, Washington, D.C., December 6, 2004.

Incorporates new mandatory hold signs that reflect changed standards for the Precision Obstacle Free Zone (POFZ) and Category (CAT II/III) operations. These changes correspond to revisions to FAA AC 150/5300-13, Airport Design, that change the Precision Object Free Area (POFA) to the POFZ and incorporate new separation standards for taxiways that parallel runways used for certain low visibility operations. This AC cancels AC 150/5340-18C, Standards for Airport Sign Systems, dated July 31, 1991.

*Standards for Specifying Construction of Airports*, AC 150/5370-10B. FAA, Washington, D.C., April 25, 2005.

Provides standards for the construction of airports. Items covered include general provisions, earthwork, flexible base courses, rigid base courses, flexible surface courses, rigid pavement, fencing, drainage, turfing, and lighting installation.

## Airport Orders

*Airport Capital Improvement Plan*. FAA, Washington, D.C., August 22, 2000. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/AIP_5100_39A.pdf

This order prescribes the development of the national Airports Capital Improvement Plan (ACIP). The ACIP serves as the primary planning tool for systematically identifying, prioritizing, and assigning funds to critical airport development and associated capital needs for the national airspace system (NAS). The ACIP also serves as the basis for the distribution of grant funds under the Airport Improvement Program (AIP). By identifying and investing in airport development and capital needs, the FAA can assure the American public that the NAS is a safe, secure, and efficient environment for air travel nationwide.

*Airport Compliance Requirements.* FAA, Washington, D.C., October 2, 1989. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/Obligations_5190_6a.pdf

This order provides the policies and procedures to be followed in carrying out the FAA's functions related to airport compliance. It may be of interest to those government agencies, both federal and state, concerned with actions associated with federal and personal property.

*Airport Improvement Program Handbook.* FAA, Washington, D.C., June 28, 2005. www.faa.gov/airports_airtraffic/airports/aip/aip_handbook/

This order provides guidance and sets forth policy and procedures to be used in the administration of the Airport Improvement Program. Several FAA orders and advisory circulars are referred to in this directive. The references appear as the basic publication number without any suffix. However, the latest issuance of the publication should be used as the reference.

*Land Acquisition and Relocation Assistance for Airport Projects.* FAA, Washington, D.C., August 1, 2005. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/environmental_5100_37b.pdf

This order provides guidelines and identifies responsibilities for FAA acceptance and monitoring of airport sponsor compliance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) (42 USC 4601 et seq.), as amended, on airport projects receiving federal financial assistance. This order incorporates all applicable requirements as provided in the Uniform Act implementing regulation 49 CFR Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs (Federal Register 70, No. 590, January 4, 2005, and as may be amended).

*National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects.* FAA, Washington, D.C., April 28, 2006. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/environmental_5050_4/

This order provides information to FAA Office of Airports personnel and others interested in fulfilling NEPA requirements for airport actions under the FAA's authority. This order is part of FAA's effort to ensure its personnel have clear instructions to address potential environmental effects resulting from major airport actions. In preparing FAA Order 5050.4B, the Office of Airports has made it consistent with FAA Order 1050.1E.2. Information on federal environmental laws other than NEPA appears in another document titled An Environmental Desk Reference for Airport Actions. The Office of Airports will publish notices in the Federal Register announcing the Desk Reference's availability.

*Passenger Facility Charge*. FAA, Washington, D.C., August 9, 2001. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/PFC_55001.pdf.

This order provides guidance and procedures to be used by FAA personnel in the administration of the Passenger Facility Charge (PFC) Program. The guidance and procedures reflect established FAA practices that have successfully met the statutory and regulatory requirements of the PFC Program. The guidance and procedures are current as of the date of issuance of this order and incorporate all changes to the PFC Program introduced by the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR 21), as well as prior legislation.

In addition, this order references several other FAA orders and advisory circulars. The references are made using the latest publication numbers for such documents as of the date of issuance of this order. However, in cases where a referenced document is updated following the issuance of this order, the latest official release of the document should be used as the reference.

*Procedures for Conducting Investigations of Vehicle/Pedestrian Deviations*. FAA, Washington, D.C., April 28, 2004. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/Safety_5200_10.pdf

This order establishes procedures for and information on conducting investigations of vehicle/pedestrian deviations and on completing FAA Form 8020-25, Investigation of Vehicle or Pedestrian Deviation (V/PD) Report (Appendix A).

*Runway Safety Area Program*. FAA, Washington, D.C., October 1, 1999. www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/Construction_5200_8.pdf

This order establishes the FAA's Runway Safety Area (RSA) Program and the procedures that FAA employees will follow in implementing that program.

### Other Publications

*Aeronautical Information Manual: Official Guide to Basic Flight Information and ATC Procedures.* FAA, Washington, D.C., March 15, 2007. www.faa.gov/airports_airtraffic/air_traffic/publications/ATpubs/AIM

## State Department of Transportation Publications

*Arizona Best Practices Guide.* Arizona Department of Transportation, Phoenix, 2007. www.azairports.org/bestpracticesguide.php

The purpose of this guide is to clarify roles, responsibilities, and expectations of all affected parties when conducting airport-related business within the state of Arizona. The Best Practices Guide is also intended to ensure that airport issues are dealt with in a uniform manner. Although this publication is specific to Arizona, the topics and information are germane to all airports. In addition, this guide may survive as a model for other airport organizations in developing best practice guides.

Michigan Department of Transportation Aeronautics. *Airport Manager Examination Study Guide.* Michigan Department of Transportation, Lansing, Mich., 2004. www.michigan.gov/documents/studyguide_18131_7.pdf

As the title indicates, the purpose of this publication is to assist airport manager candidates in preparing for the state licensure examination. Although much of the information is specific to Michigan (e.g., sections of the Michigan Aeronautics Code are often referenced), all airport managers should have knowledge of the subjects covered by the study guide for their own states.

*New York State Airport Managers'* Handbook. New York State Department of Transportation, Albany, N.Y., 2001. www.nysdot.gov/portal/page/portal/divisions/operating/opdm/aviation/repository/files/nys_airport_ managers_handbook.pdf

This comprehensive handbook was prepared by the New York State Aviation Services Bureau in association with the New York Aviation Management Association to assist airport managers in making informed decisions on airport-related issues. The topics addressed in the handbook were selected based on feedback from airport managers in New York State. Each chapter of the handbook was written by an airport manager or subject matter expert. Although the handbook was written for New York airports, the topics are relevant to airports nation-

wide. In addition, the handbook addresses many issues over which a federal agency has jurisdiction, so much of the information provided may be useful for all airports.

NewMyer, D. A. and C. B. Seibert. *Airport Commissioner's Handbook.* Illinois Department of Transportation, Springfield, Ill., 2000.

This publication was prepared by the Southern Illinois University at Carbondale under contract to the Illinois Department of Transportation, Division of Aeronautics. The handbook addresses a broad range of topics relevant to airport commission members, including the role of airport commissioners, airport rules and regulations, airport facilities, and airport finance. While some of the information is specific to Illinois, the handbook provides an outline of the issues on which airport managers must educate airport commissioners.

NewMyer, D. A., et al. *Airport Manager's Handbook*. Illinois Department of Transportation, Springfield, Ill., 2001.

This comprehensive handbook was prepared by Southern Illinois University at Carbondale under contract to the Illinois Department of Transportation, Division of Aeronautics. A variety of topics including airport control and ownership, operating and maintaining a safe airport, airport planning and finance, airport design standards, compatible land uses, and airport revenue generation are covered. The handbook also includes samples of various types of documents including the airport manager's agreement, fixed-base operator agreement, and lease agreement. Some of the information in the handbook is specific to Illinois, but the topics and majority of the information are relevant to all airports. This handbook is not available online.

*Ohio Airport Handbook.* Ohio Department of Transportation, Columbus, Ohio, 1999.

This comprehensive handbook contains sections on operating and managing a safe airport, developing airport facilities, state and federal grants, airport design, standards, leases, and community relations. The introduction includes brief descriptions of each chapter in the handbook. Some portions of the handbook are specific to Ohio airports, but there is valuable information for airport managers throughout the United States, especially the templates and sample documents. This handbook is not available online.

## Trade Publications

*Airport Business.* Cygnus Publishing, Fort Atkinson, Wis.

Airport Business is the most widely circulated and audited business publication, targeting professionals who manage airports, airport-based businesses, and corporate flight facilities. Published 11 times annually, the magazine attempts to help managers run their operations more effectively by sharing case studies as well as providing expert analysis, industry news, and product information. Current issue articles are available through the magazine's website at www.airportbusiness.com.

*Airport Magazine.* AAAE Service Corporation, Inc., Alexandria, Va.

This bi-monthly publication of the American Association of Airport Executives (AAAE) is geared toward larger airports, but each issue contains a section on general aviation and other information that may be of value to smaller airports. Subscriptions are available without joining AAAE.

*Centerlines.* Naylor, LLC, Gainesville, Fla.

The content of this quarterly publication of Airports Council International–North America (ACI-NA) is geared more towards larger airports. However, most issues include articles about national policy and/or legislative issues that may affect all airports. Free PDF versions of the magazine are available through the ACI-NA website (www.aci-na.org).

## TSA Publications

*Security Guidelines for General Aviation Airports.* Transportation Security Administration, Washington, D.C., May 2004. www.tsa.gov/assets/pdf/security_guidelines_for_general_aviation_airports.pdf

This document is intended to provide general aviation airport owners, operators, and users with guidelines and recommendations that address aviation security concepts, technology, and enhancements. To date, this document is the primary published guidance on general aviation airport security. The TSA anticipates updating this document on an as-needed basis.

APPENDIX

# ACRP Projects

The ACRP funds many projects that provide information relevant to managing small airports. The reports from several already completed ACRP projects are included in the guidebook's annotated bibliography. Publications from ACRP projects will be valuable resources for small airport managers. A list of all ACRP projects is available on the TRB website (www.trb.org/ACRP).

*Abbreviations and acronyms used without definitions in TRB publications:*

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| AAAE | American Association of Airport Executives |
| AASHO | American Association of State Highway Officials |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI–NA | Airports Council International–North America |
| ACRP | Airport Cooperative Research Program |
| ADA | Americans with Disabilities Act |
| APTA | American Public Transportation Association |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ATA | Air Transport Association |
| ATA | American Trucking Associations |
| CTAA | Community Transportation Association of America |
| CTBSSP | Commercial Truck and Bus Safety Synthesis Program |
| DHS | Department of Homeland Security |
| DOE | Department of Energy |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISTEA | Intermodal Surface Transportation Efficiency Act of 1991 |
| ITE | Institute of Transportation Engineers |
| NASA | National Aeronautics and Space Administration |
| NASAO | National Association of State Aviation Officials |
| NCFRP | National Cooperative Freight Research Program |
| NCHRP | National Cooperative Highway Research Program |
| NHTSA | National Highway Traffic Safety Administration |
| NTSB | National Transportation Safety Board |
| SAE | Society of Automotive Engineers |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005) |
| TCRP | Transit Cooperative Research Program |
| TEA-21 | Transportation Equity Act for the 21st Century (1998) |
| TRB | Transportation Research Board |
| TSA | Transportation Security Administration |
| U.S.DOT | United States Department of Transportation |