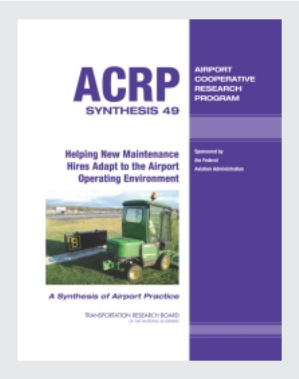

Helping New Maintenance Hires Adapt to the Airport Operating Environment

DETAILS

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP SYNTHESIS 49

Helping New Maintenance Hires Adapt to the Airport Operating Environment

A Synthesis of Airport Practice

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TRANSPORTATION RESEARCH BOARD

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2013
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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), Airlines for America (A4A), and the Airport Consultants Council (ACC) 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.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel, appointed by the TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

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

Airport administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the airport industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire airport community, the Airport Cooperative Research Program authorized the Transportation Research Board to undertake a continuing project. This project, ACRP Project 11-03, "Synthesis of Information Related to Airport Practices," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an ACRP report series, *Synthesis of Airport Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

By Donna L. Vlasak
Senior Program Officer
Transportation Research Board

This report presents information on successful peer practices or knowing where to find current, comprehensive safety and security training resources for new maintenance hires at, primarily, general aviation (GA) airports. The objectives are to locate information on training new hires, identify current practices and challenges, document core training elements and resources, and identify resources that may help raise knowledge and understanding on the airport campus and its operating environment.

The intended audiences for this synthesis are airport operators who seek information on successful peer practices or knowing where to find current, comprehensive safety and security training resources for new maintenance hires. Both GA airports and small commercial service airports can benefit from the information provided as they oftentimes face the same manpower and training issues.

Stephen M. Quilty, SMQ Airport Services, Lutz, Florida, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

HELPING NEW MAINTENANCE HIRES ADAPT TO THE AIRPORT OPERATING ENVIRONMENT

SUMMARY

This synthesis identifies current training practices for newly hired airport maintenance personnel, primarily at general aviation (GA) airports; documents many of the core training elements and resources used at those airports; and identifies methods to assist new maintenance personnel in comprehending the airport campus and its operating environment.

The specific objectives of this synthesis were: (1) to locate, document, and assemble information on the training of new airport maintenance employees; (2) to identify current challenges and practices used at airports, particularly at GA airports; (3) to document core training elements and resources for newly hired maintenance personnel; and (4) to identify resources that may help increase the knowledge and understanding of the new maintenance hires about the airport campus and its operating environment.

The intended audience for this synthesis is airport operators at GA airports who seek information on successful peer practices or direction to current comprehensive safety and security training resources for new maintenance employees. Although the synthesis target is GA airports, small commercial service airports can also benefit from the information provided, as they often face the same manpower and training issues as the GA airports.

Information for this report was obtained through a survey of 30 GA airports throughout the United States. For comparison purposes, 10 additional air carrier airports were also surveyed. The overall response rate to the survey was 80%.

Websites associated with air transportation, airlines, aviation safety, and airport ground handling services were also reviewed. Several aviation chat sites and airport conferences were visited in search of information and participation related to the subject matter. Lastly, queries were made to airport consulting firms, airport training individuals or organizations, airport trade committees, and other professional individuals who might have insight into the subject matter.

The literature search generated little in the way of academic research or other reports that specifically address the training challenges of new airport maintenance hires. This report therefore brings new data and findings to the subject. Although training material was found that would assist airport operators, most of the resources address either the requirements necessary under Part 139 airport certification or for training pilots to operate on an airport. The responses from survey participants indicate that GA airport managers often have to integrate material from several sources to meet their needs. They desire more off-the-shelf solutions that are cost-effective, or better yet, free. Sample training outlines and sources for training material are provided in the appendices.

Several major challenges and issues that airport managers face as they attempt to integrate newly hired maintenance personnel into their organizations are identified in the report. This study found that at GA airports, the responsibility for training often falls on the shoulders of the airport manager or supervisor, who may not have the requisite training background or the instructional tools and material to train new hires effectively and efficiently. The study

concluded that the lack of instructional resources and skilled instructors, along with reduced staffing and budgets, variable workforce quality, difficulty in trainee scheduling, and trainer time constraints, all make it difficult properly to prepare a new maintenance employee for operating safely on the airfield.

The size of the organizations at the GA airports in the survey ranged from three to 70 employees; the majority had fewer than 15. Those airports with a greater number of employees generally provided additional services on the airport, such as aircraft fueling or aircraft rescue and firefighting. The number of employees with access to the airfield ranged from two to 19, suggesting that airports tried to limit the exposure to safety and hazards on the airfield, but also perhaps attempted to limit the amount of training managers needed to perform. For the period from January 2011 to August 2012, the 30 GA airports in the study hired, on the average, less than one new maintenance person each. Those airports, according to the study, provided an average of 52.6 hours of training to new hires, but a number of airports provided less than one day of orientation training. Most managers were found to be satisfied with the level of new maintenance employee training, in part because it is so infrequent.

The responsibility for developing, conducting, and ensuring proper integration of a new employee into the organization was found to be trying for the manager. Eighteen of the smaller GA airport organizations had fewer than 15 employees. At those 18 airports, the airport manager or supervisor is the person primarily responsible for training any new maintenance hire. The ability of the managers or supervisors to provide such instruction competently was not assessed in this study, but the issue was identified as a concern for properly adapting new hires to the airport environment.

It was found in the study that most new maintenance hires access the airfield for the following reasons: electrical repair, pavement maintenance, emergency response, mowing, and infrastructure repair. These new hires may either be airport employees or individuals from public works department, fixed base operators, tenant organizations, FAA, or outside tradesmen, contractors, or laborers.

Airports certified under Part 139 are required to provide new employees with a minimum amount of training on certain topics. Given those regulatory requirements, the GA airports in the study provided, on average, 52.6 hours of new-hire training. That average includes the non-certified GA airports, where most new employees were given less than one day of orientation. The time spent on training tenant and contractor employees was even shorter. The survey found the amount of time the airport managers would like to expend on new maintenance hires averaged 56 hours of training. On-the-job training was the predominate method of training newly hired maintenance employees.

It was not feasible to produce a definitive outline of essential training topics in this report, because of the wide variation in airport sizes, operations, geographic and weather conditions, and local requirements. However, there was full agreement on four specific topic areas: ground vehicle operation; foreign object debris inspection; pavement maintenance and inspection; and lighting, signs, and markings. (Increasing airport safety would dictate additional topics.) This report provides a list of additional topics and their relative importance, as gleaned from survey respondents. It was found in the survey that while many GA airports indicated they had a training program in place, the program was not well-defined or organized for consistent delivery. This could lead to inadequate or incomplete training of the new hire and increase the safety risk and hazard exposures to the employee or contractor/tenant accessing the airport. This report lists a number of safety hazards and risks that a new maintenance employee or tenant/contractor might encounter on the airport, or that he/she might pose to others.

Education and training organizations worldwide generally advocate a number of steps for a successful new hire adaptation process, such as developing an orientation training program;

ensuring proper funding of any needed training; conducting the training long enough to ensure understanding and comprehension; following up the instruction with on-the-job practical training and assessment; documenting the training that occurs; and promoting and providing a philosophy of lifelong learning. However, the practical implementation often is not so simple. Adapting new maintenance hires to the airport environment in a safe and efficient manner is a challenge at large air carrier airports, but even more so at small GA airports.

It is concluded from the survey data, interviews, and literature review that GA airports lack applicable up-to-date, comprehensive training materials, videos, or computer presentations that are economically feasible to obtain or receive. Survey responses indicate that it would be beneficial to have both new hire and recurrent training material organized and developed specifically for GA airports; material that is current and functional; and that requires little or no expense. Based further on the findings and conclusions, it can be surmised that airport managers could benefit from learning instructional development skills as part of their career progression, and from receiving more support and resources from larger organization or governing bodies in helping new maintenance employees to comprehend and adapt to the airport operating environment.

CHAPTER ONE

INTRODUCTION

BACKGROUND

Airport managers, particularly at general aviation (GA) airports, often have to hire maintenance personnel who are unfamiliar with the operating environment of an airport. Ensuring that employees are trained to operate safely on the airport is critical to safe operations. Yet many GA airports, and even air carrier airports, have difficulty attracting individuals with knowledge of airport maintenance and operational practices. They also may lack the resources to adequately prepare any new employees they do hire. The question raised by this situation is, "How does one properly instruct and prepare a new employee to operate safely on the airfield when he/she may have little or no prior knowledge of airport operations?"

As directed by the synthesis panel members, this study focused on GA airports, rather than on larger commercial airports, primarily because previous synthesis studies had compiled similar data on the larger airports and it was perceived that little information existed on GA airports. GA airports also are the most common type of airport in the nation.

According to the *2013–2107 National Plan of Integrated Airport Systems* (NPIAS), which is a plan identifying those airports eligible to receive airport development funding, there are 2,560 general aviation and 269 reliever airports that provide their communities with access to the national air transportation system (NPIAS 2013–2017, 2012). Collectively, GA airports make up 84% of the total airports in the United States and account for 28% of the total development needs reported in the NPIAS. There are approximately 1,800 additional GA airports that are not included in the NPIAS but that are open to the public. Also not included in the NPIAS are more than 14,000 GA airports that are operated privately and that are not open to the public.

Though this synthesis can be helpful to both GA and commercial service air carrier airports, the air carrier airports have requirements under *Title 14 Code of Federal Regulation* (*CFR*) *Part 139* (*Airport Certification* 2004) to train individuals having access to the airfield. General aviation airports do not have such a requirement, nor may they have the resources and capabilities of the larger airport to assimilate the new maintenance hire. The survey did include seven GA airports that were certified under Part 139. Further, 12 of the GA airports had full-time air traffic control facilities, 15 had part-time facilities, and three were non-towered airports. If an airport receives federal assistance for an airfield construction project, it will be required to develop a safety plan and provide requisite training to all involved with the project, whether the airport is certified or not.

"New maintenance hires" refers to those individuals newly employed to work at an airport to provide a variety of maintenance services, both on the airfield and to the surrounding buildings and infrastructure. The term is not restricted to employees of an airport organization, as GA airports will often utilize the services of employees from other municipal departments, such as public works; or contract out the maintenance services to private individuals or firms. The term is meant to include these individuals and non-airport employees who are engaged, assigned, or contracted to provide similar maintenance activities on the airfield.

The principal function of a newly-hired airfield maintenance employee is to perform work associated with the construction, repair, and maintenance of the airport's runways, taxiways, and ramps where aircraft operate, as well as the airport's buildings, grounds, and other facilities. These areas are what can be construed as the "airport environment." The synthesis panel narrowed the area of study to the airside of the airport; that is, the area generally inside the perimeter fence, including the movement and non-movement areas. Access to these areas and operations exposes the employee and those operating on the airport to a number of known and unknown hazards.

Movement areas are the runways, taxiways, and other areas of an airport that are used for taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas (*Airport Certification* 2004). A movement area normally meets FAA or state design criteria for safe operations. At airports with an air traffic control tower (ATCT), the movement area is generally under the control of that facility. A non-movement area includes those areas not under the control of an ATCT facility, usually the loading ramps and aircraft parking areas; but it also covers those areas where design standards may not be met, such as a taxiway in close proximity to a building or where airport vehicles routinely operate. In a non-movement area, both aircraft and vehicle operators have responsibility for greater safety awareness.

Safety areas are defined surface areas comprised of either a runway or taxiway and the surrounding surfaces that are

prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, excursion from a runway, or the unintentional departure from a taxiway (*Airport Certification* 2004). It is in the movement, nonmovement, and safety areas of an airport that the FAA and airports seek to minimize the mingling of aircraft, vehicles, and persons for safety reasons. Part 139-certified airports are required to provide oversight of those persons having access to movement and safety areas of their airports. This does not hold for GA airports unless they are also certified under Part 139, or unless they are undertaking a construction project that requires airfield safety training.

The distinction between commercial airports serving scheduled air carrier (airline) operations and GA airports serving nonscheduled (charter) operations is important from the standpoint of the required level of airfield operator training required. Title 14 CFR Part 139 (2004) applies to airports served by air carrier operations with aircraft of more than 10 seats. By definition, GA airports are not air carrier airports. A GA airport is defined as a public or private airport that does not have scheduled air carrier service; or that has scheduled service of fewer than 2,500 paying passenger boardings each year (*FAA Order 5100-38C* 2005). Those paying passenger boardings at GA airports that do occur are a result of nonscheduled charter operations conducted in aircraft having fewer than 10 seats.

General aviation airports, especially those identified as reliever airports, often have infrastructure and facilities that can accommodate large aircraft. A reliever airport is a GA airport in a metropolitan area that provides pilots with alternatives to using a congested commercial service airport, or that provides GA access to the surrounding area served by a larger commercial airport (*General Aviation Airports: A National Asset* 2012). The alternative community access helps "relieve" the pressure on the busier main airport from having to accommodate general aviation activity. Reliever activity often includes larger turbine powered aircraft that would obligate the GA airport to meet Part 139 requirements. Of the 30 GA airports cited in the study, 23 held reliever status and seven are certified.

For maintenance personnel, the airport environment goes beyond the paved surfaces of the movement and non-movement areas to include the open and unimproved areas that comprise airport property. The land area encompassed by the airport perimeter fence or property lines is often referred to as the airport operations area (AOA). The term AOA is actually a security term defined under Title 49 CFR Part 1540 TSA General Rules. However, the term AOA is commonly used within the airport industry to refer to the area inside an airport's perimeter fence, which includes the movement areas, nonmovement areas, safety areas, and the adjacent land. Activities such as mowing, agriculture, herding, servicing of utility lines, mineral operation, and wildlife mitigation can all have an impact on aircraft operations, and therefore merit consideration in the training of maintenance personnel.

This synthesis describes some of the challenges airport agencies face when integrating new maintenance hires into their ranks. One main challenge is finding the time and resources to devote to helping those individuals adjust to what is generally an unfamiliar environment full of safety risks and hazards.

TYPICAL RISK AND HAZARD EXPOSURES

The safety of airport operations is of primary concern to the FAA, airport governing bodies, and airport and aircraft operators, as well as to the maintenance person themselves. All maintenance personnel are exposed to hazardous risks when operating on the airfield. They can also pose a risk to others, primarily pilots operating on the airport. Numerous hazards and safety restrictions exist on airports that are generally not known or understood by individuals unless they are specifically trained or educated in those areas. A maintenance employee's awareness of and diligent attention to these risk factors are prime defenses in reducing the possibility of accidents and incidents on airports. For this reason, providing new maintenance personnel with proper training includes understanding and awareness of the hazards they may encounter or that they might present on the airport.

A hazard is defined as any real or potential condition, circumstance, or event that can potentially cause injury, illness, or death; damage to or loss of a system, equipment, or property; or damage to the environment (*AFI 13-213: Airfield Driving* 2012).

Of major concern to the FAA is the hazard associated with a runway incursion impinging on aircraft operations. A runway incursion (RI) is defined as any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft (*FAA Guide to Ground Vehicle Operations* 2012). One type of RI is vehicle/pedestrian deviations (V/PD), which occur when a vehicle or pedestrian deviates from an ATCT communication. Annually, V/PDs account for approximately 20% of total runway incursions at U.S. airports (*FAA Guide to Ground Vehicle Operations* 2012).

Reducing RIs and V/PDs is a major safety initiative for the FAA and all involved in aviation. Both pose a significant risk for personal injury or property damage on an airport. Recently, the FAA noted a slow but steady increase in the numbers of RIs and V/PDs during the second and third quarters of fiscal year 2012 (*Certalert* 12-06). A certalert is a communication bulletin from the FAA Airport Division that informs airport operators of various safety practices, initiatives, or clarifications. The prevention of RIs and V/PDs is one of the main reasons for training new maintenance hires.

The statistics on RIs and V/PDs come from airports that have an ATCT. A majority of the nearly 4,600 GA airports

open to the public do not have an ATCT. In a 2012 study, the FAA calculated that less than 9%, or approximately 256 GA airports of the 2,952 GA airports studied, had operating control towers (*General Aviation Airports: A National Asset* 2012). For this synthesis study, the participating airports represent a greater ratio of towered facilities than the 9% ratio in the *ASSET Report.* Twenty-seven of the 30 participating GA airports had ATCT operations (12 full-time, 15 part-time). Adequate data are not collected, reported, or compiled on how many potential incidents have occurred at non-towered GA airports as a result of maintenance personnel not being adequately trained. Given the total number of GA airports in the United States that do not have an available ATCT to record RI or V/PD incidents, the risk factor for such incidents remains.

Among the hazards that maintenance persons could present when accessing the airport are attracting or disturbing wildlife, creating ruts in the safety areas, obstructing fields of vision, disturbing navigational signals, and impinging on aircraft operations.

Additional hazards a maintenance person might present include:

- Damaging aircraft by introducing foreign object debris (FOD) onto the airport through carelessness, inadequate maintenance, or insufficient inspection;
- Causing an aircraft diversion by recklessly driving on runways, taxiways or aprons; by not properly scanning for other aircraft or vehicles; or by not properly communicating on the radio;
- Causing pilot or air traffic control confusion as a result of not using proper radio communication;
- Creating a hazardous condition by not performing job tasks properly, such as cutting the grass, plowing the runway, repairing the pavement, or fixing lights, signs, or markings;
- Creating a hazardous situation by not properly following rules, regulations, policies, procedures, or by cutting corners in work activity;
- Creating a hazardous situation by the improper use of tools and equipment;
- Creating a hazardous situation by interrupting or damaging an aircraft navigation instrument, such as visual approach slope indicators (VASI) or electronic localizers and glideslopes, that guide aircraft in for landings;
- Creating a security or public exposure threat by leaving gates and other access open or unlocked;
- Causing environmental damage through disregard or improper work activity;
- Creating a wildlife hazard by improper workplace activity or by not properly carrying out wildlife mitigation;
- Not properly performing duties by omitting steps or checklist items; misdiagnosing problems; conducting inadequate inspections; and using poor work techniques;
- Compromising aircraft and air traffic control operation by not recognizing and reporting unsafe conditions.

Preventing injury to maintenance personnel is another primary objective of training. The safety of airport operations can be enhanced by making new maintenance personnel knowledgeable about hazards and how unsafe acts, such as not using proper personal protective equipment, errors, deviations from procedures, and rule violations can affect their safety and the safety of others.

Several of the common hazards that maintenance personnel can be exposed to on the airfield include:

- Electrical hazards associated with constant current electrical lighting of signs and lights
- Propeller or jet blast exposure
- Exposure to inclement weather, including lightning, ice and snow, and temperature extremes
- Exposure to hazardous materials
- Work conditions such as long hours or inadequate resources causing fatigue and/or stress
- High levels of noise from equipment and aircraft
- Erroneous communications from others
- Unsafe aircraft or vehicle operations by others
- Exposure to OSHA-identified hazards, including slip and fall factors, ladders, machines, and chemicals.

In these economic (and litigious) times, when a typical single engine piston aircraft costs $140,000, a multi-engine piston aircraft $450,000, a turboprop aircraft $1.8 million, a small corporate jet averages $6.5 million, a large corporate jet $18.5 million, and a typical small air carrier twin engine aircraft $74 million, the liability exposure resulting from inadequate maintenance personnel training can have a significant impact on an airport's financial bottom line were an accident to occur, not even accounting for personal injuries.

LITERATURE REVIEW

Information was sought on literature related to new hire or orientation training programs for airport maintenance workers. A basic Internet literature search was conducted primarily using Internet search engines Google Scholar, Lexus-Nexus, and the Transportation Research International Documentation (TRID) database. Included in the search of federal databases were FAA, TRB, and the U.S. Air Force.

A search was also made of airport and aviation trade association websites, such as the Airport Council International-North America, AAAE and its regional chapters, International Air Transportation Association, International Civil Aviation Organization, National Air Transportation Association, NASAO, and a number of individual state bureaus or departments of aviation. Websites associated with air transportation, airlines, aviation safety, and airport ground handling services were accessed, as were aviation chat sites and airport conferences. In addition, airport consulting firms, airport training individuals and organizations, airport trade committees, and

other professional individuals who would have insight into the subject matter were invited to contribute.

The result of the literature search generated little in the way of academic research or other information that addresses the training challenges associated with airport maintenance new hires. Operations employees often have responsibility for overseeing and carrying out the requirements of Part 139 airport certification; and what literature did exist on airport new hire training focused on operations personnel at air carrier airports. However, the related information on operations training does have a bearing on maintenance training, because at GA airports, the role of maintenance often includes the operations function found at larger airports. For instance, one article highlighted the efforts of the Detroit Metropolitan–Wayne County Airport to develop a three-week orientation program for operations employees that was then extended to others, including maintenance new hires (Bremer 1992).

One study explored the expected knowledge level and skills of entry-level operations employees at air carrier airports (Quilty 2005a). That study suggested that some of the skills sought by airport managers for their operations employees can be applied to new maintenance employee training programs. For instance, airport managers identified such desirable skills as the ability to: (1) communicate well with others, (2) be able to identify what is or is not a hazard to safety, (3) interact well with contractors and engineering firms, and (4) plan and organize daily activities and information.

A later study looked into the knowledge requirements for entry-level operations personnel (Quilty 2005b). The top 10 topics in that study can be compared with findings in this study. The author suggested that educational institutions could better prepare students for the airport career field by identifying topics to be covered in an educational curriculum. This same information can be used for preparing maintenance personnel as well.

A number of ACRP studies support data found in the Quilty studies. *ACRP Synthesis 27: Airport Self-inspection Practices* (Prather 2011) reviewed the training of personnel who conduct airfield inspections at Part 139-certified airports. Although the focus of *Synthesis 27* is on operations personnel, the training can be applied to maintenance personnel as well. The author emphasized that any training for new hires on an airport needs to be student-centered, meaning that the training focus should not just be on the subject matter, but on the learning outcome, or what the new hire should be able to do in the course of his or her job (Prather 2011, p.15). *Synthesis 27* explored various training and instructional methods and the benefits and drawbacks of each; consequently, this current synthesis report did not delve into the same information, but rather sought only to identify the type of instruction used in maintenance training. Comparisons to the *Synthesis 27* study are made in later sections of this study.

ACRP Synthesis 15, Identification of the Requirements and Training to Obtain Driving Privileges on Airfields studied driver access to movement areas for general aviation airports (Castellano 2009). Although this study entailed a review of Part 139 airports of all sizes, the author did include separate data on 12 GA airports. That data can be used for comparison and validation of this report's data.

Additional literature review found *Air Force Instruction 13-213, Airfield Driving* (2012) published by the Air Force Flight Standards Agency. It contains information on airfield driver training programs that can serve as a checklist and model for new hire maintenance orientation at both air carrier and GA airports. Additional training outlines were acquired from several participating survey airports, and are included as appendices to this report.

A number of FAA documents include important information that can be used in the training of maintenance new hires, including online videos, brochures, advisory circulars, and related training material from the Office of the Associate Administrator for Airports and its regional offices websites. In particular, *Advisory Circular 150/5210-20, Ground Vehicle Operations on Airports* (2008) provides guidance for development of a training program associated with driving on the airfield.

However, most existing information focuses on the regulated activities at FAA Part 139-certified airports. This synthesis report focuses on GA airports that are not Part 139 certified and are represented in *General Aviation Airports: A National Asset* (2012). Gathering information on the new maintenance hire practices at GA airports required the use of a survey questionnaire and interviews.

SURVEY METHODOLOGY

Seeking information for this synthesis study required the identification of airports that had orientation and new hire training procedures in place for maintenance personnel. Whereas initial inquiries determined that many GA airports were unlikely to have established maintenance training protocols, a decision was made to include several larger Part 139-certified airports for comparison and resource purposes. Obtaining training information from certified airports can assist smaller airports with identifying possible resources, which is a goal of the synthesis.

Both quantitative and qualitative means were used to collect data. Data was sought primarily from airports identified as having existing maintenance orientation and training programs in place, including larger Part 139 airports. However, airports without training programs in place were also surveyed to identify the challenges and issues they face. Several state agencies that oversee GA airports were queried about how they handle job vacancies, hiring, and training. Those

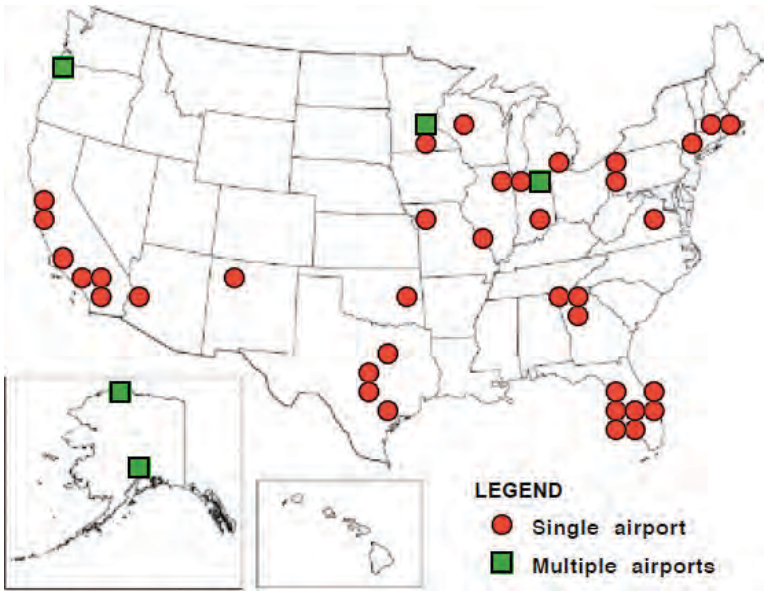

FIGURE 1 General location of survey and interview airports (*Source:* Survey data).

interviews are highlighted in later sections. Other agencies, such as military airports and professional airport associations, contributed to the report as well.

The survey developed with the help of the project panel members sought to identify the current practices and processes used by airports in the training of their maintenance personnel (see Appendix A). It was pretested with a sample from three airports and further refined before being disseminated. The survey was designed to capture the following basic information:

- Airport size, as defined by operations and based aircraft
- Size of staff and maintenance responsibilities
- Topics of new maintenance hire training
- Delivery methods for training
- Who conducts training and how is it documented
- Additional training issues such as budgets and existing needs
- Challenges and lessons learned
- Budget allocation for training.

Using the FAA's Air Traffic Activity Data System (ATADS) for the calendar year 2011 (ATADS 2012), a list of the top 100 airports as ranked by the number of air traffic operations was reviewed. From the ATADS list, 40 GA airports were identified for the study and were forwarded the survey (Appendix A). An additional 10 air carrier airports were solicited as well. Thirty of the GA airport organizations and 10 of the air carrier airports responded, resulting in a total response rate of 80%. More than 40 airports are actually represented in the response, however, as several of the responding agencies operate multiple airports. See Figure 1 for the general location of the airports that responded. Appendix B contains a more specific listing of the participating airports.

To help supplement the formal survey, several state aviation bureaus or departments were contacted and interviewed in an open format. Case information on those findings is presented in related sections of this synthesis.

REPORT ORGANIZATION

This synthesis report is organized into eight chapters, with additional sections for the references, acronyms, and appendices. Within the report, references are made to the survey questions by use of a noted letter Q and a corresponding survey question number (i.e., Q1, Q2, Q3 . . .).

Chapter one provides an introduction and describes the purpose of the synthesis, the literature review and study methodology, and the survey instruments used. The term "new maintenance hires" is described and the context in which it is used is explained. The context includes distinguishing between general aviation airports and those that are certified under 14 CFR Part 139; the emphasis on preventing runway incursions or vehicle/pedestrian deviations; and a description of hazards and risks airport maintenance employees may face on the job.

Chapter two describes the challenges facing GA airports when they hire new maintenance personnel or contract with individuals to work on the airfield. The chapter frames the

fundamental issues that will be supported and explained in later chapters.

Chapter three describes the operating environment of a GA airport organization and its staffing levels. It provides survey data on reasons individuals access the airfield and on the impact of an airport's budget on the training of new employees.

Chapter four provides survey data on the types or areas of training included in a new-hire training manual or checklist, and an observed disparity between what is desired and what actually exists. Included in this chapter is the status of training assessment within the GA airports surveyed.

Chapter five covers survey data on practices, procedures, methods, and techniques. It builds on the previous chapter by cataloguing the types and methods of training provided to new hires, along with how that training is documented.

Chapter six lists several of the resources that are available for airports to use in developing training checklists, instructional lessons, or manuals.

Chapter seven provides comments from survey respondents on what lessons might be learned from their experiences in the past on training new maintenance hires at their airport.

Chapter eight presents conclusions drawn from the study.

Appendices provide supplemental material, especially several training outlines, that may be of value to airport operators.

CHAPTER TWO

TRAINING CHALLENGES

Many of the roughly 4,600 GA airports open to the public are located in areas of the country where the local workforce is not educated in the operation of airports. In hiring maintenance workers from the local communities, airport operators are charged with helping the new employee adapt to a new and sometimes bewildering environment.

This chapter highlights several of the major challenges and issues that face airport managers as they attempt to integrate newly-hired maintenance personnel into their organizations, chief among them the lack of instructional resources and skilled instructors, reduced workforces and budgets, variable workforce quality, and time constraints on the trainers. As one survey respondent wrote, "City budget = no training & no travel."

The problems associated with the training of new maintenance hires at airports are illustrated by several quotes from airport operators participating in the study:

> My maintenance personnel are also the airport operations staff. They are first and foremost maintenance people and when new they are unfamiliar with airports or airfield safety. I am tasked with teaching them about airports and [. . .] how to stay safe when in the air operations area. I do this by taking 1 or 2 topics at a time, like proper radio communications. I have to make up material, teach them the material, practice it, and then test them to make sure they absorbed the information (although not required). It would be great to have a box-set of DVD's to pop in with associated modules to help me accomplish training (although it would have to be inexpensive).
>
> I have one maintenance employee who handles the airfield. He has been here eight years. He'll be here for another 17–20 years. I really don't have a maintenance training program. He's gained the knowledge over the years.
>
> The general education level of applicants—these are not high paying jobs, consequently, they do not draw the sharpest candidates.

Even at large air carrier airports, there are challenges as stated by one of the respondents:

> Some of our biggest challenges include finding opportunities to train with the limited staff and the need to continue regular operations, keeping motivation high for a continuous learning atmosphere, enforcing and ensuring that all contractors are trained and meet our expectations of safety on the airfield, and providing effective methods and tailoring them to staff (many of our maintenance staff are not suited for reading a 50-page document and learning through reading alone). Many are visual learners and need the learning document broken down into bullet points or a short Power Point presentation, or even the use of real-life examples to understand better. We utilize our own Supervisors to help differentiate instruction amongst staff—yes, they are both Supervisors and teachers. We also see a challenge with keeping material interesting and maintaining the motivation to learn. As such, we utilize front-line personnel to help conduct the training. They use real-life situations and examples to help get points across and improve retention.

Airports that are Part 139-certified are required under Section 139.303 to provide certain training to personnel having access to the movement areas of the airport, as well as to those engaged in aircraft rescue and firefighting (ARFF) duties. At one GA airport, the maintenance personnel were cross-trained in ARFF. This requirement poses a significant challenge, as any new maintenance employee would need to undergo extensive training to qualify as an ARFF responder. At the opposite extreme, one non-hub airport operated by a municipality depends on structural firefighters from the city. Because of departmental policies, the approximately 100 structural firefighters rotated between stations within the city and at any specific time could respond to the airport. In this case, all 100 firefighters required training on airport operations. Hiring a new firefighter would require training him/her in airport operations as well, placing a strain on training capability.

Direct quotes from several of the survey respondents underscore the degree to which budget and staffing impacts the training of new maintenance hires. An open-ended survey question (Q38) asked what challenges, other than budget, managers face in providing training to their new hires or non-airport employees. The responses were simple and mostly focused on the availability of time for training or the inadequate staffing levels:

- Allocating staff time
- Timing of training and employee absence during training
- Time constraints
- Insufficient or untrained staff to cover for employees who are away
- No system or no staff with training experience
- Time, evaluation and selection of training materials, competent trainers
- Time to perform training the way you would want the employee to learn. Hands-on training can be an issue owing to time constraints.
- Really just freeing up the schedules of those members of staff qualified to give training
- No extra person to be a designated training professional
- Time to have instruction given by existing employee/ride-alongs
- Time to give to training from qualified individual

- Time and qualified instructors
- Time to devote to training and oversight of initial time in field
- WORKLOADS
- Time
- Availability of staff to do the training
- Language/time/training
- Scheduling.

One airport manager in particular summarized it bluntly:

> In my past 20-plus years of airport management at general aviation airports in the western U.S.A., the practice of legacy training for any staffers has evaporated. This is very unfortunate and has in part contributed to a dumbing-down of much of the available pool of work force. It has also enhanced an environment where mistakes are more common than they should be. Local political expediency builds on this trend, contributing to employees moving from job to job and problems multiplying in scope and size. This doesn't benefit the industry or local system.

Another airport manager offered his perspective as a solution. This manager believed in having one person conduct all the training as part of his/her supervisory job duties. However, the respondent identifies a drawback to relying on one individual, as often is the case in small organizations:

> I believe in the concept of unity of command, which dictates an employee report to only one supervisor. I believe this is especially true when it comes to training, especially when training relates to the regulatory perspective of airports. I have found that having more than one person involved in the training process often leads to conflicting perspectives. Although actual job duties (i.e., vehicle operations, snow removal procedures, etc.) can be efficiently and effectively performed in different manners, I believe it is beneficial to the organization, and the new hire individual, to learn the operation from a single source and eventually work out their own method of performing the task rather than having multiple sources of instruction providing various pieces of information. The only issue we have with the unity of command concept is that we only have 1 dedicated training coordinator. If this individual is on vacation or out sick, then at times we have to side step the unity of command philosophy rather than having the new individual sit idle waiting for the training coordinator's return.

This airport has an organization that allows for a person to take on the role of training coordinator. As will be pointed out in a later section, much of the training at small GA airports rests with an airport manager who either is not prepared to conduct training or who has little time to do so. The state of Alaska faces some unique challenges as illustrated by the case example.

CASE EXAMPLE 1: The Alaskan Challenge

The Alaska Department of Transportation & Public Facilities (DOT&PF) owns 253 rural airports in the State of Alaska. A rural airport in this case is any airport other than the Ted Stevens Anchorage International Airport and the Fairbanks International Airport. There are a number of other commercial service airports that are operated by municipalities or special districts, such as Juneau and Ketchikan, but for general aviation access outside of those main cities, it is a rural airport that supports the community. They are indeed the lifeblood of the community, because 82% of Alaskan communities have no road access. This creates a number of challenges for the Division of Statewide Aviation, the organization that is responsible for the development, construction, operation, and management of those rural public airports.

Divided into three regions—Southeast, Central, and Northern—the Central and Northern regions are where most of the rural airports are located. Often they are not much more than gravel strips, but they must be maintained because they are the primary means of transportation access and survival for the community. Several of the larger communities in the various regions are certified under 14 CFR Part 139 and must be maintained to those standards.

So, where do state officials acquire individuals with knowledge of airport maintenance and operations in such remote areas? For the most part, they don't. As one individual pointed out in an interview, "We find it easier to hire highway road graders and make them airport managers than to try to recruit aviation managers." There is a protocol the regional managers go through to post and advertise airport positions, but more often than not, the position is opened to the rural community for applicants. The local communities do not have the resources to maintain the local roads, much less the airports, so the state takes on the responsibilities instead. Because a rural GA airport doesn't have high levels of activity compared to the local roads, maintenance workers are hired primarily as road graders first, then are given additional duties to maintain the airport. Most maintenance workers assigned to the airport have no previous knowledge of airport standards, design, maintenance, or operations.

The Division of Aviation tries to overcome these hurdles primarily through on-the-job training conducted by the regional managers, who spend several days with the new hires to prepare them. It also holds training sessions several times a year, usually in Anchorage, bringing in outside training providers to teach the courses. The agency also sends employees from the outlying airports to the training sessions to learn about operations and maintenance at a cost that includes registration, air travel, food, and lodging. Because of reduced staffing at the rural airports, the travel absence of the employees has to be scheduled for noncritical times. The state does contract with an outside training provider to deliver a variety of subject matter over the web, but the remoteness of some of the airports make Internet connections unreliable, and the topics often do not address the conditions found at rural airports in Alaska. Lately, the Division has been working to develop its own training material in DVD format for distribution to the rural airports in order to better address and prepare new employees and local supervisors.

CHAPTER THREE

OPERATING ENVIRONMENT

In synthesizing the results of the survey used in this report, it is important to understand the operating environment of GA airports and the influence various factors may have on their operation. This illuminates the ability of airport organizations to adapt new maintenance personnel to each particular airport. Given the wide diversity of general aviation purposes and use, GA airport organizations are affected by such factors as size, number and types of operations, type of governing bodies, geographic location, and budget allocations, among others. This chapter provides a synopsis of those factors and describes several of the reasons maintenance personnel might access the airfield and therefore require training.

ORGANIZATIONAL CHARACTERISTICS

The general characteristics of the airports surveyed are shown in Table 1. The basic stratification is that of 30 general aviation and 10 air carrier airports. The first survey question asked for the airport NPIAS type classification (Q1).

The second survey question asked whether an FAA ATCT existed on the airport (Q2). The responses show that many GA airports do not have operating FAA control towers, which can help prevent accidents and record data related to RIs or VP/Ds (Table 1). Even so, for those airports that do have an operating control tower, accidents and incidents attributable to a lack of employee training or understanding still occur (*FAA Annual Runway Safety Report* 2010). Without an ATCT, any employee accessing the airfield is denied a safety component otherwise provided by tower personnel. There is also increased risk exposure to maintenance personnel from pilots and aircraft that may not follow safety protocols, such as not using a particular runway or not using proper radio technique. The converse holds true for maintenance personnel who are not familiar with the same proper protocols.

Information culled from the FAA airport master records (known as Form 5010) determined an airport's level of certification under 14 CFR Part 139. If choosing to accommodate larger aircraft operations having more than 30 seats, the airport must obtain an operating certificate under Part 139. In this study, five of the GA airports in the survey have chosen to hold Class IV-A airport operating certificates while another two hold Class 1-A certificates.

A Class IV-A airport is certified to serve unscheduled passenger operations of large air carrier aircraft not exceeding 90 feet in length. A Class 1-A airport serves scheduled operations of large air carrier aircraft and can also serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft, neither exceeding 90 feet in length, The remaining 23 GA airports were not certified under Part 139 and cannot serve scheduled or unscheduled air carrier operations. This has implications for the kind of risk and hazard exposures new maintenance employees may face and what training needs to be performed.

Management oversight of operations at the GA airports in the survey is shown in Table 2. Different governmental structures can have an impact on decisions such as budget and resource allocation, hiring practices, and the implementation of rules and regulations. No one type of governmental operation is immune from the challenges associated with hiring new maintenance employees. To the survey question concerning the ownership of the airport (Q6), three of the GA airports and one of the non-hubs responded that they engaged third-party operators, rather than being operated by the owner of the airport.

Responses to the survey question (Q3) regarding the number of operations at the GA airports varied from 15,000 to 202,251 per year (Figure 2). An operation is counted when an aircraft either lands or takes off at an airport. Both the number of based aircraft and the number of operations give an indication of how busy the airport might be. For the scheduled air carrier airports, the operations ranged from 29,000 to 448,861 operations, with the average being 163,254 and the median at 144,109 operations. The median represents the middle point of the range of data presented. Knowing the median helps to place perspective on the calculated average in the event one airport's data biases the total average. An example of such a bias would be two or three well-funded airports that have their own maintenance departments being compared to other GA airports of similar size and with similar numbers of operations that rely on the public works department to perform airport maintenance.

Based on question Q4 in the survey as shown in Figure 3, the diversity of general aviation activity can be observed in

TABLE 1
CHARACTERISTICS OF SURVEYED GENERAL AVIATION AIRPORTS

NPIAS Category	General Aviation	Air Carrier
General Aviation	7	—
Reliever	23	—
Non Hub	—	6
Medium	—	2
Large	—	2
14 CFR PART 139 (1)		
None	23	—
Class I	2	10
Class IV	5	—
ATCT		
None	3	—
Part-time	15	5
Full-time	12	5

Source: Survey Q1 and Q2.
Source: FAA Form 5010.
— = not applicable.

the wide range of based aircraft and operations. The number of aircraft based at the 30 GA airports varied from 33 to 588. The larger air carrier airports reported a smaller range of eight to 155 based aircraft, with the median being 105 aircraft and the average being 106 aircraft.

MAINTENANCE PERSONNEL ACCESSING THE AIRFIELD

The number of employees at the GA airports surveyed (Q12) ranged from three to 70 (Figure 4), whereas the air carrier airports ranged from five to 600 total employees. The number of maintenance workers having access to the airfield at GA airports, as determined from the survey (Q13), ranged from two to 19 (Figure 5), while the air carrier airports reported a range of two to 156 employees.

Based on the survey responses, the average percentage of maintenance workers to total airport organization employees

TABLE 2
TYPE OF GOVERNING BODY FOR SURVEYED AIRPORTS

Governing Body	General Aviation	Air Carrier
Authority	11	4
City	12	4
County	6	2
State	1	0

Source: Survey Q5.

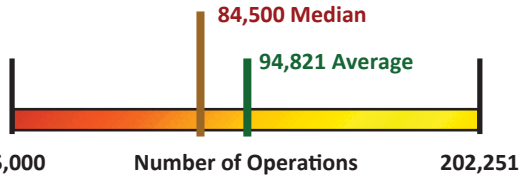

FIGURE 2 Continuum for the range and numbers of annual operations conducted at the 30 general aviation airports, *n* = 30. (*Source:* Survey Q3).

for GA airports is 50.1%, or a one to one ratio. The percentage range of maintenance employees among total employees for the GA airports ranged from a low of 15.7% (11 of 70 employees) to a high of 100% (eight of eight employees). For the air carrier airports, the total average percentage of maintenance employees among total employees was a more modest 35.0%, or roughly a one-to-two ratio.

The variability in organization size and maintenance staffing ratios can mostly be explained by the fact that the airports with larger number of employees either provide fueling services to aircraft, or the airport experiences winter operations, or both. Absent those two components, general aviation airports tended to employ fewer than 15 people (18 of the GA airports did so). The average percentage of maintenance employees among total employees for those 18 airports was 62.3%, or roughly a two-to-one ratio.

For the period from January 2011 to August 2012, the 30 GA airports averaged fewer than one maintenance hire each, as reported in the survey data (Q37). That statistic points out one of the difficulties in providing proper training, the infrequency of new hires. One survey respondent summed it this way; “Extremely small staff, not a lot of turnover.” The 10 air carrier airports averaged less than four new hires during that same period. The air carrier airport average is skewed somewhat by the hiring levels at the larger hub airports. The six non-hub airports averaged only one new maintenance hire during the 18-month time period, while the four medium and large hub airports averaged eight new hires (one medium hub airport had 16 new maintenance employees in the 18-month period).

The number of based aircraft, number of operations, the number of maintenance employees, and the degree of employee

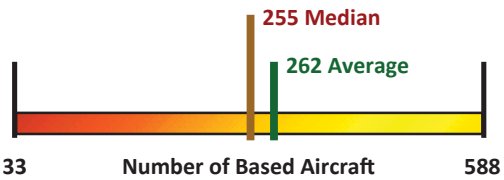

FIGURE 3 Continuum for the range and numbers of aircraft based at the 30 general aviation airports, *n* = 30. (*Source:* Survey Q4).

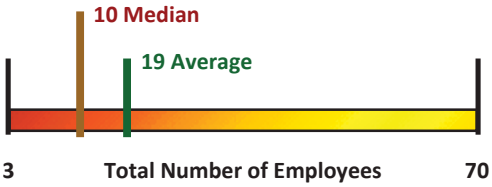

FIGURE 4 Continuum for the range and numbers of total employees at the 30 general aviation airport organization, *n* = 30. (*Source:* Survey Q12).

turnover all have implications for the risk exposure of individuals accessing the airfield, the ability of the airport to fund training activities and resources, and the ability to schedule employees for training. The low number of maintenance personnel at several of the GA airports was attributed in survey remarks to the airports being operated by a municipality (city, county, borough, or parish) that has work performed at the airport by the public works or other departments within that jurisdiction.

For other than airport-employed maintenance personnel, survey data (Q14 and Q15) indicated that maintenance personnel accessing the airfield at both GA and air carrier airports could be FAA or contract personnel (maintaining navigational aid equipment), National Weather Service personnel (weather observation), farmers, police or other security personnel, emergency and ARFF responders, FBO employees, electricians, contract maintenance workers, etc.

REASONS FOR ACCESSING THE AIRFIELD

The primary reasons for maintenance workers to access the movement and non-movement areas of the airport (ranked in order) are for electrical repair (including lighting and sign maintenance), pavement maintenance, emergency response, aircraft recovery, NAVAID maintenance, and mowing (Table 3). At those airports that experience winter snow conditions, snow removal becomes a major access issue. Less frequently, maintenance workers must also respond to infrastructure repair, utilities servicing, and wildlife issues. Several airports identified other broad reasons for accessing the airfield, including self-inspection, construction activity, security patrol, and FOD inspection.

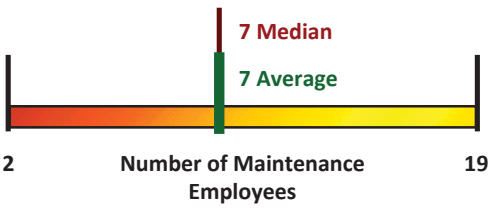

FIGURE 5 Continuum for the range and numbers of total maintenance employees at the 30 general aviation airports, *n* = 30 (*Source:* Survey Q13).

TABLE 3
REASONS MAINTENANCE PERSONNEL ACCESS THE AIRFIELD

Reasons for Airfield Access	Number of GA Airports
Electrical Repair	30
Pavement Maintenance	30
Emergency Response	29
Disabled Aircraft Recovery	29
Navaid Maintenance	29
Mowing	28
Infrastructure Repair	27
Wildlife Mitigation	27
Utilities Servicing	23
Building Repair	22
Building Maintenance	20
Vehicle Maintenance	17
Snow Removal	15
Horticulture Activity	15
Refuse Collection	15
Agriculture	6
Mineral Extraction	1
Herding Activity	1

Source: Survey Q10.

During electrical or pavement maintenance, mowing, and snow removal, individuals operate on or in close proximity to the runways. The use of supplemental or contract snow removal operators can add to the airport's risk exposure in that those workers do not routinely operate on the airfield. Prior training, when not regularly utilized or reinforced, can be easily forgotten.

A special hazard exists related to electrical airfield maintenance because airfield lighting and signage systems utilize different power and distribution than a typical building system. Working on airfield lights and signs requires specialized knowledge of constant current regulator systems. This work is often contracted to an outside maintenance worker or organization at GA airports because of the specialty aspects and local electrical code requirements. In Alaska, the three regions may hire only one or two individuals with experience in airfield lighting. Should a problem exist at an airport, the experienced individual is flown in to make needed repairs, a situation that could result in lengthy delay given some of the inclement weather conditions they routinely experience (see the Alaskan Case Example in chapter two.).

BUDGET IMPACT

In the question concerning what challenges airports face in providing training (Q38), "budget" was excluded as a potential response because it was believed it would have overshadowed other potential important responses. Budgets have always been an issue for airports of all sizes. The survey responses and comments reflected that notion.

Thirteen of the 30 GA airports indicated they had a budgetary line item for maintenance training, whereas only five of the air carrier airports did (Q33). Only four GA airports set aside more than one percent (1%) of their total budget allocation for training purposes (Q34). Fifteen GA airports indicated an allocation of equal to or less than 1%; and 11 airports indicated they dedicated no monies for training new hires at all. By comparison, seven of the 10 larger air carrier airports allocated between 1% and 4% of their budgets for training purposes. In its *2011 State of the Industry Report* (2012), the American Society for Training and Development's consolidated data on its members showed a direct expenditure as a percentage-of-payroll to be 2.66% (ASTD 2012). The average direct expenditure per employee increased from an inflation-adjusted amount of $1,098 in 2009 to $1,228 in 2010. Most of that expenditure was directed toward management development. New employee orientation garnered 7% of expenditures, while basic skill content training was shown to have the least amount of content delivered at 4%.

The problems that budgets and adequate training of newly-hired maintenance personnel present are not limited to airports, but resonate in all transportation modes. In a special TRB study focusing on the challenges of tomorrow's transportation workforce, workforce training expenditures were deemed to be inadequate and insufficient (*TRB Special Report* 2003). The report refers to benchmark studies of successful private and public organizations that assign, on average, 2% of salaries to training as a necessary investment to provide the proper knowledge and skills that workers need for their jobs.

CHAPTER FOUR

TRAINING TOPICS AND CONSIDERATIONS

Introducing new maintenance personnel into the airport operating environment requires consensus on what topics should be covered. This chapter presents survey results on the topics many GA airport operators believe should be covered in the initial orientation, which topics have more value than others, and an assessment of current training at GA airports. There is agreement on some key areas, but it is noted in this regard that the challenges that airports face outlined in chapter two, and the airport operating environment and organizational characteristics described in chapter three, affect the issues most critical for a particular airport. As with any type of training, the primary goal is safe and efficient performance by employees.

INITIAL TRAINING

One survey question asked what topics to include in a new maintenance employee training program (Q26). Table 4 presents 46 items that might be considered in such a program. The second column identifies the percentage of the 30 responding GA airports that agree each topic should be included in a training curriculum for new maintenance hires.

Some of the topics are broad and inclusionary of other topics listed. For instance, ground vehicle and radio operations includes knowledge of lighting/signs/markings and ATC operations; OSHA regulations includes the use of material safety data sheets; and instruction in safety management systems includes risk management/assessment and human factors/root cause analysis. There are several other topic descriptions that could be inclusionary as well, such as ATC operations, rules and regulations, construction activity, pilot and general aviation operations, and winter snow operations. Topics not listed but suggested by survey respondents included international refuse handling, security, and public relations skills.

All the responding airport operators agreed on four topics: (1) ground vehicle and radio operations, (2) foreign object debris (FOD) inspection, (3) airport security requirements, and (4) lighting, signs, and markings. (The latter three topics are normally included in a ground vehicle operation course.)

The identification and ranked importance of these topics reflect the views of airport managers at the surveyed airports. Readers of this report can consider Table 4 a laundry list of topics that may or may not have applicability to any particular airport. The importance of including any topic in a new-hire training orientation will vary to a large extent according to the type of operations conducted at the airport, the nature of the facilities operated and maintained, and the location of the airport. For instance, snow removal would be a very important topic for inclusion at those airports that routinely experience winter and snow conditions, but less so for GA airports in warmer winter weather areas. The requirement that maintenance personnel know about ATCT operations at an airport without an operating control tower would be less important than at those airports that do have an operating air traffic tower. Understanding Customs and Border Patrol (CBP) operations would only be necessary for employees at an airport that has CBP presence.

Nonetheless, it is important that consideration be given to the professional advancement of employees and to enhancing their overall knowledge and understanding of airport operations as a means to promote safety and awareness of industry activity. For that reason, new, recurrent, and continual training is important to elevate the knowledge and skills of all new hires.

To help clarify which of the 46 items listed in Table 4 may be the most important, respondents were asked to identify the top five topics (Q27). The number of times a topic was included in the top five ranking is shown in the 24-item list in Table 5.

Ground vehicle and radio operations is clearly the most important training element to be considered. As noted earlier, the topic of ground vehicle operation often includes several of the other topics listed lower in the lists. Table 5 finds support in a previous study listed in the literature review (Quilty 2005b) related to the training of airport operations new hires. For comparison purposes, that study found the following 10 topics were ranked most important: (1) ground vehicle operation, (2) self-inspection, (3) lighting systems, (4) airport emergency plan, (5) Notices to Airmen (NOTAMs), (6) Part 139 compliance, (7) airport certification manual, (8) aviation acronyms, (9) security identification area, and (10) construction activity.

One particular survey question helped to identify an organizational gap in training procedures. The survey question asked if the airport had a program in place for training newly hired maintenance workers or contractors (Q9). Seventeen of the 30 GA airports responded affirmatively. However, when

TABLE 4
AGREEMENT OF SURVEY RESPONDENTS ON TOPICS FOR INCLUSION IN A NEW HIRE MAINTENANCE TRAINING PROGRAM FOR GA AIRPORTS

Training Curriculum Topics	Percentage Agree
Ground Vehicle and Radio Operations	100.0
Foreign Object Debris Inspection	100.0
Airport Security Requirements	100.0
Lighting/Signs/Markings	100.0
Wildlife Mitigation	96.6
Construction Activity and Safety	93.3
Air Traffic Control Operations	93.3
Airport Rules/Regulations	93.3
GA Operations	90.0
NOTAMs	90.0
Accident/Incident Reporting	90.0
Airport Emergency Plan	83.3
Material Safety Data Sheets	83.3
Maintenance Records and Control	83.3
Non Vehicle Equipment Operation	83.3
Public Safety Awareness	80.0
Building Facility Maintenance	80.0
Environmental Compliance	80.0
Airfield/Terminal Electrical Basics	76.6
Fueling Operations	73.3
OSHA Requirements	70.0
Navigational Aid Operation	66.6
Aircraft Rescue and Fire Fighting	60.0
Organizational Communication	60.0
Pilot Operating Procedures	56.6
Snow Removal Operations	56.6
Helicopter Operations	56.6
Part 77 Obstructions	53.3
Airport Design and Layout	53.3
Human Factors/Root Cause Analysis	50.0
Safety Management System	46.6
Risk Assessment/Management	40.0
Building Codes	36.6
Meteorology	30.0
Communication Center Operations	26.6
Building and Construction Methods	26.6
Aircraft Deicing	23.3
Military Operations	20.0
Custom Border Patrol/Immigration	20.0
Airline/Commuter/Air Taxi Operations	13.3
Air Cargo Operations	13.3
FAA 5010 Master Record	13.3
International Aviation Operations	6.6
State/Federal Regulations	3.3
Tort, Contract & Similar Law	3.3
Secondary Language	0.0

Source: Survey Q26.

TABLE 5
IMPORTANCE OF TOPICS FOR INCLUSION IN A TRAINING PROGRAM

Top 5 Important Training Topics	Number of Top 5 Mentions
Ground Vehicle and Radio Operations	29
Lighting/Signs/Markings	19
Foreign Object Debris Inspection	15
Airport Rules/Regulations	13
Air Traffic Control Operations	9
Construction Activity and Safety	9
Airport Emergency Plan	8
Airport Security Requirements	6
NOTAMs	6
GA Operations	4
Airfield/Terminal Electrical Basics	4
Organizational Communication	3
OSHA Requirements	3
Airport Design and Layout	3
Pilot Operating Procedures	3
Snow Removal Operations	2
Accident/Incident Reporting	2
Wildlife Mitigation	2
Maintenance Records and Control	2
Environmental Compliance	2
Safety Management System	1
Public Safety Awareness	1
Accident/Incident Reporting	1
Building Facility Maintenance	1

Source: Survey Q27.

asked to provide a copy of their training outline, only three airports responded. Further follow-up indicated that while several airports may have had a training program per se, it was not necessarily well organized or in a format they could produce in writing.

The lack of a formal program could be a factor in why an airport may be satisfied or dissatisfied with its new employee training. Two of the airports indicated they had participated in the study because they were hoping to obtain information to improve their own training curricula and therefore did not have a training outline as yet.

Sample training material submitted by a few airports (reproduced in Appendices D through K) shows that the integration process for new employees often includes other pertinent topics. Learning about the airport organization, its policies and procedures, and customer relations are common subjects. Other topics such as general business, human resources development (HRD), safety training, and more specialized areas can supplement an airport's training regimen. Managers at GA airports can improve their training curricula or procedures by extracting information from the various appendices in this synthesis to suit their operations.

ACRP Report 16: Guidebook for Managing Small Airports (Grothaus et al. 2009) contains a section on developing an orientation program for new employees. It recommends that an orientation program include normal human resources policies and procedures (i.e., harassment, drug and alcohol use, safety policies, and employment agreements); airport operating plans and procedures (airport emergency plans, security, snow removal, and safety plans); the airport's design and layout; and the tenant structure and operating requirements, coupled with on-the-job training (OJT). The state of Oregon is currently working on a program for the training of its airfield maintenance operators and contractors, as illustrated in the case example here.

CASE EXAMPLE 2: The Oregon Effort

The Oregon State Department of Aviation oversees the operation of 28 general aviation airports throughout the state. It does so primarily through interagency agreements with the local communities. For the small communities, the agency may hire either a full-time or temporary employee to oversee the airport operation, depending upon the level of activity and need. It will then normally contract with a local landscaping company to provide needed services such as mowing. Either the state airport manager or local onsite supervisor will then meet with the local contractor and provide one to two hours of on-the-job training covering the safety aspects of airport operations. The department, as part of its General Instructions and Procedures agreement with the contractor, includes a Ground Vehicle Access Program Training Guide. The guide is an outline of some of the responsibilities and safety concerns the contractor is to be aware of, but the actual body of instruction is left to the trainer. Currently, the department is working to develop a guidebook that would better serve as a training tool to supplement the training process. Ideally, the agency would like to have available some sort of computer-based training that would include testing capabilities.

RECURRENT TRAINING

The synthesis survey also inquired about recurrent training of new maintenance employees after they have been on the job for a period of time (Q22). The majority of respondents (22) do provide recurrent training); eight do not. Under 14 CFR Part 139.303(c), the seven GA airports that hold operating certificates are required to conduct annual recurrent training for persons having access to the movement and safety areas of the airport. For GA airports, *Advisory Circular 150/5210-20, Ground Vehicle Operations on Airports* (2008) recommends that regular recurrent training be provided to all personnel who access the movement area. If an airport receives federal assistance for an airfield construction project, it will be required to develop a safety plan and provide requisite training to all involved with the project, whether the airport is certified or not.

In a previous ACRP study by Castellano (2009), eight of 13 GA airports reported recurrent training requirements for individuals having driving privileges on the movement areas of the airport. As mentioned previously, consideration needs to be given to enhancing employees' overall knowledge and understanding of airport operations and maintenance in order to promote general safety and awareness. For that reason, recurrent and continual training are important to elevate the knowledge and skills of a new hire.

ASSESSMENT

Assessment is important for validating the initial and recurrent training efforts of any organization. One survey question asked whether the new hire or contractor/tenant training is assessed in some way (Q28). Some form of training assessment is performed at 11 of the 30 GA airports. The other 14 airports provided basic training but did not have a formal method of ensuring the effectiveness of that training. As with many training initiatives, assessment can be a way to prevent later mistakes or errors in practice. An FAA drivers training curriculum suggests a written test be administered with a passing grade of 90% (*Advisory Circular 150/5210-20* 2008).

Corroborating the data from the literature review, a study on driver access onto the movement areas of airports (Castellano 2009, p. 16) identified several GA airports that conducted some type of movement area training assessment. Nine of the 13 GA airports in that study used a written test, four administered a driving exam, and three employed an oral exam.

The literature review also pointed up the U.S. Air Force's use of assessment in its training by requiring its servicemen and servicewomen to pass the following examinations before being authorized onto the airfield (AFI 13-213 2012):

1. Airfield diagram/layout practical test
2. Communications test
3. Basic communication principles
4. General knowledge test
5. Practical driving test
6. Runway incursion prevention test.

Typical safety audit findings suggest that the development and use of a checklist for airfield driver training will help ensure airfield operators can meet necessary competencies during a practical drivers test (AFI 13-213 2012). A practical driving test for certification could include the use of an airfield diagram and having the new driver point out all of the key areas noted on the diagram while driving (Appendices C and F).

CHAPTER FIVE

TRAINING METHODS AND PRACTICES

After identifying what topics to cover when training new maintenance employees, as described in chapter four, airports must address the issues of developing and delivering that training. This chapter describes survey responses associated with the different methods of training that GA airports currently use. Described in this section is the extent to which the airports used classroom instruction, mentoring and/or coaching, OJT), in-house or web-based computer based-training (CBT), or seminars and/or workshops. Also presented are data on how many hours are expended; who conducts and documents the training; and the level of satisfaction managers express with their existing training efforts.

METHODS OF INSTRUCTION

Airport Employee Training

With the exception of all but one of the 30 GA airports, OJT was described as the predominate method of training new maintenance employees (Q15). Eighteen of the 30 GA airports used OJT for more than 70% of their total orientation training. Nine of those 18 airports used it for more than 80% of their training, and five used it for more than 90% of their introductory training.

OJT can be one of the most effective methods of training new hires, provided it is structured. Unstructured training, without, for example, a checklist of topics or items to cover, can lead to gaps in knowledge transfer and poor work habits. One key drawback to OJT for new hires is the amount of time required to properly structure and conduct it. As noted previously, managers and supervisors—who are usually responsible for providing the training—indicated in the survey that their workloads and available time present a challenge in properly carrying out that responsibility.

The second most common method for providing initial training was the use of mentoring and coaching methods (Q15). Twenty-three airports used those instructional techniques for about 23% of their total training. Mentoring and coaching are terms often used interchangeably, although there is a difference. Most airport managers and supervisors will engage in coaching, which is related more to having an employee acquire functional knowledge and skills about the job. Mentoring is more relational in its approach. A person who mentors another helps that individual to grow in ways other than related to his or her job.

Assigning a new hire to shadow or buddy up with another employee of like stature in the organization can help him or her to learn the ropes. However, because of the few number of maintenance employees typical of small GA airports, the buddy system may not be a viable option. It is more frequently found at airports with larger staffs; two of the large hub airports and one of the medium hub airports in the study rely in part on that method.

The one GA airport that did not use OJT as its primary training tool instead used an in-house CBT platform for 70% of new employee orientation. Examples of CBT technology include the use of compact disc, digital video display (DVD), slide presentation, in-house computer use, or interactive web instruction. Only three other GA airports used in-house CBT, averaging only 15% usage. Those airports that had the in-house CBTs did so as a benefit from being part of a larger airport authority, making it cost-beneficial to use shared resources.

Sixteen GA airports used a formal classroom for introductory training, reporting an average of only 13.8% of training time there. Sending individuals to seminars or workshops (three airports) and the use of an online CBT method (two airports) represented, on average respectively, only 7% and 5% of the training effort at the airports using them. In follow-up interviews, the cost to use such systems was identified as an issue, as was the infrequency of need contributing to low usage.

An ASTD report identified instructor-led classroom training as the most widely used delivery method, with about 70% of all training being provided that way (ASTD 2012). It is noted in the ASTD report that technology is changing and several airport training providers are championing the use of interactive and efficient training modules over the Internet. The same ASTD report pointed out that technology-based training increased approximately 21.5% from 2001 to 2010, despite actually declining 7.2% in the year 2010. Of the totals, on-line learning increased a little more than 9% from 2003 to 2010. Some CBT or web-based instruction can be tied to an organizational learning management system that tracks trainee usage, thereby enhancing the agency's record-keeping capabilities.

The training methods at the 30 GA airports contrast to those at the eight air carrier airports in the following way: only three of the 10 air carrier airports use OJT more than 70% of the time. Instead, they rely on other methods to meet their needs. Nine of the 10 air carrier airports incorporate mentoring and

coaching into training, representing approximately 20% of training. Providing on-line CBT (four airports) or in-house CBT (five airports), or sending individuals to seminars and/or/workshops (three airports), together constituted 10% or less of the training effort. Additional self-study was used by one air carrier airport. It is reported in *ACRP Synthesis 27, Airport Self-Inspection Practices* that interactive training is relied on by 27% of large-hub airports and 25% of non-hub airports, but much less at airports of other sizes (Prather 2011, p. 17).

Castellano's 2009 *ACRP Synthesis 15* study on the requirements to obtain driving privileges at air carrier airports did include some information on GA airports. Only three of the 13 GA airports in that study held Part 139 certificates at the time. A survey question from that study asked what method of training was used for movement and non-movement area training. For movement area training, eight of the GA airports required the reading of their driving manual, nine conducted classroom training, three used CBT, and five conducted OJT. For non-movement area training (ramps, terminal, and parking areas), eight required the reading of a manual, four conducted classroom training, two conducted OJT, and one responded "other." The information from that study is similar to the findings of this current synthesis.

There are advantages and disadvantages to all of the training delivery methods. Based on the survey responses, the decision concerning what method to use at GA airports is primarily dictated by the budget, the constraints of a manager or supervisor's time, and by the availability of employee release time and scheduling. Even one large airport organization that oversees several GA airports in a metropolitan area wrote, "Web-based [training] is desirable but too expensive," when asked about what instructional method it uses.

Tenant or Contractor Training

A distinction is made between the training conducted for new tenant or contractor employee access on the airport for routine maintenance activities, versus the training of contractors for airfield construction projects. A construction project using federal funds, whether at an air carrier or GA airport, requires a safety plan and the training of associated contractors for the duration of the project. A survey question (Q32) asked whether or not the airport training in both circumstances was the same or different. Twenty-three of the GA airports and five of the air carrier airports indicated there was a difference in the level of training for each. The construction project training was deemed more extensive. One large air carrier airport reported no difference between the two because its policy was for everyone to be qualified through the same training.

Thirteen of the 30 GA airports indicated on the survey that training of outside tenant and contractor maintenance employees either did not occur or was not applicable (Q16). The "not applicable" response was mainly from those airports certified under Part 139, where escort was provided to all contractors and tenants. (Driver training is required under Part 139 requirements for having unescorted access to the movement areas of the airport.) The preferred method of instructing maintenance personnel from other companies needing to work on the airfield is OJT, according to those 13 airports. Mentoring/coaching was the second most common method and was reported by eight of the GA airports. Only three GA airports indicated they use in-house CBT for contractor training. One large hub airport has a very structured training program for all contractors and tenants that uses both classroom and field tour instruction. Appendix K describes that training.

The FAA requires individuals having interaction with the ATCT or pilot operations to communicate and understand the English language. Although not requiring English proficiency of all persons who might have access to the airfield, the FAA suggests that any person expected to operate on the movement area should demonstrate a functional knowledge of the English language (*Advisory Circular 150/5210-20* 2008, p. 2). All airports in the survey conducted their instruction in English. However, one airport did provide additional Spanish language instruction. It is noted in the Castellano study on airport driver training that the author found two medium hub airports, one small hub, and one GA airport that conducted driver training in Spanish (Castellano 2009, p. 10).

TRAINING INTERVALS, DOCUMENTATION, AND BUDGET

Airport Employee Training

Results from the survey of GA airports showed wide differences in the amount of time the airports devoted to the training of new maintenance employees (Q20). The time varied from 1.5 hour to 480 hours, with the average being 80 hours (see Figure 6). The median (meaning half of the airports on one side and half on the other side) was 40 hours or one week, currently conducted by six of the airports.

The range of 1.5 to 480 hours for airport employee maintenance training is skewed to the high end, as the median of 40 hours suggests. Five airports require 160 hours of training before a new employee is set loose. The 480 hours of orienta-

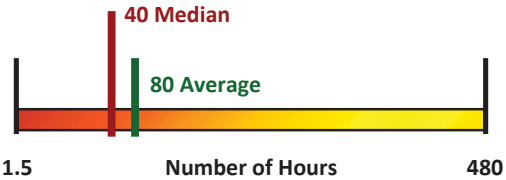

FIGURE 6 Continuum for the range and numbers of hours currently spent training new airport maintenance hires, $n = 27$ (*Source:* Survey Q20).

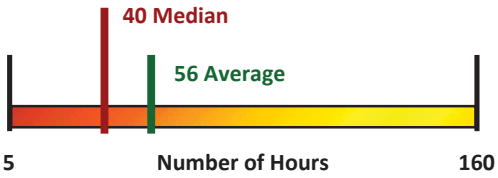

FIGURE 7 Continuum for the range and numbers of hours survey respondents at 29 GA airports desired for the training of new maintenance hires, *n* = 29 (*Source:* Survey Q31).

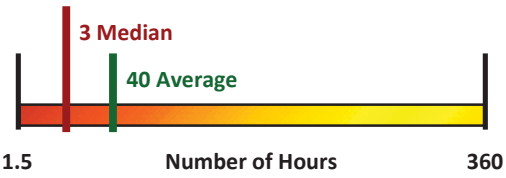

FIGURE 8 Continuum for the range and number of hours currently spent training new tenant or contractor maintenance hires, *n* = 19 (*Source:* Survey Q21).

tion training was provided by a single airport, where a new maintenance employee shadows others and is coached over a three-month period before being allowed to work independently on the airfield. Two GA airports identified a two-week requirement, whereas three airports had a one-month training requirement. By comparison, nine of the air carrier airports averaged 162 hours of training per employee, with the range being from one to nine weeks. One airport could not reply because, as the respondent stated, "none in 11 years," meaning it had not hired any new maintenance workers in more than a decade.

When asked how much time should be devoted to the training of newly hired maintenance employees (Q31), a disparity emerged between current practice and desired practice. The response from GA airports narrowed from the 1.5 to 480 hours to between five and 160 hours, with 56 hours (approximately 1.5 weeks) being the average and 40 being the median (Figure 7). One GA airport expressed a desire to require two to three years for initial training. For the air carrier airports, the desired range was 40 to 240 hours, with the average and median both at 120 hours, or three weeks. Those data are in line with existing practices reported by the air carrier airports in the survey.

A number of factors—primarily the overall staffing needs of the organization—play into the length of training time. For airports with small or lean maintenance staffs, the hiring of a new employee is often the result of a previous one leaving. A second reason for the diversity of responses is the degree to which resources are available to the airport, whether it is the time for training, the training material, adequate budget allocation, or the support of other organizational departments such as human resources. Most airports do not have available an extended time period for bringing a new employee on line. The lack of time and a limited budget were cited as reasons why several managers or supervisors favored the mentoring/coaching method.

Tenant or Contractor Training

Contractor and tenant new hires received much less training than airport maintenance employees (Figure 8). Eleven airports marked Q21 as "not applicable," including three of the seven airports certified under Part 139 who provide escort to all contractors and tenants. One airport treats contractor/tenant employees the same as its own employees, requiring 160 hours of training, whereas another airport provides contractor/non-employee training over a probationary period of 360 hours.

Overall, though, 10 of 19 airports provide less than two hours of training to contractors and tenants coming onto the airport and 11 GA airports conducted no training for tenant/contractors. Construction activity is not factored into these data, as 23 GA airports indicated their training of contractors for a construction project is different than for ordinary new maintenance hires (Q32). A construction project funded through the FAA or a state organization normally requires specific training as part of the safety plan for the project.

RESPONSIBILITY FOR TRAINING

Airport Employee Training

Based on the survey responses, the training of new maintenance personnel is primarily performed by the airport's manager or a supervisor (Q17). This can be challenging in a number of respects: (1) A manager or supervisor is not normally trained or proficient as a trainer, (2) the time available to train is limited owing to other duties; and (3) training is limited by the manager's or supervisor's own knowledge and understanding.

The data from Q17 shows that at half of the 30 GA airports, the manager or supervisor is the sole provider of new maintenance employee training, and another seven airports use their manager or supervisor for more than 80% of the training effort. In addition to the manager or supervisor, the GA airports relied on their human resources departments (six airports), outside associations (seven airports), or self-study programs (nine airports) to satisfy their needs. However, the supplemental resources accounted for no more than 20% of total instruction.

At the larger air carrier airports, all of which are subject to the training requirements of Part 139, the responsibility for training is more diverse, in part because of a generally higher amount of resources available to them. Although all the air carrier airports used supervisors or dedicated trainers, their

use only constituted an average of 64% of training programs. The larger airports tended to rely more on the resources of a human relations department, further supplemented by individual study and the use of professional associations providing conference workshops, web-based instruction, or other instructional methods. The same held true for training non-airport maintenance employees. Prather reported in his synthesis study that the airport manager was found to conduct 100% of the training at non-hub airports and 50% at GA airports (Prather 2011, p. 17).

Tenant or Contractor Training

For the training of contractor or tenant employees, as determined from the survey (Q17), the GA airports rely more often on their HRD or similar departments within the municipality to conduct the training; or they rely on the FBO for training its own employees, tenants, or contractors. Based on survey and interview comments, the type of training provided by the HRD or police departments is more related to security and driver badging requirements,. The survey also indicated that the training of outside contractor/tenant maintenance personnel using workshops offered by professional associations, federal or state training resources, academic institutions, or self-study was negligible or non-existent (Q18).

DOCUMENTATION

An important requirement for those airports with Part 139 certification is to maintain records of training (Section 139.301), which is also generally considered a good business practice: All but four of the 30 GA airports, each non-139 certified, kept training records of their personnel. Half used electronically-stored methods to record training as well. One GA airport is certified under International Organization Standards 9000, and uses those approved processes for documentation.

For the training of new contractor and tenant maintenance employees, the preferred method of documentation was the simple written record placed in a file system. Two GA airports kept no training records on contractors or tenants. The air carrier airports in the survey tended to incorporate both a written and electronic copy. All 10 had written records, with eight also having electronic records. One GA and one air carrier airport used a third party to maintain training documentation.

No clear pattern emerged from the data regarding responsibility within the airport organization (Q23). Survey responses describing responsible positions included HRD, airport manager, operations officer, training officer, and maintenance supervisor, to name a few. For contractor/tenant documentation of training (Q24), 11 responded either “none” or “not applicable”; three referred to the FBO having responsibility; and the remaining 16 identified various individuals in the airport organization.

Seventeen of the GA airports reported that they had some sort of training program for their new maintenance employees (Q9). However, to a follow-up request, only three of the GA airports provided a formal outline of the training they conducted.

SATISFACTION WITH TRAINING

Figure 9 indicates that GA airport managers were generally more satisfied with their own level of employee training than with the training provided to contractors and tenants. Still, the level of dissatisfaction indicates room for improvement in both areas. Seven of the GA airports did not respond to the question regarding satisfaction related to tenant/contractor training (Q30) as they did not train either group, preferring to escort those needing access to the airfield.

FIGURE 9 Level of airport satisfaction with training of new maintenance hires and contractor/tenant hires, $n = 30$ (*Source:* Survey Q29 and Q30).

CHAPTER SIX

RESOURCES AVAILABLE

This chapter seeks to help airport organizations by providing sources of information that can be used to develop or provide training to their new maintenance, tenant, and contractor hires.

The one resource that the survey responses indicated was needed for this synthesis was not found. Ideally, airports would like to have a comprehensive training video or computer presentation that cost them very little, if anything at all. The FAA, trade associations, and private companies do try to meet this need by offering a number of solutions, including face-to-face meetings, seminars or workshops; videos; DVDs; web-based interactive programs; or other similar delivery methods. Unfortunately, except for the FAA material, most instructional information will not meet the zero budget line item of many GA airports. Many airports therefore default to the FAA material.

The FAA does provide a number of resources that can assist an airport operator with some aspects of adapting maintenance new hires to the airport environment. In particular, the Office of Runway Safety (http://www.faa.gov/airports/runway_safety/vehicle) has a number of resources that can be of value. Links to other FAA documents, such as advisory circulars, the *Aeronautical Information Manual* (AIM), and other resources, can be found on that same site. However, it is still incumbent upon the airport operator to sift through and adapt related material to his or her own airport. This was cited as an issue for several airports, as the managers did not believe they had adequate time or the necessary skill to make the adaptations.

Several ACRP studies have addressed the need for training and are good resources for airports seeking to develop their own training material. The Castellano study on the requirements necessary for obtaining driving privileges on an airport, and comparisons of the data collected in that study to this, have already been noted. Another source for use in developing training material can be found in the ACRP Synthesis on ramp safety (Landry and Ingolia 2011). Although focused primarily on ramp operations at air carrier airports, it contains a list of training resources used by airports, air carrier operators (airlines), and FBOs that have applicability or merit for consideration at GA airports as well. A table listing those resources is reproduced in this synthesis (see Appendix C). The list includes material from private sources and ramp operators as well as trade and governmental associations.

As mentioned in chapter five, Air Force documents providing suggested training outlines are reproduced in Appendices D–F. For airports that conduct winter operations, a study on preventing runway incursions during winter operations identifies safety issues and suggestions that should be considered in a training curriculum (Quilty 2008). One other reference source that may provide additional insight into the training of new hires may be found in the soon-to-be published report, ACRP 09-02: *Best Practices for Working In or Near Airport Movement Areas.*

Information on security issues and related topics for inclusion in training are provided in *ACRP Synthesis 3: General Aviation Safety and Security Practices* (Williams 2007) and two reports from the TSA (ASAC Working Group 11 2003; and *TSA Security Guidelines for General Aviation Airports* 2004).

National and international airport and aviation trade associations can provide training material or training solutions for airports. Regionally, individual state aviation organizations or chapters may provide material, though the study did not discover many that do so beyond conducting an annual workshop or convention. There are also a number of private companies or individuals that provide similar training support to the industry. An Internet search on key training terminology will help to identify several organizations or private commercial training providers. Often, airports rely on the networking sources within the airport community to share best practices or training material.

A number of states have bureaus or departments of aviation. The bureaus are established for a number of purposes, such as coordinating airport development, channeling federal and state money, providing licensure of aircraft and airports, promoting aviation education, or even operating airports. Among states that operate airports are Vermont, Rhode Island, Oregon, Hawaii, and Alaska. Alaska, in particular, operates more than 250 rural GA airports (a case example on Alaska GA airports is presented in chapter two, while a case example on Oregon's efforts are presented in chapter four). A number of state aviation organizations have developed airport management handbooks or similar materials for their airports (e.g., Illinois, Louisiana, New York, Wisconsin, and Washington, to name a few). Those handbooks can be valuable resources training new hires.

Many states also have airport organizations that serve the needs of the airports in that particular state. These organizations

can be of value in providing resources or assistance in resolving airport issues. A case example from the state of Virginia is presented here.

CASE EXAMPLE 3: Virginia Maintenance Training Workshop

A number of states have airport organizations that help to serve the needs of the airports in that particular state. The Virginia Airport Operators Council (VOAC) is one of those organizations. Primarily an advocacy group, the VOAC stepped up to the challenges highlighted in this synthesis by offering a workshop in 2009 called the Mid-Atlantic Maintenance Symposium. It was structured specifically to support airport maintenance personnel not just in Virginia, but as its name implies, the greater mid-Atlantic region of the United States.

In that session, which was well attended, topics such as wildlife management, airfield lighting diagnostics, ground vehicle communication, storm water control, vegetation management, and pavement crack sealing were addressed.

The intent of the VOAC was to offer the workshop every two years. However, in 2011, economic recession and waning travel budgets required the agency to cancel that year's session. VOAC hopes to resurrect the symposium in 2013.

CHAPTER SEVEN

LESSONS LEARNED

The general lack of GA airports-specific training material has resulted in their "going it alone," so to speak. As the industry moves forward, it is helpful to address the training needs of GA airports by learning from those that have first-hand experience. This chapter seeks to highlight some of the lessons that these airports have learned over the years. Managers' comments, which have been grouped into common themes, are provided verbatim.

One survey question (Q39) asked airport operators to describe what lessons they had learned from their hiring of new maintenance personnel. Most survey respondents provided some sort of response, albeit many were brief. The comments still provide insight into how an airport organization can try to improve its own training efforts.

One respondent addressed the key challenge of not having time available to conduct training:

- Absolutely. Don't be in a rush to get a new hire out on his or her own. Expediting the training process to have an additional source of manpower to perform routine functions can ultimately lead to poor workmanship and even worse, disastrous results. Take your time and ensure that when you let a new hire out on their own you can leave the airport every day with a sense of comfort in knowing that the personnel you have working are competent, capable, thorough, and knowledgeable employees, ensuring a safe and sound environment for the traveling public.

On the general topic of safety, and safety awareness, respondents noted:

- Really need to stress public safety is #1.
- Ensure they understand the importance of not entering a movement area without ATC permission.
- We learned not to overlook the human factors in our training. Once we began discussing situational awareness and managing stress, our accident rates went down.

Related to chapter four, several respondents commented on assessment:

- Constant monitoring results in better retention.
- Need to follow up after initial training.
- Better training = $$$$ savings and higher safety awareness overall.
- Participate as much as you can, not only to evaluate trainers, trainees and course material, but to build your own knowledge and understand better how members of staff work together.

Related to chapter five and the type of training to provide, respondents said:

- Nothing beats hands-on airfield driving!
- A combination of classroom training and hands-on/supervised OJT works best.
- Keep it simple and entertaining!

A number of comments give insight into the importance of assigning training responsibilities:

- A key point here is that staffers must be people persons.
- Dedicated well-trained mentors are critical in consistent training protocols.
- Put them with a mentor for months. When the mentor thinks they are ready to be on their own, have them drive the airport director or assistant director around on an airport tour.

Chapter five discusses documentation. One airport respondent advised:

- Maintain detailed and complete training documentation.

Throughout this report, and particularly in the section of chapter five that discusses the study findings on the amount of time given to tenant/contractor training, the following advice was provided:

- Never assume a person truly knows the airport. Always ensure that airport staff interfaces with anyone that may be providing any kind of maintenance support to the airport.
- All the training in the world doesn't help if the contractor switches staff around to cover other crews or employees. Contractors have to understand that they cannot just rotate people in and out of airport positions without training in advance. They are reluctant to designate an alternate worker and more so, pay them to come to the airport for training that they may or may not use.
- Continually evaluate the activities of new contractors/non-employees to ensure that the training they received

is still adequate when their scope of work or activities changes. Don't just assume that once they have been trained they are able to safely handle changes without additional training.

One response from an air carrier airport manager, however, crystallizes the importance of helping new maintenance and other employees adapt to the organization. And although this particular airport clearly has resources available to it that GA airports do not, his message highlights the importance of establishing a culture of safety and emphasizing the need for continuous learning. The individual's comment is produced in whole:

At our airport, we believe that properly training Maintenance staff is an absolute necessity in order to meet our top priority of a safe airport environment for not only employees, but all visitors to our airport. As such, one of our primary beliefs is in the importance of continuous learning. Although this survey has a focus on initial training, we believe that continuous learning is the only way to stay alert and always keep safety at the forefront. As such, we have developed numerous continuous learning opportunities for staff. We have an annual Part 139, hands-on training class for all staff who access the airfield. We go above and beyond the requirements of the FAA, including topics such as sustainability, customer service, and many other safety topics that are not required, but help us maintain a situational awareness amongst our work force that we hope will prevent future incidents. We also offer a training class similar to our Part 139 Program for staff that does not have access to the airfield. Although not required, we believe it is critical to also make sure this group is vigilant, whether as a passenger in a vehicle or when just walking around the non-secure areas and facilities of our airport.

We also strive to create a safety culture in which we learn continuously—not only from topics brought up in safety committee meetings, but also from a thorough review by a team of all incidents (notice only, medicals, and lost-time incidents). It is imperative that any lessons learned through these incidents get communicated to the front line Maintenance staff through daily tool-box talks. We also conduct routine JSAs (or job safety analysis) on jobs or work tasks that we believe to be the riskiest and communicate those findings to staff. We have also implemented numerous systems that we believe help keep our staff and airfield safe. A few of these include the implementation of the SMS (safety management system), in which we find it very beneficial to have front line staff involved in safety risk analysis meetings with the goal of finding safer ways to operate and perform our everyday duties. We are also working closely with Eagle on the start-up of a new computerized SMS program for making our airport's reporting and inspections paperless, accountable and more efficient. We also work closely with all of our trades and support unions in order to partner and ensure that our Maintenance staff are properly trained in the newest technology and has the tools that they need to perform the job in the safest and most efficient manner. Many of our local union halls offer such training, and in the areas that they are not offering learning opportunities, we work with equipment/tool manufacturers, consultants, and local experts to ensure adequate training. We have also found that real-life training (not just classroom or computer-based training) is the best way to prepare our staff. One example of this is the Snow Removal Drill that we have recently developed to provide a live exercise to all staff involved in snow removal operations. With typically 5–6 new temporary heavy equipment operators joining our staff every year, and the many new faces we had this past winter in our Operations Department, we knew that there was going to be a significant learning curve when it came to snow removal operations. We knew the potential mess we could have on our hands when the first winter storm came to our area. We had some of our expert Operations and Maintenance Managers and Supervisors put together a snow removal drill that really helped us all coordinate and learn from our mistakes (before we made them in real-time). We also worked closely with the ATCT to ensure proper coordination, and it was even a great learning opportunity for their newer staff members. This drill was such a great success that we will be continuing it on an annual basis. We also used the drill as an opportunity for many of the staff outside the Maintenance and Operations Departments to shadow our front line staff and learn more about the jobs they do each and every day. One other critical factor that we believe is a must for training is working very closely with the tenants (mainly airlines) and the FAA. We have weekly construction meetings (including critical tenants, the FAA, and contractors/consultants) during construction season to coordinate airfield activities. We have monthly meetings between the Maintenance Department and all Airline Station Managers to discuss any issues and just give our customers an opportunity to vent and discuss any concerns—and we ultimately learn from these issues and communicate solutions to staff. We also have meetings with the FAA periodically to make sure we are all on the same page and resolve any issues before they get out of hand.

Although training at our airport starts on the first day an employee starts his/her job, we believe in the importance of continuous learning. Every employee is involved in what we believe to be a continuous learning process until the day they leave or retire from the Airport Authority. We see the greatest success through a combination of an intensive initial training program, which involves all elements of training—classroom, computer-based, on-the-job, and mentor-student learning, as well as, and we believe most importantly, a continuous learning process with all of the previously mentioned elements until the employee's last day at the airport.

CHAPTER EIGHT

CONCLUSIONS

The specific objectives of this synthesis were: (1) to locate, document, and assemble information on the training of newly-hired airport maintenance employees; (2) to identify current challenges and practices used at airports, particularly at general aviation (GA) airports; (3) to document core training elements and resources for new maintenance personnel; and (4) to identify resources that may help increase the knowledge and understanding of the new maintenance hires on the airport campus and its operating environment.

The study identified several major challenges and issues that airport managers face as they attempt to integrate newly hired maintenance personnel into their organizations, including the lack of instructional resources and skilled instructors, limited staffing and budgets, variable quality in the workforce, and time constraints on the trainer.

Information for this report was obtained through a survey of 30 GA reports from across the United States. Ten air carrier airports were also surveyed for the purpose of comparison. The overall response rate was 80%.

The organizational size of the GA airports in the survey ranged from three to 70 employees; the majority had fewer than 15 employees. For the period from January 2011 to August 2012, the 30 GA airports in the survey averaged less than one new maintenance hire. Those airports provided an average of 52.6 hours of training to the new hire, but a number of airports provided less than one day of orientation.

It was found in the study that new maintenance hires access the airfield primarily for the following reasons: electrical repair, pavement maintenance, emergency response, mowing, and infrastructure repair. The new hires can either be airport employees or individuals from public works department, a fixed base operator, tenant organizations, the FAA, or outside tradesmen, contractors, or laborers.

At the 18 smaller GA airport organizations with fewer than 15 employees, the responsibility for training and ensuring integration of new employees was generally assigned to the airport manager or employee supervisor. The ability of the managers or supervisors competently to provide such instruction was not assessed in this study, but it was identified as a concern for helping integrate new employees into the airport environment.

Airports certified under Part 139 are required to provide a minimum amount of training on certain topics. Given those regulatory requirements, the GA airports in the study provided, on average, 52.6 hours of training to new hires. That average includes the non-certified GA airports, most of which provided less than one day of orientation. The amount of time spent on training tenant and contractor employees was even less. However, the amount of time that airport managers desired to spend training new maintenance employees averaged 56 hours.

A definitive outline of essential training topics would have to factor in airport size, operations, geographic and weather conditions, and local requirements. However there was full agreement on four specific topic areas: (1) ground vehicle operation, (2) foreign object debris inspection, (3) pavement maintenance and inspection, and (4) lighting, signs, and markings. Additional topics were identified from the survey responses, and the report provides a laundry list of topics and their ranked importance. It was also found through the survey that while many GA airports indicated they had a training program in place, the program was not well-defined or constructed.

It is concluded from the survey data, interviews, and literature review that GA airports lack current, comprehensive training materials, videos or computer presentations applicable to GA airports which are economically feasible for them to obtain. Further, survey findings and conclusions suggest that airport managers can benefit from learning instructional development skills as part of their career progression, and from receiving more support and resources from their larger organization leadership or governing bodies in preparing new employees to take their places in the airport environment.

ACRONYMS

14 CFR	Title 14 Code of Federal Regulations
AC	Advisory Circular
AOA	Air Operations Area
ARFF	Aircraft Rescue and Fire Fighting
ASTD	American Society for Training and Development
ATADS	Air Traffic Activity Data System
ATCT	Air traffic control tower
CBP	Customs and Border Patrol
CBT	Computer base training
DVD	Digital video display
FBO	Fixed based operator
GA	General aviation
HRD	Human resources department
MSDS	Material Safety Data Sheet
NAVAIDS	Navigational Aids
NPIAS	National Plan of Integrated Airport System
NWS	National Weather Service
OJT	On-the-job training
RI	Runway incursions
V/PD	Vehicle/pedestrian deviations

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APPENDIX A

Survey Instrument

ACRP 06-04 SURVEY INSTRUMENT

Adapting New Maintenance Hires to the Airport Environment

NAME: **TITLE:**

ORGANIZATION: **AIRPORT IDENTIFIER:**

CITY & STATE:

E-MAIL: **TELEPHONE:**

Q1. Type of airport (check): _____ large hub _____ medium hub
_____ small hub _____ non hub _____ general aviation

Q2. ATC operation (check): _____ full-time ATCT _____ seasonal ATCT
_____ part-time ATCT _____ no ATCT

Q3. Total number of annual aircraft operations: _____

Q4. Total number of based aircraft: _____

Q5. Type of airport governing body (check)**:**

_____ private owned	_____ consolidated city-county	_____ borough
_____ city	_____ county/parish	_____ authority
_____ joint-use	_____ state	_____ federal

Q6. Are you the owner/operator of the airport or are you under contract to manage or represent the airport owner?
_____ airport owner/operator _____ FBO/third party representative

Q7. Who at your airport determines who is authorized or allowed to go onto the airside airfield and ramps (describe)?
_____

Q8. Are records maintained at your airport of incidents, accidents, incursions or other safety issues related to maintenance personnel activity on the ramp and airfield? _____ yes _____ no

Q9. Do you currently have a program in place for training newly hired maintenance workers or contractors?
_____ yes _____ no

Q10. For what reasons do maintenance personnel access the air operations area of your airport (check all that apply)?

_____ airfield electrical (light & sign repairs)	_____ mowing
_____ pavement maintenance & repair (include painting)	_____ snow removal
_____ utility service (sewer, water, gas, electric, pipeline, etc.)	_____ wildlife mitigation
_____ horticultural or tree trimming	_____ NAVAIDS maintenance
_____ herding, grazing or other animal usage	_____ building repair
_____ mineral operation (oil well, mining, etc.)	_____ agriculture
_____ infrastructure maintenance (fuel systems, fencing, etc.)	_____ building maintenance
_____ disabled aircraft or vehicle removal	_____ vehicle maintenance
_____ emergency response	_____ refuse removal
_____ other (describe): _____	

Q11. Of the list in question 9, please <u>rank order</u> the <u>top three</u> reasons maintenance personnel access the air operations area at your airport (1 is most important):
1. _____ 2. _____ 3. _____

Q12. Total number of <u>all</u> employees in your organization: _____

Q13. Total number of your employees who engage in airfield maintenance: _____

Q14. Total number of *contractor/non-employee* personnel authorized to engage in airfield maintenance on the airport ramps and airfield (enter number):

_____ airport contracted maintenance persons
_____ FBO employed maintenance person
_____ other airport tenant employed maintenance person
_____ city or county maintenance person (public works, sanitation, etc.)
_____ FAA maintenance person
_____ other (describe): _____

Q15. What method is used for training your maintenance *new hires*: (% over one year) 100% total

_____% on-the-job (OJT) _____% seminar/workshops
_____% classroom _____% in-house computer-based training
_____% mentoring _____% other (describe): _____
_____% online or web-based computer-based training

Q16. What method is used for training maintenance *new contractors/non-employees* at your airport (% over one year): 100% total _____ not applicable

_____% on-the-job (OJT) _____% seminar/workshops
_____% classroom _____% in-house computer-based training
_____% mentoring _____% other (describe): _____
_____% online or web-based computer-based training

Q17. What percentage of your *new hire* maintenance training is conducted by each of the following (% over one year): 100% total

_____% airport manager/supervisor/training officer
_____% other airport associated (city/county/authority human resource and/or training personnel)
_____% professional association workshop/seminars/conferences (AAAE, NATA, etc.)
_____% federal or state aviation organization
_____% outside consultant/trainer
_____% self-study
_____% academic institution
_____% other (describe): _____

Q18. What percentage of *new contractor/non-employee* maintenance training is conducted by each of the following (% over a year): 100% total_____ not applicable

_____ % FBO/tenant/organization responsible for employee/contractor oversight
_____ % airport/city/county/authority human resource or other training personnel
_____ % professional association workshop/seminars/conferences (AAAE, NATA, etc.)
_____ % federal or state aviation organization
_____ % outside consultant/trainer
_____ % self-study
_____ % academic institution
_____ % other (describe): _____

Q19. What language(s) is/are used in your maintenance training (list)?

_____ _____ _____

Q20. How much time is initially spent training your maintenance *new hires*? _____ hours

Q21. How much time is initially spent training *new* maintenance *contractors/non-employees*? _____ hours

Q22. Do you require annual recurrent training of either *new hires* or *contractors/non-employees* training?

_____ yes _____ no

Q23. Who is responsible for documenting your *new hire* maintenance training (list)? _____

Q24. Who is responsible for documenting your *new contractor/non-employee* maintenance training (list)? _____

Q25. How is maintenance *new hire employee* or *new contractor/non-employee* maintenance training documented (check all that apply)?

_____ airport written copy _____ airport electronic/computer copy
_____ none at all _____ third party (describe): _____
_____ other (describe): _____

Q26. For each of the items below, please use a "y" to identify those topics that you believe *should be included* in maintenance new hire or new contractor training, and use an "n" to identify those topics that you believe *should not* be included.

_____ ground vehicle operation & radios
_____ airport emergency plan
_____ foreign object debris
_____ meteorology
_____ military operations
_____ construction activity & safety
_____ airport security requirements
_____ Part 77 obstructions
_____ general aviation operations
_____ air traffic control operations
_____ fueling operations
_____ aircraft deicing
_____ communication center operation
_____ risk assessment/management
_____ airline/commuter/air taxi operations
_____ construction & building methods
_____ navigational aid equipment operation
_____ OSHA requirements
_____ human factors/root cause analysis
_____ material safety data sheets & hazmat
_____ public safety awareness
_____ air cargo operations
_____ international aviation operations
_____ other topics (describe): _____

_____ airfield lighting/marking/signs
_____ NOTAMS
_____ airport rules/regulations/policies
_____ accident & incident reporting
_____ maintenance records/document control
_____ wildlife
_____ non-vehicle equipment operation
_____ airport design & layout
_____ building facility maintenance
_____ aircraft rescue fire fighting
_____ pilot operating procedures
_____ state/federal regulations
_____ form 5010 master record
_____ snow removal operation
_____ safety management systems (SMS)
_____ airfield & terminal electricity basics
_____ building codes
_____ helicopter operations
_____ tort, contract, and similar law
_____ organizational communication
_____ secondary language
_____ environmental compliance
_____ customs border patrol/immigration

Q27. Of the "y" list in question 24, please rank order the top five topics for your airport:

1. _____
2. _____
3. _____
4. _____
5. _____

Q28. Does your organization test, evaluate or otherwise assess the training provided to *new hire* maintenance employees or *new contractors/non-employees*?

_____ yes _____ no

Q29. How satisfied are you with the training provided to *new hires* (check)?

____ very satisfied ____ somewhat satisfied ____ satisfied
____ unsatisfied ____ very unsatisfied

Q30. How satisfied are you with the training provided to *new contractors/non-employees* (check):

____ very satisfied ____ somewhat satisfied ____ satisfied
____ unsatisfied ____ very unsatisfied

Q31. With no constraints, how much initial time do you believe should be devoted to the training of your maintenance new hires or new contractor/non-employee maintenance personnel to adequately prepare them to safely operate on the air operations area? _____ hours

Q32. With respect to dedicated one-time construction projects requiring safety training, does the training of those construction contractor employees differ from that provided (or not provided) to regular *new contractor/non-employee* maintenance training? _____ yes, it is different _____ no, it is not different

Q33. Does your budget provide a line item for training of maintenance personnel?

_____ yes _____ no

Q34. What percent of your overall budget is used to provide training resources for your maintenance *employees?* _____ %

Q35. What percent of your overall budget is used to provide training resources for maintenance *contractors/non-employees?*
_____ %

Q36. If you had an unlimited budget, what training activities or resources might you provide your maintenance employees and/or *contractors/non-employees* with (describe)? _____

Q37. How many new hire maintenance persons have you employed since January 2011? _____

Q38. Other than budget, what challenges do you have in providing training to your maintenance *new hires* or *new contractors/ non-employees* (describe)? _____

Q39. Are there any lessons you have learned from providing training to your maintenance *new hires* or *new contractors/ non-employees* that is important for others to learn (describe)? _____

***Thank you very much* for providing your input and for assisting others in ways to improve their airport!!**

Best regards,
Stephen M. Quilty, A.A.E.
please return by regular mail

SMQ Airport Services
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Lutz, FL 33559

or e-mail to:
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APPENDIX B

List of Participating Airports

Airport Code	Airport Name	Airport Location
General Aviation Airports		
AGC	Allegheny County	Pittsburgh, PA
APF	Naples Municipal	Naples, FL
BED	Laurence G. Hanscom Field	Bedford, MA
CPS	St. Louis Downtown	Cahokia, IL
DPA	DuPage County	West Chicago, IL
EMT	El Monte	El Monte, CA
FMY	Page Field	Ft. Myers, FL
FPR	St. Lucie County International	Fort Pierce, FL
FRG	Republic Airport	Farmingdale, NY
FUL	Fullerton Municipal	Fullerton, CA
GKY	Arlington Municipal	Arlington, TX
HEF	Manassas Municipal	Manassas, VA
HII	Lake Havasu City	Lake Havasu City, AZ
HNB	Huntingburg Regional	Huntingburg, WV
HWD	Hayward Executive	Hayward, CA
ISM	Kissimmee Gateway	Kissimmee, FL
LZU	Gwinnett County	Lawrenceville, GA
MKC	Wheeler Downtown	Kansas City, MO
PDK	Peachtree–DeKalb County	Atlanta, GA
RAL	Riverside Municipal	Riverside, CA
RVS	Richard Lloyd Jones Jr.	Tulsa, OK
RYY	Cobb County–McCollum Field	Kennesaw, GA
SGR	Sugar Land Regional	Sugar Land, TX
SMD	Smith Field	Fort Wayne, IN
SPG	Albert Whitted	St. Petersburg, FL
SUA	Witham Field	Stuart, FL
TEB	Teterboro	Teterboro, NJ
VRB	Vero Beach Municipal	Vero Beach, FL
Primary Airports		
DTW	Detroit Metropolitan Wayne County	Detroit, MI
FWA	Ft. Wayne International	Ft. Wayne, IN
EAU	Chippewa Valley	Eau Claire, WI
MSP	Minneapolis–St. Paul International	Minneapolis, MN
PIT	Pittsburgh International	Pittsburgh, PA
RST	Rochester Municipal	Rochester, MN
SAF	Santa Fe Municipal	Santa Fe, NM
SAT	San Antonio International	San Antonio, TX
SBP	San Luis County Regional	San Luis Obispo, CA
SJC	San Jose International	San Jose, CA

Organizations Interviewed

Alaska Division of Aviation	Anchorage, AK
North Slope Bureau	Barrow, AK
Oregon Department of Transportation	Portland, OR

APPENDIX C

Training Resources for Ramp Operation

Organization	Acronym	Handbooks, Guides, Standards	Website	Brief Description
Air Charter Safety Foundation	ACSF	ACSF Industry Audit Standard Operator Documents	http://www.acsf.aero/	Provides safety standards that cover aircraft ground handling and servicing. The intent of this standard is to raise the level of safety during ground operations by reviewing a ground operator's organization and management, manuals and related documentation, applicable training programs, contract ground handling, auditing, and quality assurance. The standards also focus on specific ground operator's programs including parking of aircraft, towing and taxiing of aircraft, fueling and servicing, baggage loading, and others.
Air Transport Association	ATA	*Recommended Guidelines for Preventing and Investigating Aircraft Ground Damage*	https://publications.airlines.org/	Multiple documents including those related to safety and ramp operations
Airports Council International	ACI	*Airside Safety Handbook* and *Apron Markings and Signs Handbook*	http://www.airports.org/cda/aci_common/display/main/aci_content07_banners.jsp?zn=aci&cp=1-65733_725_2	Provides airside managers with a comprehensive set of guidelines for safety and markings
Australasian Aviation Ground Safety Council	AAGSC	Ground safety practices and training material	http://www.aagsc.org/rips.htm and http://www.aagsc.org/trainig.htm	AAGSC has developed both video and computer-based resources, including standard practices for ramp safety.
Boeing	Boeing	*Ramp Error Decision Aid* (*REDA*) *Users Guide*	http://www.atec.or.jp/SMS_WS_Boeing_REDA%20Users%20Guide.pdf (one of many sites providing this document)	Structured process used to investigate errors made by ramp personnel.
Civil Aviation Authority	CAA	CAP 642 Airside Safety Management	http://www.caa.co.uk/docs/33/Cap642.pdf	U.K. ramp safety operations and practices including risk analysis
Flight Safety Foundation	FSF	Ground Accident Prevention (GAP)	http://flightsafety.org/archives-and-resources	A set of e-tools on ramp operations and safety practices including but not limited to Ramp Operational Safety Procedures.
International Air Transport Association	IATA	IATA Safety Audit for Ground Operators (ISAGO) Airport Handling Manual (AHM)	http://www.iata.org/ps/certification/isago/Pages/index.aspx http://www.iata.org/ps/publications/Pages/ahm.aspx	Ground Services Audit program documentation including an audit checklist Field reference publication containing recommended industry standards and procedures on airside safety; load control; baggage, cargo, and mail handling; aircraft movement control; aircraft loading; and departure control systems.

(*continued on next page*)

(*continued*)

International Civil Aviation Organization	ICAO	Annexes *Safety Management Manual* (SMM)	http://store1.icao.int/mainpae. ch2 (costs vary by document) http://www.icao.int/anb/safetymanagement/DOC_9859_FULL_EN.pdf (publication is free)	A variety of documents including Annex 14 for Aerodrome operations and Annex 13 for accident incident investigation
National Air Transportation Association	NATA	Safety 1st and Fueling NATA Ground Safety Audit Program	http://www.nata.aero/web/page/557/sectionid/557/pagelevel/1/module/toggle/interior.aspx	Program promotes safety for ground operations that provides a number of training programs and best management practices to enhance safety for general aviation service providers.
Occupational Safety and Health Administration Voluntary Protection Program	OSHA VPP	Safety management program	http://www.osha.gov/dcsp/vpp/	VPP sets performance-based criteria for a managed safety and health system, invites sites to apply, and then assesses applicants against these criteria.
U.S. National Safety Council	NSC	*Aviation Ground Operations Safety Handbook*	http://shop.nsc.org/Aviation- Ground-Operation-Safety-Handbook-6th-Ed-P1753.aspx	The handbook sets forth the guidelines for safely accomplishing most ground operations associated with aircraft and applicable to aviation ground operations.

Source: *ACRP Synthesis 29: Ramp Safety Practices.*

APPENDIX D

Sample USAF Driver Qualification Training Curriculum

AIRFIELD DRIVING QUALIFICATION TRAINING CHECKLIST (CURRICULUM)				
SECTION I – TRAINEE INFORMATION (*Completed by Unit ADPM*)				
Name (Last, First, Middle Initial)	Rank, Civilian Grade or equivalent		Unit/Office Symbol or Company Name	Duty Phone
	Date Completed	Trainee's Initials	Trainer's Initials	Not Available (N/A)
1. Definitions and terms. Training Outcome(s): Trainee must be knowledgeable of the terms used on an airfield.				
1.1. Runway				
1.2. Controlled Movement Area (CMA)				
1.3. Controlled Movement Area Violation (CMAV)				
1.4. Runway Incursion				
1.5. Taxiway				
1.6. Ramp/Apron				
1.7. Foreign Object Damage (FOD) control/prevention				
1.8. Overrun				
1.9. Taxi lane				
1.10. Light Gun				
1.11. Jet Blast				
1.12. Vehicle Service Road				
1.13. Hot Cargo Area				
1.14. Arm/De-Arm Area				
1.15. Aircraft Arresting Gear				
1.16. ILS Critical Area				
1.17. Mandatory Sign				
1.18. Informational Sign				
1.19. Emergency Response Vehicle				
1.20. Circle of Safety				
1.21. Restricted Area				
1.22. Entry Control Point				
1.23. Fixed/Mobile Obstacle				
1.24. Airfield Management				
1.25. Air Traffic Control Tower (ATCT)				
2. Vehicle operator requirements. Training Outcome(s): Trainee must be knowledgeable on local procedures and requirements for operating a vehicle on the airfield.				
2.1. Use of vehicle lighting (e.g., daytime running, rotating/IR beacons, hazard/emergency flashers)				
2.2. Procedures for reporting an accident or vehicle maintenance problems				
2.3. Vehicle parking and chocking requirements				
2.4. Use of perimeter and infield roadways				

2.5. Lateral distance requirements for mobile obstacles on an apron/ramp and taxiway				
2.6. Speed limits for vehicles operating on an apron/ramp and taxiway				
2.7. Requirements for operating a vehicle within the immediate vicinity of aircraft				
2.8. Procedures for reporting and removing FOD				
2.9. Restricted visibility and/or night driving				
2.10. Procedures for operating of bicycles, tricycles, etc., on the airfield				
2.11. Use of traction control devices as applicable				
2.12. Emergency response vehicle requirements				
2.13. Vehicle escort/convoy driving procedures as applicable				
3. Aircraft Operations. Training outcome(s): Trainee must be knowledgeable of hazards associated with aircraft.				
3.1. Right-of-way				
3.2. Taxiing				
3.3. Jet blast safety requirements				
4. Practical Day and Night (as applicable) Airfield Familiarization Training. Training Outcome(s): Trainee must be knowledgeable of the airfield environment. At a minimum, the trainee must demonstrate the ability to operate a vehicle to and from their designated work areas.				
5. Local Airfield Basics. Training Outcome(s): Trainee must be knowledgeable of the airfield environment.				
5.1. Familiarize trainee with the following airfield lighting				
5.1.1. Runway				
5.1.1.1. Edge Lights				
5.1.1.2. Approach Lights				
5.1.2. Taxiway				
5.1.2.1. Edge Lights				
5.1.2.2. Centerline Lights				
5.1.2.3. Guard Lights (as applicable)				
5.2. Familiarize trainee with the following airfield signage				
5.2.1. Runway Hold Sign				
5.2.2. Taxiway Location Sign				
5.2.3. ILS Critical Area Sign				
5.2.4. Direction Sign				
5.2.5. Distance Remaining Sign				
5.3. Familiarize trainee with the following airfield markings				
5.3.1. Runway				
5.3.1.1. Centerline				
5.3.1.2. Edge				
5.3.1.3. Runway ID Numbers				
5.3.1.4. Threshold Markings				
5.3.1.5. VFR Hold Line				
5.3.2. Vehicle Stop Bars				
5.3.3. Taxiways				
5.3.3.1. Centerline				
5.3.3.2. Edge Markings				
5.3.4. ILS Critical Areas				

5.3.5. Non-Movement Area Boundary Marking as applicable				
5.3.6. Non-Standard Airfield Markings as Applicable				
5.3.7. Aircraft Arresting Gear Marking as Applicable				
5.4. Familiarize trainee with the locations or airfield Navigational Aids and Visual Approach Aid				
5.5. Familiarize trainee with the location of Restricted Areas and Entry Control Points				
5.6. Familiarize trainee with the location of Free Zones as applicable				
5.7. Familiarize trainee with the reduced visibility/inclement weather driving techniques				
5.8. Familiarize trainee with the location of the Fire Department, Air Traffic Control Tower and Airfield Management				
5.9. Familiarize trainee with the location and use of traffic control devices				
5.10. Familiarize trainee with jet blast hazardous locations on the airfield				
5.11. Familiarize trainee with runway(s) configuration (e.g., dimensions, location, designation, etc.)				
5.12. Familiarize trainee with the taxiway configuration (e.g., dimensions, location, designation, etc.)				
5.13. Familiarize trainee with Controlled Movement Area Boundaries				
5.14. Familiarize trainee with congested Areas				
5.15. Familiarize trainee with hot spots as required locally				
5.16. Identify smoking areas as applicable				
6. Communications. Training Outcome(s): Trainee must be knowledgeable of proper radio terminology and ATCT phraseology use on the airfield				
6.1. Ground Vehicle Communications				
6.2. Procedural Words and Phrases				
6.3. Aviation Phonetic Alphabet				
6.4. Aviation Terminology				
6.5. Procedures for Contacting the ATCT				
6.6. Light Gun Signals (Description of ATCT Light Gun Signals)				
6.7. ATCT and or vehicle blind spots				
7. Other.				
7.1. Review ADI				
7.2. Runway Incursion Prevention Training				
7.3. Demonstrate the ability to contact ATCT for approval to enter/exit the CMA. **Note:** Required for all personnel that require access on or across taxiways, helipads and aprons located in the CMA				
7.4. Demonstrate the ability to contact ATCT for approval to enter/exit the runway. **Note:** Required for all personnel that require assess on or across the runway				

SECTION III – TRAINING CERTIFICATION (*Completed by the Trainee, Unit ADPM and Wing ADPM*)			
TRAINEE			
I have received and completed all of the above training requirements and will comply with *Local Base* Airfield Driving Instruction (ADI). I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement areas without approval from the Air Traffic Control Tower (ATCT).			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
UNIT ADPM			
I certify that the above individual has completed all local training requirements outlined in *State Local Base* Airfield Driving Instruction (ADI). Check all applicable restrictions. ☐ Ramp only ☐ Daylight hours only ☐ Other (*Specify*):			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
WING ADPM or designated representative (*as required*)			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

Source: United States Air Force Instruction 13-213.

APPENDIX E

Sample USAF Driver Certification Checklist

AIRFIELD DRIVING TRAINING
DOCUMENTATION AND CERTIFICATION CHECKLIST

SECTION I – TRAINEE INFORMATION (*Completed by the Unit ADPM*)

Name (Last, First, Middle Initial)	Rank, Civilian Grade or equivalent	Unit/Office Symbol or Company Name	Duty Phone

SECTION II – QUALIFICATION TRAINING (*Completed by the Trainee and Unit Trainer*)

	Date Completed	Trainee's Initials	Trainer's Initials
1. Trainee possesses a valid (*List State of Issue*) Driver's License (*List restrictions*).			
2. Trainee possesses a valid Government Driver's License.			
3. USAF Airfield Driving Computer Base Training. [Score:]			
4. Airfield Driver Training Classroom (*as determined locally*).			
5. Airfield Driving Qualification Training Checklist/ Curriculum (See Attachment 6).			
6. Practical Day Airfield Driver Familiarization Training (SeeAttachment 6, Item 4).			
7. Practical Night Airfield Driver Familiarization Training as applicable (See Attachment 6, Item 4).			
8. Practical Driving Test. Includes day and night (as applicable).			
9. Communications Test. [Score:]			
10. Airfield Diagram/Layout Test. [Score:]			
11. General Knowledge Test (Written). [Score:]			
12. Runway Incursion Prevention Test. [Score:]			

SECTION III – Color Vision Test for CMA drivers only (*Completed by Hospital/Medical Treatment Facility Optometry For*)

Check applicable.			
☐ Normal Color Vision.			
☐ Color Blind/Deficient.			

Name (Last, First, MI):	Grade:	Signature:	Date:

SECTION IV – TRAINER CERTIFICATION (*Completed by Authorized Airfield Driving Training Instructor*)

I certify that the trainee has received all required qualification training requirements annotated above.

Name of Trainer (Last, First, MI):	Grade:	Signature:	Date:

SECTION V – TRAINEE ACKNOWLEDGEMENT (*Completed by Trainee*)			
I have received and completed all of the above training requirements and will comply with *Local Base* Airfield Driving Instruction (ADI). I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement areas without approval from the Air Traffic Control Tower (ATCT).			
Name of Trainee (Last, First, MI):	Grade:	Signature:	Date:
SECTION VI – UNIT CERTIFICATION (*Completed by Unit Commander or Unit ADPM*)			
I certify that the above trainee has successfully completed all training requirements to operate a vehicle at *Local Base.* Check all applicable restrictions and or special access. ☐ Ramp only ☐ Daylight hours only ☐ Other (*Specify*):			
Name (Last, First, MI):	Grade:	Signature:	Date:
SECTION VII – AIRFIELD DRIVING AUTHORIZATION (*Completed by the Wing ADPM or designated representative)*			
☐ Approved ☐ Disapproved		AF IMT483 CERTIFICATE #	
Name (Last, First, MI):	Grade:	Signature:	Date:

Source: United States Air Force Instruction 13-213.

APPENDIX F

Sample USAF Contractor Training Checklist

TDY PERSONNEL/NON-BASE ASSIGNED CONTRACTORS TRAINING CHECKLIST

SECTION I – TRAINEE INFORMATION (*Competed by Unit ADPM or Wing ADPM*)

Name (Last, First, Middle Initial)	Rank, Civilian Grade or equivalent	Unit/Office Symbol or Company Name	Duty Phone

SECTION II – QUALIFICATION TRAINING
(*Completed by the Trainee, Unit ADPM or designated Trainer*)

	Date Completed	Trainee's Initials	Trainer's Initials
1. Explain the difference between mandatory/informational airfield signs. Provide examples of mandatory/informational local airfield signs.			
2. Explain the different types of airfield markings (e.g., runway, taxiway, apron/ramp). Provide examples of local airfield markings.			
3. Explain the different types of airfield lighting systems (e.g., runway, taxiway, apron/ramp). Provide examples of local airfield lighting.			
4. Identify the speed limits for general/special purpose vehicles operating on aircraft parking aprons/ramp and taxiways.			
5. Identify the procedures for vehicle operating in the immediate vicinity of base assigned and transient (if applicable) aircraft.			
6. Explain the requirements for parking and chocking vehicles and/or equipment on the airfield.			
7. Identify the lateral distance requirements for mobile obstacles on taxiways and aprons.			
8. Discuss Foreign Object Damage (FOD) control/prevention measures for the airfield.			
9. Identify methods/practices to prevent a runway incursion.			
10. Explain the different types of airfield violations and their consequences.			
11. Identify the proper radio terminology and phraseology.			
12. Provide a local airfield diagram.			
13. Identify all restricted areas and entry control points.			
14. Identify all Control Movement Area boundaries.			
15. Identify Free Zones, when applicable.			
16. Practical airfield familiarization training. At a minimum, familiarize individual on route(s) to and from the designated work area.			
17. Explain procedures for night driving, reduced visibility and Inclement weather, when applicable.			
18. Explain procedures for reporting an accident or vehicle maintenance problems.			

SECTION III – TRAINING CERTIFICATION (*Competed by Trainee, Unit ADPM and Wing ADPM as required*)			
TRAINEE			
I have received and completed all of the above training requirements and will comply with *Local Base* Airfield Driving Instruction (ADI). I am also fully aware that no vehicle or pedestrian shall enter a runway or other controlled movement areas without approval from the Air Traffic Control Tower (ATCT).			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
UNIT ADPM			
I certify that the above individual has completed all local training requirements outlined in *State Local Base* Airfield Driving Instruction (ADI). Check all applicable restrictions. ☐ Ramp only ☐ Daylight Hours only ☐ Other (*Specify*)			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:
WING ADPM or designated representative (*as required*)			
Name (Last, First, MI):	Rank, Civilian Grade or equivalent:	Signature:	Date:

Source: United States Air Force Instruction 13-213.

APPENDIX G

Sample Ground Vehicle Access Training Curriculum

NOTE: The purpose of the Ground Vehicle Access Program Training Curriculum is to provide airport operators with a comprehensive list of training topics for educating vehicle operators who may have access to the airside of an airport. Each individual airport has unique situations that might require site-specific training. Airport operators may use this training curriculum as a guide for developing and implementing a detailed training program tailored to the airport's individual situation.

The purpose of a training program is to provide vehicle operators with the level of training necessary for their positions so they are capable of operating safely on the airside of an airport. Specific programs may be tailored to account for the items listed below:

1. Various infield aircraft navigation aids
2. Identification of a given point on a grid map or other standard map used at the airport
3. Applicable airport rules, regulations, or procedures pertaining to vehicle operations
4. Airport layout, including designation of runways and taxiways
5. Boundaries of movement areas
6. Interpretation and color coding of airfield signs, pavement markings, and lighting
7. Location and understanding of critical areas associated with instrument landing system (ILS) and very high frequency omnidirectional ranges (VORs)
8. Proper terminology (including phonetic alphabet) and procedures for radio communications with the airport traffic control tower (ATCT)
9. ATCT light gun signals
10. Established routes for emergency response vehicles
11. Dangers associated with jet blast and prop wash
12. Traffic patterns associated with each runway (left or right) and location of each leg; i.e., downwind, base, final, and crosswind
13. Situational awareness

An airport operator may choose to develop customized training programs for vehicle operators who are restricted to operating ground vehicles only on ramps and apron areas.

AREAS OF TRAINING

All drivers should have training in the following areas:

1. Discussion of Runway Incursions, Airfield Safety, and Security
   Training Outcome(s) – Trainee should be able to define a runway incursion and explain the benefits of airfield safety/security.
2. Definitions and Terms
   Training Outcome(s) – Trainee should be knowledgeable of the terms used on an airport.
3. Vehicle Operating Requirements
   - **a.** Authorized Vehicles and Vehicle Identification
   - **b.** Vehicle Lighting
   - **c.** Vehicle Insurance
   - **d.** Vehicle Inspection
   - **e.** Vehicle Parking
   - **f.** Accident Reporting
   - **g.** Perimeter Roadways
   - **h.** Aircraft Lighting
4. Rules and Regulations
   - **a.** Review
   - **b.** Noncompliance/Penalties

   Training Outcome(s) – Trainee should be knowledgeable of ground vehicle rules and regulations.
5. Testing
   - **a.** Written Test
   - **b.** Practical Test

   Training Outcome(s) – Trainee should be able to pass a written examination with a minimum score of 90 percent.

Source: Federal Aviation Administration Advisory Circular 150/5210-20 Change 1.

APPENDIX H

Sample General Aviation Training Outline

CUSTOMER SERVICE
LOW-FLYING AIRCRAFT/NOISE COMPLAINTS
HANDLING OF MISDIRECTED CALLS
PUBLIC RECORDS
INTERNAL COMMUNICATIONS
TELEPHONE USAGE
E-MAILS
CONTACT INFORMATION
UNIFORMS, ATTIRE, AND GROOMING
TIMEKEEPING
- Leave requests
- Illness/appointments

BREAKS FOR NON-EXEMPT STAFF
INCLEMENT WEATHER
USE OF CITY VEHICLES
PARKING
MISCELLANEOUS
- Employees may not store personal items
- Gloves, headsets, uniforms, etc., assigned
- Loitering in the operations area
- Operations board
- Headset radios or music players (IPods)
- Kitchen/workspace cleanliness

SECURITY/SAFETY
- Transportation Security Administration “Security Guidelines for General Aviation Airports”
- Equipment
- Key safes and drop safes
- Terminal security
- Gate codes/security
- Unauthorized entrance to aircraft movement area
- Criminal trespass
- Operating vehicles in the aircraft movement area

AIRSIDE INSPECTIONS
EQUIPMENT MAINTENANCE
MOWING/MAINTENANCE PROCEDURES
ATCT EQUIPMENT MAINTENANCE
HANGAR MAINTENANCE
- Entry
- Repairs

OTHER
- Americans with Disabilities Act Accommodations

Source: Arlington Municipal Airport, TX. Used with permission.

APPENDIX I

Sample Part 139 Airport Training Outline

Introduction
Training Program Description
Phase 1 – Company Orientation
- SECTION 1 – Organization History
- SECTION 2 – Chronological History
- SECTION 3 – Current Facilities
- SECTION 4 – Organization Structure
- SECTION 5 – Job Descriptions
- SECTION 6 – Performance Expectations
- SECTION 7 – Company Benefits
- SECTION 8 – Employee Policy Manual
- SECTION 9 – Work/Shift Schedules
- SECTION 10 – Timekeeping Requirements
- SECTION 11 – Policies and Procedures

Phase 2 – Safety Training
- SECTION 1 – Safety Policy Statement
- SECTION 2 – Workplace Safety Program
- SECTION 3 – Right-to-Know Program
- SECTION 4 – Exposure Control Plan
- SECTION 5 – Hepatitis B Vaccination and/or Declination
- SECTION 6 – Safety Committee
- SECTION 7 – Reporting Injuries

Phase 3 – Federal Aviation Administration Requirements (Part 139)
- SECTION 1 – Airport Familiarization
- SECTION 2 – Airport Communications
- SECTION 2 – 14 CFR 139 Requirements
- SECTION 3 – Part 139 Contents
- SECTION 4 – 139.301 Records
- SECTION 5 – 139.303 Personnel
- SECTION 6 – 139.305 Paved Areas
- SECTION 7 – 139.307 Unpaved Areas
- SECTION 8 – 139.309 Safety Areas
- SECTION 9 – 139.311 Marking, Signs and Lighting
  - A. Runway Signs, Marking, and Lighting
  - B. Taxiway Signs, Marking, and Lighting
  - C. Airfield Signs
- SECTION 10 – 139.313 Snow and Ice Control Plan
- SECTION 11 – 139.315 Aircraft Rescue Firefighting Index Determination
- SECTION 12 – 139.317 Aircraft Rescue Firefighting Equipment and Agents
- SECTION 13 – 139.319 Aircraft Rescue Firefighting Operational Requirements
- SECTION 14 – 139.321 Handling & Storage of Hazardous Materials
- SECTION 15 – 139.323 Traffic and Wind Direction Indicators
- SECTION 16 – 139.325 Airport Emergency Plan
- SECTION 17 – 139.327 Self-Inspection Program
- SECTION 18 – 139.329 Pedestrians and Ground Vehicles
- SECTION 19 – 139.331 Obstructions
- SECTION 20 – 139.333 Protection of NAVAIDS
- SECTION 21 – 139.335 Public Protection
- SECTION 22 – 139.337 Wildlife Hazard Management
- SECTION 23 – 139.339 Airport Condition Reporting
- SECTION 24 – 139.341 Identifying, Marking and Lighting Construction & Other Unserviceable Areas
- SECTION 25 – 139.343 Non-Complying Conditions

Phase 4 – Airport Operations Database
- SECTION 1 – Database Introduction
- SECTION 2 – Airport Maintenance Database Contents
- SECTION 2 – Airport Fire Department Database Contents

Phase 5 – Airport Safety Self-Inspection Program
- SECTION 1 – Safety Self-Inspection Program Introduction
- SECTION 2 – Safety Self-Inspection Procedures
  - A. Pavement Areas
  - B. Safety Areas

- C. Markings
- D. Signs
- E. Lighting
- F. Navigational Aids
- G. Obstructions
- H. Snow and Ice
- I. Construction
- J. Public Protection
- K. Fuel Farms
- L. Wildlife Hazards

SECTION 3 – Safety Self-Inspection Reporting Procedures
SECTION 4 – Work Order System
- A. Creating a Work Order
- B. Printing a Work Order
- C. Closing (Completing) a Work Order

Phase 6 – Airport Condition Reporting
SECTION 1 – Airport Condition Reporting (General)
SECTION 2 – Field Condition Report (FICON) System
SECTION 3 – Notice to Airmen (NOTAM) and e-Notam system
Phase 7 – Airport Emergency Plan
SECTION 1 – General Airport Emergency Plan Information/Training
Phase 8 – Ground Vehicle Operations
SECTION 1 – Ground Vehicle Operator Training Requirements
Phase 9 – Airport Security Requirements/Procedures and the Transportation Security Administration
SECTION 1 – History of Airport Security Requirements/Procedures
SECTION 2 – Airport Issued IDs, Training Requirements
Phase 10 – Job Specific Duties, Equipment Operations, Miscellaneous
SECTION 1 – Equipment Operations
SECTION 2 – Job Functions/Tasks
Phase 11 – Final Examinations (Written and Practical)

Source: Rochester Municipal Airport, Rochester, MN. Used with permission.

APPENDIX J

Sample Health and Policy Training Outline

Part 1: Purpose of Manual & Safety Statement
Part 2: Safety & Health Policies/Procedures
Part 3: Safety & Health Training/Employee Orientation
Part 4: Identifying & Controlling Hazards
Part 5: Fire Prevention & Fire Safety
Part 6: Emergency Procedures & Building Evacuation
Part 7: Basic Precautions for Job Tasks
Part 8: PPE Policy
Part 9: Confined Space Entry
Part 10: Electrical Safety
Part 11: Material Handling & Storage
Part 12: Excavation & Protective Systems
Part 13: Utility Line Safety
Part 14: Fall Protection
Part 15: Hazardous Chemicals & Right to Know
Part 16: Hearing Conservation
Part 17: Respiratory Protection
Part 18: Bloodborne Pathogens
Part 19: Hot Work Permit
Part 20: Lock Out Tag Out

Source: Courtesy of Allegheny County Airport, PA. Used with permission.

APPENDIX K

Sample Contractor Vendor Training Outline

Tours will cover:
- Contractor Responsibilities
- Explanation of Movement/Non-Movement Areas
- Rules and Regulations Review
- SMGCS Review

Contractor Responsibilities
- Importance of notification of cranes or other hazards to navigation
- Foreign object damage/debris (FOD)
- Display badges
- Security identification display area (SIDA) – Badge challenges
- Vehicle credentials

Non-movement area
- Explain the non-movement area and boundaries
- Aircraft always have right-of-way (“Give way to Aircraft”)
- Zipper roadways
- Speed Limit 15 mph
- Vehicle escort policy
- Push backs – wing walkers, strobe lights, wheel chocks
- Tunnel road from north to south ramp
- Power backs – Explain the differences
- Push backs – wing walkers, strobe lights, wheel chocks

Movement Area
- Explain the movement area and boundaries
- Explain access restrictions
- Brief review SMGCS – hold signs & pavement markings
- Boundaries of work sites

Driving Tour
- Show boundaries of ramp
- Show contractor work site and access to work site
- Show check point access 1, 2, 3, 4
- Show hold signs/painted hold markings
- If possible show example of an aircraft push back
- Tunnel road from north to south ramp

Quiz
- Administer contractor vendor quiz.

Source: Courtesy of Detroit–Wayne County International Airport, Michigan. Used with permission.

APPENDIX L

Ground Handling Training Outline

The airside safety training program focuses on individuals who have duties that require access to airside areas to complete initial and recurrent airside safety training. This includes operators of ground support equipment (GSE) such as tugs, deicing vehicles, loaders, and catering vehicles, to name a few. The training outline comprises operational and management issues that reflect a safety management document.

- Safety philosophy;
- Safety regulations;
- Hazards;
- Human factors;
- Airside markings and signage;
- Emergency situations;
- FOD prevention;
- Personal protection;
- Accidents, incidents, near misses;
- Risk assessment; and
- Airside safety supervision.

Airside driver training for ground handling personnel typically addresses:

- Role and responsibilities of vehicle operators;
- Vehicle equipment standards;
- Hazards of airside driving;
- Reduced visibility procedures;
- Accident and incident reporting procedures;
- Rules and procedures for driving on ramps (aprons), stands, and airside roads; and
- Rules and procedures for driving in aircraft maneuvering areas.

The topic of risk management is presented to help ensure that risk management processes are learned and implemented. In general, risk management typically includes the basic elements of:

- Safety hazard identification;
- Security threat identification;
- Risk assessment;
- Risk control; and
- Risk monitoring.

Source: International Air Transportation Association Airport Handling Manual (AHM 630).

APPENDIX M

Recurrent Training Outline

XYZ Airport Operations/Maintenance Training Schedule
2011–2012

August 2011	AEP training
September 2011	Wildlife Hazard Management training
October 2011	Snow Plan training
November 2011	Airport Condition Reporting
December 2011	Communications (Radio for ATC and Non-ATC Times)
January 2012	Aircraft Rescue and Firefighting (Operational Requirements, Index, NOTAMS)
February 2012	Pedestrian and Ground Vehicles (Enforcement Procedures, Escorting, Radio Communications, Limited Access)
March 2012	LOA's, Mutual Aid Agreements, Low Visibility Procedures, Airport Owned Lighting, Obstructions, Public Protection.
April 2012	Airport Familiarization
May 2012	Self Inspection Program (Procedures for Daily Inspections and Unusual or Other Conditions that may affect Safe Operations)
June 2012	Hazardous Substances and Materials (Procedures for Fueling, Quarterly Inspections and Reporting/Correcting Discrepancies)
July 2012	Movement/Safety Areas (Access Procedures and Operations)

Source: Federal Aviation Administration Airport Certification Office.

Abbreviations used without definitions in TRB publications:

A4A	Airlines for America
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	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
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
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
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
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