

CHAPTER I

INTRODUCTION

As stated in the original Airport Cooperative Research Program (ACRP) project statement, “The research plan objective of ACRP Project 07-05 is to produce an Airport Passenger Terminal Planning Guidebook”. This guidebook should include sections (a) describing the airport passenger terminal planning process and (b) identifying current and future issues, trends, impacts, and solutions in airport passenger terminal planning.” The Team’s approach in response to this research objective was to prepare an Airport Terminal Planning Guidebook that provides airport managers, their staff, airport planners, architects, and in general, the aviation industry at large, with a thorough understanding of all the items to consider when undertaking the process of planning and designing terminal facilities in the ever-evolving commercial aviation market.

There have been many attempts over the years, through various white papers, past industry publications, and the recent on-going TRB/ACRP initiatives, to provide planning and design guidance on selected issues for terminal planning and the terminal design process. There have not been any recent efforts in the U.S. to produce a comprehensive and up-to-date Guidebook for industry use. One exception, from a source outside the U.S., is the International Airport Transport Industry’s (IATA) publication, *Airport Development Reference Manual*, 9th Edition, (effective January 2004). Numerous past publications that have served the terminal planning and design process in various ways include: *The Airport: Architecture-Urban Integration Ecological Problems* (Praeger, 1975); *The Apron and Terminal Building Planning Report* (FAA-RD 75-191); 1975, and the FAA’s first terminal planning guide, *The Apron-Terminal Complex* (FAA-RD-73-82), published in September 1973.

There has been enormous change in the commercial aviation industry due to deregulation, the events of 9/11, as well as a significant financial evolution within the commercial air service market. These coinciding events have created an increased emphasis on the terminal planning issues of flexibility, financial feasibility, concessions revenue generation, heightened regulatory requirements and security procedures, sustainable terminal designs, more sophisticated information technology (IT), and baggage handling systems (BHS). Terminal facilities have a direct relationship with airside and landside facilities that require any terminal planning and design process to address capacity balance between these major airport components and Level of Service (LOS) performance.

This Final Report describes the study’s progress through the collection and evaluation of data and the initial structuring of the content of the Guidebook itself. This includes the Team’s research, review, and assessment of a variety of previously prepared “white papers” that had been commissioned by the Federal Aviation Administration (FAA) over the years. This Report serves as a summary of the results of this research project. Additionally, this report provides a glimpse of the state of the industry in terms of its priorities relative to current issues and

emerging trends communicated to the Team by industry stakeholders who participated in the research project survey efforts. It is important to note that the research efforts for the ACRP 07-05 project have been done in conjunction with the ACRP 07-04 research project, *Spreadsheet Models for Airport Terminal Planning and Design*.

The following chapters provide, in some detail, the information compiled during Tasks 1 through 4 of the Amplified Work Plan. The major components are:

- Chapter II – includes a summary of the research approach, the literature search, a listing of the FAA “white papers,” and a description of the industry outreach and web-based questionnaire process. This chapter describes the research efforts for reviewing information sources including those available to every user through web-based technologies, as well as information that is available only in written form. An annotated bibliography is provided in Chapter II and serves as Appendix H in the Guidebook that will be useful to the reader who wishes to further pursue specific topics of interest. Also included in Chapter II is a description of the authors and topics of various FAA “white papers.” Chapter II lists and discusses the challenges involved for the ACRP 07-05 research project to coordinate with and, where possible, reference and draw upon, significant findings and recommendations stemming from 22 other on-going airport terminal related TRB/ACRP research projects. A listing of these pertinent TRB/ACRP research projects are summarized in Appendix B of the Guidebook.
- Chapter III – This chapter describes the Team’s summary comments on the substance and current relevancy of the “white papers” and their inclusion, sourcing, and/or exclusion relative to the preparation of the final Guidebook. The preparation for, and results of a survey conducted from October 19, 2007 to November 26, 2007 of the aviation industry are also discussed in this chapter. This includes a description of the web-site and questionnaire. The industry survey effort combined with the Team’s industry experience and insights produced a synopsis of current issues and emerging trends relative to airport terminal planning and design. A description of these industry issues and trends is included as Appendix G of the Guidebook.
- Chapter IV – This chapter includes the conclusions and recommendations, and discusses what the Team has learned from the research efforts and the challenges that lie ahead. This includes key decisions made at the TRB ACRP 07-05 Panel Session in Washington, D.C. on April 29th and 30th 2008.

CHAPTER II

RESEARCH APPROACH

This chapter presents the approach taken to develop information for the study including a literature review, the development of the survey instrument, and the process of soliciting industry involvement and participation. The compilation of the survey results are presented in Chapter III. Additionally, research includes the review and assessment of the Federal Aviation Administration (FAA) “white papers” and their relevance to potential inclusion in the Guidebook. Chapter II provides a comprehensive list of the FAA white papers with the results of the Team’s review presented in Chapter III.

LITERATURE REVIEW

In accordance with the Work Plan for the project, a literature search was conducted to identify and document airport passenger terminal guidelines currently being used or that could be used in terminal design. The literature search was compiled into an annotated bibliography.

First, readily available published documents from domestic and foreign sources were accessed that included information sources for terminal planning guidelines. These primarily included FAA Advisory Circulars, guidelines, and reference documents published by reputed research institutions and industry organizations like TSA, IATA, ICAO etc.

Second, searches were made through internet search engines for web sites containing information on airport passenger terminals to supplement the information available from guidelines and reports.

The extensive annotated bibliography of web sites, electronic information sources and documents that were examined for issues, trends, impacts, and existing potential solutions for airport passenger terminals is given below:

“Access to Airports by Individuals with Disabilities.” Advisory Circular 150/5360-14. U.S. Department of Transportation, Federal Aviation Administration. (June 30, 1999). http://www.faa.gov/documentLibrary/media/advisory_circular/150-5360-14/150_5360_14.PDF. (As of August 25, 2009).

This advisory circular (AC) is designed to assist airports in complying with the current laws and regulations regarding individuals with disabilities by: (1) identifying the relevant statutes and regulations which impact airports; (2) presenting the main features of each of the statutes and regulations in a single document; (3) providing legal citations to facilitate research; (4) listing sources of assistance or additional information; and (5) identifying Final Rules. It presents and reconciles the federal accessibility regulations implementing the Americans with Disabilities Act of 1990 (ADA); the Air Carrier Access Act of 1986 (ACAA); the Rehabilitation Act of 1973, as amended (RA); and the Architectural Barriers Act of 1968, as amended (ABA) which affect the architectural or program accessibility of airports in the U. S. transportation system and employment opportunities on these airports for individuals

with disabilities. This AC applies to airports operated by public entities and those receiving federal financial assistance.

“ADA Standards for Accessible Design.” 28 CFR Part 36. U.S. Department of Justice. (July 1, 1994). <http://www.usdoj.gov/crt/ada/adastd94.pdf>. (As of August 25, 2009).

This document sets guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities. These guidelines are to be applied during the design, construction, and alteration of such buildings and facilities to the extent required by regulations issued by federal agencies, including the Department of Justice, under the Americans with Disabilities Act of 1990.

“The Airline Deregulation Act.” (1978).

This law decreased the federal government’s control over commercial aviation. The Federal Aviation Administration (FAA) could no longer control fares, routes, and market entry. However, the FAA retained its authority over airline security and safety. The act was intended to lower fares and increase competition.

“Airport Capacity and Delay.” Advisory Circular 150-5060-5. U.S. Department of Transportation, Federal Aviation Administration. (September 23, 1983). http://www.faa.gov/documentLibrary/media/advisory_circular/150-5060-5/150_5060_5.pdf. (As of August 25, 2009).

This advisory circular (AC) explains how to compute airport capacity and aircraft delay for airport planning and design. Hourly airport capacities and annual aircraft delay computations are needed to design and evaluate airport development and improvement projects. The method for computing airport capacity and aircraft delay is the throughput method provided in this AC.

“Airport Curbside and Terminal Area Roadways Operations.” ACRP Project 07-02. Transportation Research Board. (Expected publication 2009).

This document developed guidance to help analyze the operation of the airport curbside and the terminal-area roadways, including the effects of direct access points such as on-airport commercial parking, rental car operations, and hotels.

“Airport Curbside Planning and Design.” Transportation Research Board. (1982). <http://pubsindex.trb.org/document/view/default.asp?bid=181073>. (As of August 25, 2009).

This document developed guidance for a method of estimating airport curbside demand and procedures for adjusting this demand for various service levels. In addition, operating conditions are discussed as well as operational problems that typically occur at an airport curb. Data are presented describing the effects of passenger and vehicular activity at the airport curb areas. Factors influencing operational problems at the curb are addressed, as well as a means of determining curb frontage requirements, demands, and relating these to levels of service, based on observations at six major U.S. airports. This approach affords airport planners an opportunity to measure the degree of use of the curbside area and to correlate curbside requirements to the effective length of curb. Volumes of originating and terminating passengers were found to be of prime importance in forecasting demand as contrasted to total enplanements and deplanements. The enforcement level of parking

regulations and corresponding vehicle dwell time was found to strongly influence curbside capacity. Design considerations such as roadway and sidewalk widths that affect the efficiency of the curb are presented, and criteria are recommended.

“Airport Design.” Advisory Circular 150/5300-13. U.S. Department of Transportation, Federal Aviation Administration. (September 29, 1989). http://www.faa.gov/airports/resources/advisory_circulars/media/150-5300-13/150_5300_13.pdf. (As of August 25, 2009).

This advisory circular (AC) contains the Federal Aviation Administration’s (FAA) standards and recommendations for airport design. The standards and recommendations contained in this AC are recommended by the FAA for use in the design of civil airports. For airport projects receiving federal grant-in-aid assistance, the use of these standards is mandatory.

“Airport Development Reference Manual.” International Air Transport Association. (Jan 2004).

This manual provides a guide for best practice airport design all over the world. It combines recommendations from experts and industry specialists relating to all areas of airport design: planning, development, financing, and operation.

“Airport Ground Access Mode Choice Models.” ACRP Synthesis Report 5. Transportation Research Board. (2008).

This report addresses airport ground access mode choice models and how they are involved in airport planning.

“Airport Ground Access Planning Guide.” Transportation Systems Center. Cambridge, MA. (July 1980). <http://ntl.bts.gov/DOCS/AGAPP.html>. (As of August 25, 2009).

This report presents the results of the first phase of a project jointly sponsored by the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA). It outlines the process for planning ground access to airports within the context of current laws, regulations, and procedures. This report identifies the key components of an airport access work program, discusses performance measures, and provides extensive information on alternative strategies for improving airport access conditions.

“Airport Improvement Program Handbook.” Order 5100.38C. U.S. Department of Transportation, Federal Aviation Administration. (28 Jun 2005).

This handbook gives directions to the Federal Aviation Administration (FAA) staff on how to implement and manage the Airport Improvement Program.

“Airport Passenger Buildings: Efficiency through Shared Use of Facilities.” Massachusetts Institute of Technology. http://ardent.mit.edu/airports/ASP_papers/Belinshareduse.PDF. (As of August 25, 2009).

This paper provides a comprehensive guide to the design of shared facilities, which are detailed through appropriate analyses of various instances. This paper implies that the design of passenger buildings should normally include shared space, swing gates, and shared buffer facilities.

"Airport Pavement Design and Evaluation." Advisory Circular 150/5320-6. U.S. Department of Transportation, Federal Aviation Administration. (30 Jan 1996).

This Advisory Circular provides guidelines related to the design and evaluation of pavements at civil airports.

"Airport Research Needs: Cooperative Solutions." Special Report 272. *Transportation Research Board*. (2003).

This report presents the argument to establish cooperative research between airports so that airport security, efficiency, safety, and environmental compatibility are ensured.

"Airports & Air Traffic: Design Standards." U.S. Department of Transportation, Federal Aviation Administration. (May 25, 2007).

http://www.faa.gov/airports_airtraffic/airports/construction/design_standards/. (As of August 25 2009).

This website provides a quick reference to design standards for various airport-related equipment, facilities, and structures from the Series 150 Advisor Circular Library.

"Airport Sponsor Assurances." U.S. Department of Transportation, Federal Aviation Administration. (Mar 2005).

http://www.faa.gov/airports/aip/grant_assurances/media/airport_sponsor_assurances.pdf. (Accessed May 13, 2009).

This document provides information for airport planners and developers who enter into certain types of grant agreements with the federal government. The document details assurances, or obligations, that must be complied with.

"The Airport System Planning Process." Advisory Circular 150/5070-7. U.S. Department of Transportation, Federal Aviation Administration. (November 10, 2004). "The Airport System Planning Process." Advisory Circular 150/5070-7. (As of August 25, 2009).

This Advisory Circular (AC) provides guidance for use in accomplishing effective airport system planning. The main purpose of the airport system planning process is to determine the type, extent, location, timing, and cost of the airport development needed in a state or metropolitan area to establish a viable system of airports. The aviation planning agency and the FAA should use the findings of the planning process to guide them in making informed decisions regarding which local airport development proposals to consider for future review and support.

"Airport Technical Design Standards Passenger Processing Facilities." U.S. Department of Homeland Security, Customs and Border Protection. (Aug 2006).

<http://www.dhsprojects.com/SAS-DO-SO/CBPAirportTechnicalDesignStandards.pdf>. (As of July 30, 2009).

This document presents the U.S. Customs and Border Protection (CBP) requirements and recommendations for the planning, design, renovation, and development of passenger processing facilities at airports. It aims to provide clear guidance and protocol in order to protect American citizen safety. Both traditional methods and innovative approaches are used.

“Americans with Disabilities Act.” (1990).

This federal law prohibits discrimination against any individual due to disability. Employers, including state and local agencies, are required to make reasonable accommodations for employees with disabilities. Furthermore, persons with disabilities may not be discriminated against in transportation, public accommodation, communications, and governmental activities.

“Annex 14.” International Civil Aviation Organization. (July 2004).

This document describes requirements set forth by the Convention on International Civil Aviation. It provides standards and recommended practices for aerodromes, including airport planning and design. It discusses facilities for airport movement and specifications for airspace requirements. Overall, the document seeks to promote greater safety in aviation.

“A Policy on Geometric Design of Highways and Streets, 5th Edition.” American Association of State and Highway Transportation Officials. (Nov 2004).

This book, prepared by the American Association of State and Highway Transportation Officials (AASHTO), is often referred to as the “Green Book.” This book presents updated recommendations and uniform practices for standard highway geometric design.

“Approaches to Integrating Airport Development and Federal Environmental Review Processes.” ACRP 11-03. Transportation Research Board. (Expected completion 2009.)

This document explores how the Federal Aviation Administration (FAA) and individual airport sponsors can increase the efficiency of the environmental review during airport planning and development processes. In particular, it focuses on inefficiency associated with changing airport project definitions. Procedures for better integrating environmental considerations with overall project development are proposed.

“ATA Facility Planning Guidelines SG 901: New Baggage Handling Systems for Passenger Terminals.” Air Transport Association of America, Inc. (March 2006).

This document presents recommendations for the planning and implementation of new baggage handling systems for passenger terminals. This information is intended to assist all parties involved in the design, manufacturing, installation, and utilization of baggage handling systems.

“Aviation and Transportation Security Act.” (2001).

This act, enacted following the attacks on September 11, 2001, established the Transportation Security Administration as the authority over airport security. It also presented guidelines for a more secure air travel system including requirements for checked baggage screening and the federalization of airport security screeners. It set up a timeline for improved civil aviation security.

“Aviation Crossroads: Challenges in a Changing World – The Proceedings of the 23rd Air Transport Conference.” Air Transport Division of the American Society of Civil Engineers. Arlington, VA. (June 22-24, 1994).

This paper reviews alternative configurations of roadway and curbside facilities designed to accommodate commercial vehicle passenger pick-up and drop-off. In addition, the use of operation and management measures such as commercial vehicle permitting and fees and the use of Automatic Vehicle Identification (AVI) systems are also described.

“Aviation Security Improvement Act.” (1990).

This act presented recommendations for improving security in airports. In particular, it created the position of Director of Intelligence and Security in the Department of Transportation and encouraged investigations into the security of individual airports.

“Aviation Systems Performance Metrics.” U.S. Department of Transportation, Federal Aviation Administration. <http://aspm.faa.gov>. (As of July 30, 2009).

This website is maintained by the Federal Aviation Administration (FAA) and contains airport utilization statistics.

“The Airport: Architecture – Urban Integration – Ecological Problems.” Edward G. Blankenship. (1974).

This document presents guidelines for airport interface design specifically focusing on terminal sizing, terminal configuration, airport airside, and airport landside.

“Bureau of Transportation Statistics.” U.S. Department of Transportation, Research and Innovative Technology Administration. <http://www.bts.gov>. (As of July 30, 2009).

This website was created by the U.S. Department of Transportation and includes several useful databases that describe airline and airport activity. These include Form 41, OD1a databases, and T-100 databases. Furthermore, it lists various vendors that preprocess and analyze the databases.

“Change 1 to Airport Master Plans.” Advisory Circular 150/5070-6B. U.S. Department of Transportation, Federal Aviation Administration. (May 1, 2007). http://www.faa.gov/documentLibrary/media/advisory_circular/150-5070-6B/150_5070_6b_chg1.pdf. (As of August 25, 2009).

This Advisory Circular (AC) provides guidance for the preparation of master plans for airports that range in size and function from small general aviation to large commercial service facilities. The intent of this AC is to foster a flexible approach to master planning that directs attention and resources to critical issues. The scope of each master plan must be tailored to the individual airport under evaluation.

“Coastal Zone Management Act.” National Oceanic and Atmospheric Administration. (1972).

http://coastalmanagement.noaa.gov/czm/czm_act.html. (As of January 3, 2008).

Due to increased growth in coastal regions, this government act was enacted to preserve, protect, and develop the United States’ coastal resources. These coastal resources include wetlands, beaches, coral reefs, fish, wildlife in these habitats, and many other coastal features. In particular, the act tries to balance competing land and water issues.

Participation is voluntary, but federal financial compensation is available to any state, tribe, or territory that participates. An amendment added in 1990 encourages states, tribes, and territories to implement solutions to reduce nonpoint source pollution.

“Common Use Facilities and Equipment at Airports.” ACRP Synthesis 8. Transportation Research Board. (2008).

This document discusses common use technology. It provides guidelines for airport operators to be able to take space previously used by a single airline and make it available for use by multiple airlines.

“Common Use Passenger Processing System (CUPPS).” International Air Transport Association. (October 2004).

This is an official IATA- and ATA-sanctioned process (as approved by the Joint Passenger Services Conference (JPSC) in October, 2004), with the additional patronage of Airports Council International (ACI). CUPPS is an overhaul of the former CUTE standard, and is the generic term applied to standardized system platforms for agent-facing common-use implementations at airports.

“Design and Construction Guidance for Community Safe Rooms.” FEMA 361, Second Edition. U.S. Department of Homeland Security, Federal Emergency Management Agency. (August 2008).

This document discusses the design and construction of community safe rooms that protect people during hurricane, tornado, or other high-wind emergencies. Some designs could accommodate up to twelve people, while others could hold several hundred. These rooms are intended to provide near-absolute life safety.

“Design of Aircraft Deicing Facilities.” Advisory Circular 150/5300-14B. U.S. Department of Transportation, Federal Aviation Administration. (February 5, 2008).

This document provides standards, specifications, and guidelines for the design of aircraft deicing facilities.

“Development of State Standards for Non-Primary Airports.” Advisory Circular 150/5100-13A. U.S. Department of Transportation, Federal Aviation Administration. (September 28, 1999).

http://www.faa.gov/documentLibrary/media/advisory_circular/150-5100-13A/150_5100_13a.pdf. (As of August 25, 2009).

This advisory circular (AC) provides guidelines for the development of state standards for non-primary public-use airports as provided for in Title 49 United States Code, Section 47105 (c). The FAA recommends the use of the guidance in this publication for the preparation of design standards and specifications for pavement construction at non-primary public-use airports for those airports using federal grant-in-aid assistance in the funding of those projects.

“Download Human Factors Design Standard.” U.S. Department of Transportation, Federal Aviation Administration. (June 13, 2007).

http://hf.tc.faa.gov/vti_bin/shtml.dll/hfds/download.htm. (As of August 25, 2009).

This website provides a free multi-platform download of the Human Factors Design Standard in Adobe Acrobat format. As the National Airspace System (NAS) continues to modernize, new systems and equipment are continually being added to the existing architecture. The integration of human factors into the development and procurement of these new systems is vital to the success of the future NAS. Formerly known as the Human Factor Design Guide (FHDG), the information within has been revised and expanded since its original version, changing into standards instead of guidelines.

“Air Quality Procedures for Civilian Airports and Air Force Bases.” FAA-AEE-97-03. U.S. Department of Transportation, Federal Aviation Administration. Draper, Webb, Pernigotti Augustine, and Liang Plante. (April 1997).

This guidebook provides comprehensive directions for evaluating the impact of airport actions on air quality. Air quality assessments are required in order to comply with provisions from the National Environmental Policy Act (NEPA), the Clean Air Act (CAA), and other government policies. This book also outlines specific procedures and methodologies for performing air quality assessments.

“Entry and Competition in the U.S. Airline Industry: Issues and Opportunities.” Special Report 255. Transportation Research Board. (1999).

After new-entrant air carriers formally complained that older carriers were using predatory pricing to shut down competition, the Department of Transportation (DOT) considered making new regulations to address these practices. The Transportation Research Board (TRB) examined entry and competition in the U.S. airline industry and recommended that DOT refrain from enacting new regulations. Instead, TRB recommended that DOT use other already established policies to promote new carrier entry.

“Environmental Desk Reference for Airport Actions.” APP-400. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Planning and Programming. (October 2007).

http://www.faa.gov/airports/environmental/environmental_desk_ref/media/desk_ref_intro.pdf. (As of August 4, 2009).

This reference serves as a compilation of information for airport developers that is pertinent to implementing the National Environmental Policy Act (NEPA) and related “special purpose laws.” To comply with these laws, airport developers must prepare environmental analyses. This reference focuses on procedures for meeting the requirements of these analyses.

“ERA Guidelines on High Quality Passenger and Aircraft Handling.” European Regions Airline Association. (August 2004).

<http://www.eraa.org/intranet/documents/105/516/ERAA5passengerAChandlin.pdf>. (As of August 25, 2009).

This document provides guidelines that were published by the European Regions Airline Association (ERA) Directorate and have been developed through consultation and discussion between ERA members (airlines, airports, and suppliers). The guidelines are not designed as rigid rules, but rather as a list of suggested topics which airports, handling companies,

and airlines can, depending on local circumstances, review together with the aim of agreeing if any of the measures may improve the provision, cost effectiveness, and quality of services delivered.

“Guidelines for Airport Signing and Graphics, Terminals and Landside.” Air Transport Association of America. (2001) Joseph Erhart.

This guidebook provides useful recommendations for the design of airport terminal signing systems. It includes information on signing philosophy, standard terminology, regulatory signage, Federal Inspection Services facility signage, lettering styles, color coding aviation symbols, arrow graphic applications, material selection, and signage maintenance. The Federal Aviation Administration recommends its use.

“Fact Book.” Airport Revenue News. (2008).

This book is a compilation of data related to revenue information from 95 North American airports. It includes details on sales from food and beverages, specialty retail, news and gifts, duty free, passenger services, and terminal advertising. In addition, many other services such as parking and car rental revenue are outlined.

“Farmland Protection Policy Act.” U.S. Department of Agriculture. (1994). <http://www.nrcs.usda.gov/programs/fppa/>. (As of August 25, 2009).

This government act protects farmland in the U.S. from urbanization. It intends to stop unnecessary conversion of farmland to other nonagricultural uses because of federal programs. As a result, waste of energy and resources is reduced.

“Controlling the Airport Data Grid.” Airport Transport World, Vol. 36. No. 6. J. Feldman. (1999).

This magazine article from Airport Transport World is not available on their online database of past publications.

“Pedestrian Planning and Design.” Metropolitan Association of Urban Designers and Environmental Planners. revised edition. John J. Fruin. New York. (1987).

This document provides information to improve the pedestrian experience in-between streetscapes and buildings. It specifically examines human factors such as physiology and psychology to determine the comfortability and convenience of these spaces.

“Airport Ground Access.” M. Gorstein, L. Frenkel, R. Marek. Federal Aviation Administration, Office of Systems Engineering Management. (October 1978).

This technical report is an outgrowth of a study requested by Congress to determine the extent to which inadequate (off-airport) ground access to airports constrains airport capacity and air travel. Case studies of sixteen commercial airports of various sizes and locales were prepared. The report describes these case studies and includes the following: (1) An identification and projection of the access capacity of representative airports; (2) A determination as to whether access needs at these airports are adequately considered in the planning process; (3) An identification of the potential solutions to noted access problems; and (4) An identification of projects for consideration by local public bodies and planning authorities which may improve airport access in selected cases. Also included is a 1978 update of the ground access to airports study prepared by the Federal Highway Administration (FHWA).

"Analysis of Changes in Airport Ground Access Mode Use." Pgs 63-77 Meeting the Challenge: Rebuilding Inner City Airports 1996. Geoffrey D. Gosling. American Society of Civil Engineers. (April 15, 1996). <http://cedb.asce.org/cgi/WWWdisplay.cgi?9603427>. (As of August 25, 2009).

These proceedings, *Meeting the Challenge: Rebuilding Inner City Airports*, includes papers presented at the 24th International Air Transportation Conference in Louisville, Kentucky, June 5-7, 1996. This volume discusses the issues involved with the redevelopment of inner city airports. It covers such topics as 1) airport planning, 2) financing, 3) airfield pavements, 4) airport security, 5) terminal planning and accessibility. Redevelopment of the Louisville International Airport to include UPS expansions and relocation of Air National Guard facilities is also included.

"Ground Access to Airports." Institute of Transportation Studies, UCB. Geoffrey Gosling. (December 1994).

This document contains the proceedings of two workshops sponsored by the FAA.

"Grant Assurances (Obligations)." U.S. Department of Transportation, Federal Aviation Administration. (Last updated June 25, 2009). http://www.faa.gov/airports/aip/grant_assurances/.

This is a section of the FAA's official website which defines a grant assurance. It explains that in order to receive federal financial assistance, often airport planning agencies and other organizations must agree to fulfill certain obligations, such as putting a particular safety condition into practice. Also, the site provides links to other information relating to grant assurances.

"Ground Access to Major Airports by Public Transportation." ACRP Report 4. *Transportation Research Board*. (2007). http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_004.pdf (As of July 30, 2009).

This document discusses recent trends in planning and developing airport ground access. It presents characteristics of effective ground access and strategies to implement better access.

"A Guidebook for Measuring Performance of Automated People Mover Systems at Airports." ACRP 03-07. *Transportation Research Board*. (Expected publication 2009).

This guidebook is a user-friendly aid for measuring the efficiency, effectiveness, and quality of automated people mover systems at airports. It identifies measures and data requirements for completing necessary assessments.

"Guidebook for Planning and Implementing Automated People Mover Systems at Airports." ACRP 03-06. *Transportation Research Board*. (Expected publication 2009).

This guidebook serves as a comprehensive resource for planning and implementing automated people mover (APM) systems in airports. It covers APM systems that provide transportation on airport grounds as well as access to remote facilities such as airport parking, car rental facilities, hotels, etc.

“Guidelines for Airport Capacity/Demand Management.” International Air Transport Association. (1990).

This report aids airport operators and air carriers to manage the limitations of airport capacity and to maximize the utilization of their facilities and resources.

“Guide to the ADA and ABA Standards.” <http://www.access-board.gov/ada-aba/guide.htm>. (As of August 25, 2009).

This website gives details regarding ADA and ABA standards according to facility type that are currently in effect. ADA Standards utilize facility types such as: public accommodations/commercial facilities, state/local government, and transportation facilities; while ABA Standards utilize housing, federal, postal, and military facilities. These facility types are listed with direct links to the ADA and ABA Standards and other related information.

“The Airport Passenger Terminal.” Walter Hart. (1991).

This document elaborates on the complete terminal planning process, specifically focusing on the processes of forecasting, space calculations, and design.

“Highway Capacity Manual.” Transportation Research Board. (2000).

This manual was developed from decades of research from various agencies using advanced analysis methodologies. It provides guidelines and procedures for determining the capacity and quality of various highway systems.

“IAQ Guidelines for Occupied Buildings under Construction.” Sheet Metal and Air Conditioning National Contractors’ Association. (1995).

This document outlines effective practices for maintaining indoor air quality in occupied buildings under construction or significant maintenance. It includes examples, references, resources, and specific methods to aid project managers. Air pollutant management, control measures, quality control and documentation, and communication with occupants are addressed.

“Impact of New Large Aircraft on Airport Design.” DOT/FAA/AR-97/26. U.S. Department of Transportation, Federal Aviation Administration. (March 1999). <http://www.tc.faa.gov/its/worldpac/techrpt/ar97-26.pdf>. (As of August 25, 2009).

This report is intended to predict the impact of the introduction of new large aircraft (NLA) on the airport environment and on the corresponding Federal Aviation Administration’s (FAA) Advisory Circulars covering airport design. This report identifies several key design and operational characteristics of proposed NLA that will need to be taken into consideration before such aircraft are introduced into the current airport environment. Specific elements of airport planning and design that may be affected by these changes in aircraft characteristics have been identified to assist airport planners and the FAA in preparing for the NLA’s arrival. In addition, a 20-year projection of NLA development and a qualitative cost and compatibility assessment of introducing NLA to a sample airport that currently serves the Boeing 747 are included in this report.

"Improving Public Transportation Access to Large Airports." TCRP Report 62. Federal Transit Administration. (2000).

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_62-a.pdf. (As of August 25, 2009).

The report examines legal, financial, institutional, technical, jurisdictional, and other factors affecting public transport to airports. It contains lessons learned from successful rail access systems, new and emerging technologies, definition of the airport ground access market, and airport ground access passenger survey techniques.

"Innovations for Airport Terminal Facilities." ACRP Report 10. Transportation Research Board. (2009).

This report explores new concepts in the way that airport terminal facilities are designed in airports around the world. These innovations improve passenger accessibility and the level of service between ground transportation and other secure parts of the terminal. The report also examines future trends in passenger service and processing procedures.

"Integrated Security System Standard for Airport Access Control." Radio Technical Commission for Aeronautics. (June 19, 2008).

This document is a guide for implementing access control systems as part of the security systems of airports. It discusses design, testing, and evaluating performance, and operational requirements of these systems. It also presents best practices to comply with current government regulations regarding airport security.

"Interim Level of Service Standards." Transport Canada. (1977).

This study developed a set of definitions for passenger Level of Service (LOS) based on the degree of crowding, amount of delay, and ease of flow. This was converted to ranges of area occupied per person based on observations at a limited number of airports.

"Intermodal Ground Access to Airports: A Planning Guide – A Good Start." Transportation Research Board. (1997).

This document adds to the guidance of the *Intermodal Ground Access to Airports: A Planning Guide* on planning airport access, primarily for commercial airports. It provides policy guidance, rules of thumb, data, and analytical techniques. Furthermore, it describes how problems with airport access can be identified and ways to find effective alternative solutions.

"Introduction to the ICC." <http://www.iccsafe.org/news/about/>. (As of August 25, 2009).

The International Code Council (ICC)'s website provides information such as the ICC's vision/mission/values, origin, purpose, publications, services, code development, offices and addresses, board of directors and annual reports.

"Manual on Uniform Traffic Control Devices." U.S. Department of Transportation, Federal Highway Administration. (2003).

This manual presents the requirements and standards for traffic control devices on all streets and highways.

“Measuring Airport Landside Capacity.” Special Report 215. Transportation Research Board. (January 1, 1987).

This report reviews existing capacity assessment techniques and recommends guidelines that can be used by airport operators, planners, and others who must measure airport landside capacity. Congestion, at airport terminal buildings, access roads, and parking areas, increasingly threatens the capability of airports to serve additional passengers and air cargo. Measuring the capacity of these airport landside facilities and services is becoming critical. No generally accepted standards exist for gauging the level of service provided by landside facilities and their operations. This report concludes that current knowledge about the performance of various airport landside components is inadequate to support airport landside service standards at this time. Instead, the report recommends a process for measuring airport landside capacity that takes an important first step toward developing such standards.

“National Environmental Policy Act (NEPA).” (1970).

This federal law requires all federal agencies to assess the environmental impact of proposed federal projects (such as airports) that could significantly impact the environment. An prepare an Environmental Impact Statement should be prepared. This statement discusses the purposes and needs of the project, alternatives, and the resulting environmental consequences should the project be implemented.

“National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions.” FAA Order 5050.4B. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Planning and Programming. (April 2007).

This order seeks to help airport planners and developers address possible environmental impacts of proposed airport projects. Furthermore, it gives airport sponsors clear instructions for implementing airport projects in compliance with NEPA standards and regulations.

“National Fire Protection Association (NFPA).” <http://www.nfpa.org>.

The National Fire Protection Association’s website provides information regarding safety information, codes and standards, education, fire services, training, research, membership, NFPA catalog, and publications.

“Obstruction Marking and Lighting.” Advisory Circular 70/7460-1. U.S. Department of Transportation, Federal Aviation Administration. (February 1, 2007).

This Advisory Circular focuses on Obstruction Marking and Lighting within an airfield. The circular provides regulations for specific structure markings and lighting. This may include paint color and pattern requirements as well as guidelines for flashing lights within the obstruction light system of an airfield. The document also provides safety markings and lighting regulations for structures that pose air navigation hazards.

"Passenger Terminal Design." Massachusetts Institute of Technology. Odoni, Amedeo, and Richard de Neufville.
http://ardent.mit.edu/airports/ASP_papers/Pax%20bldg%20design.PDF. (As of August 25, 2009).

This paper presents practical procedures for incorporating stochastic considerations into terminal design, based both on theory and extensive experience internationally at major airports. The approach builds on detailed consideration of the sequences of flows of the passengers, their likely dwell-time in each facility, and their psychological response to the configuration of the spaces.

"The Official Airline Guide." <http://www.oag.com>. (As of July 30, 2009).

This guide is a compilation of a vast amount of data relating to flight-by-flight scheduled airline activity including aircraft type, number of seats, arrival and departure time, flight numbers, fares, and full flight itineraries.

"Part 77: Objects Affecting Navigable Airspace." Title 14 Aeronautics and Space. U.S. Department of Transportation, Federal Aviation Administration. (Last revised 2004).

Part 77 focuses on the obstruction and construction standards that may affect air navigability and includes regulations behind notice of construction, obstruction standards, and aeronautical studies on navigable airspace. The section also states the rules of practice for proposed construction hearings.

"Passenger and Cabin Baggage Screening Major International Airport." *International Civil Aviation Organization*. (November 24, 2006).
<http://www.icao.int/icao/en/ro/nacc/meetings/2006/20ECARDCA/20ecardcawp23.pdf>. (As of August 25, 2009).

This document provides important information regarding passenger and cabin baggage screening. Screening and searching of passengers and their baggage is an essential and basic part of aviation security. The use of adequate screening technology and proper layout can ensure that the screening checkpoint can detect all dangerous and prohibited items without impeding on the flow of passengers.

"Passenger Facility Charge." Order 5500.1. U.S. Department of Transportation, Federal Aviation Administration. (August 9, 2001).

This document discusses how Federal Aviation Administration (FAA) staff should implement and manage the Passenger Facility Charge Program.

"Passenger Space Allocation Guidelines for Planning and Design of Airport Terminals." ACRP 03-05. Transportation Research Board. (Expected completion 2009).

This report assesses the increasing volume of passengers entering airports and its effect on terminal use. It contains guidelines for passenger space allocation design based on level-of-service scales determined from research done at ten airports.

“Planning and Design Guidelines for Airport Terminal Facilities.” Advisory Circular 150/5360-13. U.S. Department of Transportation, Federal Aviation Administration. http://www.faa.gov/documentLibrary/media/advisory_circular/150-5360-13/150_5360_13.PDF. (As of August 25, 2009).

This advisory circular (AC) provides guidelines for the planning and design of airport terminal buildings and related access facilities. The material and monographs included herein provide general guidelines and approximations for determining space and terminal facility requirements for planning purposes. It is not intended that they be used to replace the detailed engineering analyses necessary for the specific design of individual airport terminal facilities.

“Planning Guidelines and Design Standards for Checked Baggage Inspection Systems.” Transportation Security Administration. (Oct 2007).

This document is intended to be used by those planning a new checked baggage inspection system in order to assist them in planning how to best meet the CBIS security requirements of the TSA. This guide also provides airport planners with cost-effective solutions.

“Planning Landside Facilities at Major Airports.” Federal Aviation Administration - White Paper prepared for the U.S. Department of Transportation/Volpe National Transportation Systems Center. Peter Mandle. Jacobs Consultancy.

This research paper describes the primary components of an airport landside system and provides an overview of the key planning parameters affecting these components.

“Policies and Procedures for Considering Environmental Impacts.” Order 1050.1E. U.S. Department of Transportation, Federal Aviation Administration. (June 8, 2004).

This document presents policies and procedures for complying with the National Environmental Policy Act (NEPA) and regulations from the Council on Environmental Quality. These requirements apply to legislation proposed by the Federal Aviation Administration (FAA) as well as any grants, loans, contracts, leases, construction, research activities, regulatory actions, etc. that are submitted to the FAA by state and local agencies.

“Policy Regarding Airport Rates and Charges.” Federal Register Vol. 61, No. 21. U.S. Department of Transportation, Federal Aviation Administration. (June 21, 1996, amended August 1998 and July 14, 2008).

This document sets forth the Federal Aviation Administration’s policy regarding fees at federally-assisted airports. Fees for airfield and public use roadways must be based on cost, and guidelines are included for how to determine cost. The 2008 amendment allows operators at congested airports to use landing fees to encourage air carriers to use the airport at less congested times or use an alternate airport to meet regional flight needs.

“Quarantine Stations at Port of Entry Protecting the Public’s Health.” Institute of Medicine of the National Academies. (2005).

This book evaluates the role of federal quarantine stations at U.S. port of entries in several major airports. These quarantine stations are designed to protect public health and reduce the risks associated with the entry of infectious diseases into the U.S. from sources abroad.

This book focuses on providing guidelines for the expansion of these quarantine stations in airports across the country.

“Apron and Terminal Building Planning Manual.” Ralph M. Parsons Company. Report FAA-RD-75-191. U.S. Department of Transportation, Federal Aviation Administration. (July 1975).

This report was prepared for the FAA and presents recommendations for terminal building areas and apron space. It focuses on aprons, connectors, terminals, and curb parking and roadways. Furthermore, it analyzes the effect of airport traffic volumes, types, and station characteristics on space.

“The Apron-terminal Complex.” Ralph M. Parsons Company. Report FAA-RD-73-82. U.S. Department of Transportation, Federal Aviation Administration. (1973).

This report discusses the principal considerations involved in the planning of an airport apron-terminal complex. It explores the four common design concepts (pier, satellite, linear, and transporter) and evaluates their effectiveness for specific airport conditions.

“Recommended Security Guidelines for Airport Planning, Design, and Construction.” U.S. Department of Homeland Security, Transportation Security Administration. (June 15, 2006).

http://www.tsa.gov/assets/pdf/airport_security_design_guidelines.pdf.

(As of August 25, 2009).

This document presents recommendations for incorporating sound security considerations into the planning, design, construction, and modification of security-related airport facilities and airport terminal buildings. It consolidates information developed through the participation of the Transportation Security Administration (TSA) and other government and aviation industry professionals.

“Runway Length Requirements for Aircraft Design.” Advisory Circular 150/5325-4B. U.S. Department of Transportation, Federal Aviation Administration. (1 July 2005).

This document provides design standards and guidelines for determining recommended runway lengths for new runways or extensions to existing runways.

“Security Checkpoint Design Guide.” Transportation Security Administration. (February 2006).

This document provides guidance to airport planners and Transportation Security Administration officials as they consider laws that mandate that air travelers and their carry-on baggage be screened. It describes security screening checkpoint equipment and processes. In addition, it provides suggestions for screening practices and ways to implement new technology and practices.

“Security Guidelines for General Aviation Airports.” Transportation Security Administration. (May 2004).

http://www.tsa.gov/assets/pdf/security_guidelines_for_general_aviation_airports.pdf. (As of August 25, 2009).

This document is intended to provide owners, operators, sponsors, and other entities charged with oversight of GA airports, a set of federally-endorsed security enhancements and a method for determining when and where these enhancements may be appropriate.

The document does not contain regulatory language nor is it intended to suggest that any recommendations or guidelines should be considered a mandatory requirement.

“Intermodal Ground Access to Airports: A Planning Guide – A Good Start.” BMI for FHWA. Phillip S. Shapiro. (December 2005).

<http://ntl.bts.gov/lib/7000/7500/7502/789764.pdf>. (As of August 25, 2009).

This Guide is designed to provide policy guidance, rules of thumb, data, and analytical techniques related to airport access. It has been prepared to help airport operators, local governments, metropolitan planning organizations (MPO's), consultants, and others identify the nature of airport access problems, identify alternative solutions and evaluate their effectiveness. It primarily compiles information from other sources; however, it does summarize and present this information so that it can be used to systematically analyze airport access problems and alternative solutions.

“Terminal Groundside Access Systems.” U.S. Department of Transportation, Federal Aviation Administration White Paper. Fred Silverman (April 9, 2007)

This research document provides an overview of the terminal groundside access system elements and describes the procedures, tools and standards involved in a comprehensive study approach to terminal landside planning.

“Spreadsheet Models for Terminal Planning and Design.” ACRP Project 07-04. Transportation Research Board. (Expected publication 2009).

This document serves to provide employees of airport operators with user-friendly spreadsheet models for common computerized analyses relating to passenger terminal planning and design. In addition, manuals for each spreadsheet are included.

“Standards for Specifying Construction of Airports.” Advisory Circular 150/5370-10B. U.S. Department of Transportation, Federal Aviation Administration. (April 25, 2005).

This advisory circular (AC) provides standards for the construction of airports. Items covered in this AC include general provisions, earthwork, flexible base courses, rigid base courses, flexible surface courses, rigid pavement, miscellaneous, fencing, drainage, turfing, and lighting installation.

“Strategies for Improving Public Transportation Access to Large Airports.” TCRP Report 83. Federal Transit Administration. (2002).

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_83a.pdf.

(As of August 25, 2009).

This report contains information on improving public mode share for employees, and strategies for improving the management of airport ground access services and distributing intermodal information to the customer.

“Summary of OSHA Regulations and Requirements.”

<http://www.ehso.com/oshaoverview.php#Basic>. (As of August 25, 2009).

The Environmental, Health and Safety Online website provides information concerning who is covered, the basic provisions/requirements of, employee/employer rights and responsibilities, assistance available, penalties, state/local/other federal laws, and personal protective equipment requirements for the Occupational Safety and Health Act of 1970.

"Summary of the Clean Water Act." Environmental Protection Agency. (Last updated 30 July 2009). <http://www.epa.gov/lawsregs/laws/cwa.html>. (As of August 25, 2009).

This website summarizes the Clean Water Act, which is a federal law that gives requirements and recommendations for eliminating and reducing the emission of pollutants into national water sources. It also presents other standards for regulating the quality of water.

"Travel.State.Gov." <http://travel.state.gov>. (As of August 6, 2009).

This website is a part of the U.S. Department of State and provides guidance about travel, particularly international travel, for U.S. citizens. It includes up-to-date travel warnings, information on passports and visas, and many other useful tools.

"United States Standard for Terminal Instrument Procedures (TERPS)." Order 8260.3B. U.S. Department of Transportation, Federal Aviation Administration. (1976).

This document gives standardized methods for designing instrument flight procedures.

"U.S. Airport Passenger-Related Processing Rates." ACRP Project 03-02. Transportation Research Board. (Expected publication 2009).

This document presents a compiled database of passenger processing rates as an electronic spreadsheet. These rates are typically used when determining the facility requirements of current and future airport terminals. They reflect the influence of many airport factors such as type of airline service, type of travel, amount of baggage, and size of party. In addition, this document recommends various procedures to effectively collect passenger-related processing point data.

"U.S. Customs and Border Protection." <http://cbp.gov>. (As of August 6, 2009).

This website is the homepage for the U.S. Customs and Border Protection agency, which is part of the Department of Homeland Security.

"Wayfinding and Signing Guidance for Airport Terminals and Landside." ACRP 07-06. Transportation Research Board. (Expected publication 2010).

This report serves as a guidebook for uniform wayfinding and signing in airport terminals and landside in order to move passengers safely and efficiently. These guidelines reflect changes made necessary by increases in common use facilities, new requirements from the Americans with Disabilities Act (ADA), increasing needs of senior citizens, and the influx of passengers who arrive in the terminal via transit or people mover systems. The guidebook covers terminal areas, curbside and ground transportation, parking, on-airport roadways, and off-airport access roads.

"Winds of Change: Domestic Air Transport since Deregulation." Special Report 230. Transportation Research Board. (1991).

The Transportation Research Board explores how the government should appropriately interact with the airline industry after the Airline Deregulation Act of 1978, which removed many federal economic regulations from air carriers. Deregulation was expected to allow newer, more efficient carriers to effectively compete with older carriers. However, the

report finds that the older carriers used inherited advantages to limit and overcome competition. Regardless, passengers have benefited from the Act due to reduced fares and increased service.

"Operational and Maintenance Considerations in Terminal Planning and Design." Norman D Witteveen. (October 2003).

This document provides background for the Federal Aviation Administration's Advisory Circular, "Planning and Design Guidelines for Airport Terminal Facilities." It contends that operational and maintenance considerations have often been overlooked in favor of other terminal planning considerations. It provides suggestions for including operational and maintenance needs as part of the design process.

Survey Instrument

The survey document was designed as an interactive web-based questionnaire with a series of multiple choice and short answer questions. The purpose of this questionnaire was to gather information about what the industry considers to be the current issues and emerging trends as well as to identify what is currently being used as guidelines, standards, and checklists.

The survey questions focused on important issues and trends currently prevailing in the industry. In addition, questions included lists of standards, guidelines, and checklists used by the industry practitioners. Questions aimed at obtaining basic information about the person/organization taking the survey were also included. The surveying activities took place during a six-week period in October and November 2007.

Survey Airport Selection

A specific list of individual airport stakeholders and their contact information was readied for use in the distribution of the ACRP 07-05 internet survey. The following industry groups were added to the key industry organizations and stakeholders list:

- Airports Consultant Council (ACC)
- American Disabilities Act (ADA)
- Air Transport Association (ATA)
- Building Officials and Code Administration (BOCA)
- Federal Aviation Administration (FAA)
- International Air Transport Association (IATA)
- International Civil Aviation Organization (ICAO)
- Transportation Security Administration (TSA)
- Airport (AAAE, ACI)
- Consultant (ACC, AIA, APA)
- Airline (ATA, IATA)
- Academia (Embry Riddle, MIT, Berkeley, University of Waterloo, University of California Institute of Transport Studies, Virginia Tec, George Mason, University of Aachen)

- Other (ADA, OSHA, BOCA, NFPA)

It was believed that a sample of 71 airports (domestic and international) would provide an adequate universe of information to allow evaluation of their awareness of pertinent issues, trends, standards, guidelines, and checklists on the subject of terminal facility planning and design. In consultation with the Project Panel of experts and the TRB management staff, these numbers grew to 89 airports (domestic and international) so that the survey invitation sample could range across airports of all sizes and of multiple purposes.

Further, the 89 airport authorities and their management were identified on the basis of hub classification of airports adopted from FAA Advisory Circular 150-5360 and the total enplaned passengers in the year 2006 was used. **Table 2-1** below shows the percent of airport contacted for the web survey.

Table 2-1 Hub Classifications

HUB CLASSIFICATION	PERCENT OF TOTAL ENPLANED PASSENGER	NUMBER AIRPORT CONTACTED	PERCENT AIRPORT CONTACTED
Large airport	1.0 percent or more	31	35%
Medium airport	0.25 to 0.9999 percent	31	35%
Small airport	0.05 to 0.249 percent	19	21%
Non Hub airport	Less than 0.05 percent	8	9%

HUB CLASSIFICATION	PERCENT OF TOTAL ENPLANED PASSENGER	NUMBER AIRPORT*	NUMBER AIRPORT CONTACTED
Large airport	1.0 percent or more	32	31
Medium airport	0.25 to 0.9999 percent	37	31
Small airport	0.05 to 0.249 percent	56	19
Non Hub airport	Less than 0.05 percent	54	8

* - 2006 Final Traffic Count Report ACI-NA

Survey Design

The survey was distributed via email to 115 key industry organizations and stakeholders seeking their participation in the research effort. We received 40 responses to the TRB 07-05 questionnaire with varying degrees of information on each question. The information from the survey helped assure that the Guidebook addresses the most pressing issues and emerging trends while understanding what standards and checklists are currently being utilized by these practitioners. In addition, the survey identified a subset of the stakeholders that had interest enough in the study that we could potentially go back to these individuals for clarification or additional input if deemed necessary. The compilation of the survey results are presented in Chapter III.

Compilation of FAA White Papers

FAA has unpublished white papers (42 papers of approximately 15 to 25 pages in length) that were produced by various industry experts on the subject of airport passenger terminals. These papers were a part of the literature review and certain excerpts from the white papers were used in the final version of Airport Passenger Terminal Planning Guidebook while others were utilized as general background materials. The previous annotated bibliography section contains the specific white papers that are referenced in the Guidebook. The titles and authors of all the FAA topic papers that were reviewed relative to the Guidebook research project are the following:

1. Gloria Bender (TransSolutions)
"Programming Domestic Air Terminal Passenger Processing Areas Using Computer Simulation"
2. Peter Bianconi (PDK Airport Planning)
"Recent Experience in Sizing Airport Terminals"
3. Gary Blankenship (Landrum & Brown)
"The Process of Terminal Planning"
4. Tom Brown (Ricondo & Associates)
"Accommodating Changing Airline Requirements in Terminal Design"
5. Tom Brown (Ricondo & Associates)
"Airline Perspectives on Terminal Performance"
6. Greg Casto (AvAir Pros)
"Developing a Space Program for Airport Passenger Terminals"
7. David Daileida (Gensler)
"Considerations for Selecting a Terminal Configuration"
8. Richard deNeufville (MIT)
"Dealing with Uncertainty in the Planning and Design of Airport Passenger Buildings"
9. Richard deNeufville (MIT)
"Valuing Flexibility Measures in the Planning, Design, and Management of Airport Passenger Buildings"
10. Paul Dorsey (Southwest Airlines)
"Airport Terminal Performance: The Low-Cost Carrier Perspective"
11. Paul Dorsey (Southwest Airlines)
"The Air Carrier Perspective on Airport Security"
12. Daniel Feil (Metropolitan Washington Airport Authority)
"Airport Terminal Public Concourse Planning and Design"

13. Andrew Grenier and Steve Rondinelli (Rolf Jensen Associates)
"Airport Terminal Fire/ Life Safety and Emergency Evacuation"
14. Joel Hirsh (Hirsh Associates)
"Developing a Space Program for Airport Passenger Terminals"
15. Joel Hirsh (Hirsh Associates)
"Federal Inspection Services (FIS) Planning Process"
16. Robert Hornblower (IATA)
"IATA Space Standards"
17. Robert Jones (Architects Alliance)
"Developing a Building Concept for Airport Passenger Terminals: Non-Public Areas"
18. Art Kosatka (TranSecure)
"Security Considerations in Airport Terminal Planning"
19. David Lind (Corgan Associates)
"Developing a Building Concept for Airport Passenger Terminals: Considerations for Hub Operations"
20. Peter Mandle (Leigh Fisher Associates)
"Planning Landside Facilities at Major Airports"
21. Doug Mansel (Oakland International Airport)
"Airport Terminal Performance: Airport Operator Perspective"
22. Ted McCagg (Gresham Smith Partners)
"Human Factors Considerations in Terminal Design"
23. Frank McKelvey (Michigan State University)
"Forecasting for Airport Terminal Building Planning"
24. Phil Mein (Corgan Associates)
"Developing a Space Program for Airport Terminal Buildings"
25. Eric Miller (TransSolutions)
"Developing a Building Concept for Airport Passenger Terminals: A Simulation-Based Perspective"
26. Mark Nagle (Leigh Fisher Associates)
"Management and Financial Considerations in Terminal Planning and Design"
27. Mike O'Brien (IATA)
"Passenger Flows at Airports - The Human Element"

28. Colleen Quinn (Ricondo & Associates) & Frederick Busch (Orlando Int. Airport)
"Airport Terminal Apron and Gate Areas"
29. Jim Robinson (Leigh Fisher Associates)
"Implementation and Phasing Considerations in Terminal Planning"
30. Jim Robinson & Derrick Choi (Leigh Fisher Associates)
"Terminal Planning Implications of Emerging Passenger Processing Technologies"
31. LaVern Rollet (Leo A. Daly)
"Boarding Gate and Holdroom Facilities for Airport Passenger Terminals"
32. Joseph Romano (Gensler)
"Developing a Building Concept for Airport Passenger Terminals"
33. Fred Silverman (PB Aviation)
"Terminal Groundside Access Systems"
34. Ron Steinert (Gensler)
"Developing a Building Concept for Airport Passenger Terminals: Terminal Configuration"
35. Marilyn Taylor (Skidmore, Owings, & Merrill)
"The Air Terminal: Program to Concept Design"
36. Keith Thompson (Gensler)
"Developing a Space Program for Airport Passenger Terminals"
37. Keith Thompson (Gensler)
"Interdependence of Security and Terminal Design"
38. Tony Vacchione (Skidmore, Owings, & Merrill)
"Flexibility in Airport Terminal Design"
39. Regine Weston (Weston-Wong Aviation Consultants)
"Developing a Space Program for Airport Passenger Terminals"
40. Regine Weston (Weston-Wong Aviation Consultants)
"Passenger Flow Dynamics and Level of Service in Airport Terminal Buildings"
41. Norm Witteveen (HNTB)
"Operations and Maintenance (O&M) Considerations in Terminal Planning and Design"
42. Harry Wolfe (Maricopa Association of Governments)
"Accommodating Aging Population Needs in Airport Terminals"

Challenges Involved in the Research

In addition to leading the ACRP 07-05 project, L&B is also the lead consultant on the ACRP 07-04 – *Spreadsheet Models for Airport Terminal Planning and Design* research project. The 07-05 Team had determined that the terminal facilities spreadsheet would be incorporated in some manner into the Guidebook. In order to contact the industry stakeholders only once, the research teams of both the projects agreed to launch coordinated internet survey efforts for both the 07-04 and 07-05 research projects. This slightly delayed the launch of the combined internet survey effort.

Another challenge the 07-05 Team faced was the lack of response from the stakeholders in participating in the surveys. The Team provided three E-mail reminders to each contact to expand the potential responses. We also expanded the distribution list to assist in mitigating the initial low level of response. In general, this further delayed the culmination of the survey effort.

As of the writing of this report an unresolved research Team issue involved the preparation and distribution of a notification letter to the FAA white paper authors. The purpose of the letter was to simply notify the white paper authors of the potential use of these materials in the development of the new Guidebook. The research team presented a draft letter to the joint Panels at the review meeting in D.C. in April 2008. The FAA expressed their opinion that this letter should not be issued by the research Team but rather the FAA. As of July 20, 2009 the FAA has not yet issued the notification letter.

CHAPTER III

FINDINGS AND APPLICATIONS

This chapter presents the findings derived from the review of the FAA “white papers”. This chapter describes our Team’s summary comments on the substance and current relevancy of the “white papers” and recommendations for their inclusion, sourcing, and/or exclusion relative to the preparation of the Guidebook. The compilation of the survey results is also included in this chapter.

REVIEW OF FAA WHITE PAPERS

FAA has unpublished white papers (42 papers of approximately 15 to 25 pages in length) that were produced by various industry experts on the subject of airport passenger terminal planning. These papers, written between early 2001 and 2004, were made available to the key technical team members for their review. The papers were reviewed for relevant terminal guidelines to be included in the Guidebook. In most cases papers were not used directly, but influenced the development of guideline content and emphasis.

Although the FAA has ownership of these papers and released them to the Team for use in the development of this Guidebook, the Team requested that the authors be informed of this intended use, and that they would receive credit in the Guidebook. As of the date of this Final Report, such letters have not been sent.

The comprehensive list including titles and authors of the FAA topic papers and brief summary describing each topic paper is given below.

Paper 1 – “Programming Domestic Air Terminal Passenger Processing Areas Using Computer Simulation” - Gloria Bender – TransSolutions

Team Recommendations - The paper includes flow charts of typical enplaning and deplaning functions and outlines the inputs required like time distributions, percentages using various facilities, etc. The paper contains IATA charts for Level of Service and other time-based examples developed by specific airports. The description of Security is pre 9/11. The author includes lists of discreet simulation programming languages and 'checklists' of questions/issues for various processors. In passenger processing discussions, the author omits the role of concessions in interrupting passenger flows and impacting holdroom requirements. Overall it is a good overview of the quantitative side of terminal programming, whether or not a simulation is used.

Paper 2 - ACC/FAA Terminal Workshop Series: “Transport Canada Level of Service Standards Some History, Applications and Recent Experience” - Peter Bianconi - PDK Airport Planning/ –“Recent Experience in Sizing Airport Terminals” - Peter Bianconi - PDK Airport Planning

Team Recommendations - The Transport Canada work indicates that the typical simulations in the 1980s required a lot of data and multiple runs to average out the stochastic. The author points out the problem with simple IATA formulae which do not take arrival time distributions into account. He makes some good points about the fallacies and different consultants' interpretations of Level of Service and IATA standards. Portions of the paper were used in the discussion of Level of Service standard development.

Paper 3 – “The Process of Terminal Planning” - Gary Blankenship - Landrum & Brown

Team Recommendations - Most of the early sections were used in the Guidebook. There is good discussion on the basic process and organization. The author, as part of the Team, has updated the content for inclusion in the Guidebook.

Paper 4 – “Accommodating Changing Airline Requirements in Terminal Design” – Tom Brown - Ricondo & Associates

Team Recommendations - The author looks from airline perspective on programming and facilities. The author points at trade-offs between renovation / new construction and differing airline points of view on the same project. There are good notes on airline non-participation and conflicting policies/data which need to be sorted out by the planner.

Paper 5 – “Airline Perspectives on Terminal Performance” - Tom Brown - Ricondo & Associates

Team Recommendations - The author looks from the airline's perspective and is more focused on operations issues and how these affect airline preferences toward various concepts, such as gate configurations. The paper influenced the related sections of the Guidebook.

Paper 6 – “Developing a Space Program for Airport Passenger Terminals” - Greg Casto - AvAir Pros

Team Recommendations - The author discusses issues between airlines, airport management, and consultants which are not specific to the actual process or approach to quantifying things. He cites many examples of lack of communication between the groups. Some points were used in the section on stakeholder involvement.

Paper 7 – “Basic Terminal Configuration Comparison” - David Daileda - Gensler

- “Considerations for Selecting a Terminal Configuration” - David Daileda – Gensler

Team Recommendations - The author examines some characteristics like flexibility, which are important to terminal planning. In his discussion, he adds a fifth terminal type called ‘simple’ for smaller airports and includes a comparison chart of basic terminal configurations. Elements of the paper were incorporated into the Guidelines. The team also used the terminal graphics of the paper for the Guidebook.

Paper 8 – “Dealing with Uncertainty in the Planning and Design of Airport Passenger Buildings” - Richard deNeufville –MIT

Team Recommendations - The team agrees with the author’s comments that the only certainty is change, which translates directly into the need for flexibility of design. The team considered the discussion about creating more flexible facilities in the three dimensions of space, function, and time to be useful to include in the Guidebook.

Paper 9 – “Valuing Flexibility Measures in the Planning, Design, and Management of Airport Passenger Buildings” - Richard deNeufville –MIT

Team Recommendations - The paper may be supplemented by adding business planning related to terminal operational management. This can be an integral component of the planning process. However, there is a lot of repetition and citation of the author’s previous paper (Paper 8- “Dealing with Uncertainty in the Planning and Design of Airport Passenger Buildings”).

Paper 10 – “Airport Terminal Performance: The Low-Cost Carrier Perspective” - Paul Dorsey - Southwest Airlines

Team Recommendations - There is a general description of low cost carrier (LCC) characteristics. The author concludes that the best-designed airport is the most flexible airport. This would indicate openness to common-use that is not obvious in the behavior of some LCCs. However, the team believes that not many strong issues were cited to differentiate an LCC terminal from any other Origin & Destination airport.

Paper 11 – “The Air Carrier Perspective on Airport Security” - Paul Dorsey - Southwest Airlines

Team Recommendations - There is a general overview of changes in screening since 9/11, but much is already out of date.

Paper 12 – “Airport Terminal Public Concourse Planning and Design” - Daniel Feil -Metropolitan Washington Airport Authority

Team Recommendations - The team considers that the author provides a good description of some planning and design characteristics like wayfinding, degree of spatial experience, Level of Service, public movement, and queuing.

Paper 13 – “Airport Terminal Fire / Life Safety and Emergency Evacuation” - Andrew Grenier / Steve Rondinelli - Rolf Jensen Associates

Team Recommendations - This is a general survey paper on all the typical issues, including codes and applicability to terminals. It also includes issues of evacuation verses security. The paper was incorporated into the Guidebook in Appendix C.

Paper 14 – “Developing a Space Program for Airport Passenger Terminals” - Joel Hirsh - Hirsh Associates

Team Recommendations - The paper gives an overview of terminal programming process including gate forecasts and gate equivalencies such as Narrowbody Equivalent Gate. The author, as part of the Team, has updated the content for inclusion in the Guidebook.

Paper 15 – “Federal Inspection Services (FIS) Planning Process” - Joel Hirsh - Hirsh Associates

Team Recommendations - The paper gives an overview of the process and program considerations prior to the creation of U.S. Customs and Border Protection, and is thus outdated. The author, as part of the Team, has updated the content for inclusion in the Guidebook.

Paper 16 – “IATA Space Standards” - Robert Hornblower – IATA

Team Recommendations - The paper gives a summary of Level of Service concepts. It also has some references on walking speed and other factors which are not in the 9th edition of *Airport Development Reference Manual* by IATA. These were included in the Guidebook as applicable.

Paper 17 - “Developing a Building Concept for Airport Passenger Terminals: Non-Public Areas” - Robert Jones - Architects Alliance

Team Recommendations - The paper gives an overview of considerations for planning airline spaces, and some specific issues like Airline Operation Area, security, vertical dimensions (bag systems), and ramp door widths. It also includes airport administration spaces and functions to be considered and a programming flow chart. The paper influenced some sections of the Guidebook.

Paper 18 – “Security Considerations in Airport Terminal Planning” - Art Kosatka –TransSecure

Team Recommendations - The paper suffers a bit from redundancy and has numerous outdated links to documents that now have later versions, or which contain updated design information. The author, as part of the Team, has updated the content for the Guidebook.

Paper 19 – “Passenger Terminal Programming Sequence for HUB Terminals” - David Lind - Corgan Associates / “Developing a Building Concept for Airport Passenger Terminals: Considerations for Hub Operations” - David Lind -Corgan Associates

Team Recommendations - There is a good discussion of major hub airports and their characteristics. The team considers that there are some worthwhile points to distinguish the big connecting hub from other airports, but some specifics may be outdated.

Paper 20 – “Planning Landside Facilities at Major Airports” - Peter Mandle - Leigh Fisher Associates

Team Recommendations - The paper provides a good description of the primary components of the airport landside system, their planning criteria, and measures of effectiveness. It also includes a discussion on curb Level of Service (LOS), rental car facilities, rail service, pedestrian access facilities, and loading docks. The definitions of curb LOS and the photographic illustrations were incorporated into the Guidebook. Other portions of the paper influenced the sections on landside planning.

Paper 21 – “Airport Terminal Performance: Airport Operator Perspective” - Doug Mansel - Oakland International Airport

Team Recommendations - There is an overview of entities which run airports, general legal frameworks and issues like long-term perspective for passenger experience versus specific operational considerations of airlines, tenants, etc.; balancing stakeholders; economic impact; and financial feasibility. Some paragraphs from these topics were used in the Guidebook.

Paper 22 – “Human Factors Consideration in Terminal Design” - Ted McCagg
- Gresham Smith Partners

Team Recommendations - The author gives an overview of the human factors important to terminal design like pedestrian movement, wayfinding, 'personal space', environmental factors, amenities, and access. The author emphasizes minimizing passenger stress levels in design and also gives directions to choose lighting levels, floor surfaces, etc. The Team considered some good points to incorporate into an overview of the passenger experience.

Paper 23 – “Forecasting for Airport Terminal Building Planning” - Frank McKelvey
- Michigan State University

Team Recommendations - In the paper, there is a description of forecasting passengers in general and then breaking down into the peak hour volumes used for terminal planning. The Team is not sure of any material to use in the Guidebook.

Paper 24 – “Passenger Terminal Programming Sequence” - Phil Mein -
Corgan Associates / **Developing a Space Program for Airport Terminal Buildings** -Phil Mein - Corgan Associates

Team Recommendations - The paper gives an overview of programming for medium sized (15-50 gates) terminals. Some good points from the airline operations functions influenced the Guidebook.

Paper 25 – “Developing a Building Concept for Airport Passenger Terminals: A Simulation-Based Perspective” - Eric Miller – TransSolutions

Team Recommendations - The paper focuses on using simulation to refine the design of the terminal and as a way of checking how well the design performs and meets client goals. There is an interesting discussion on how to quantify client goals like 'world class' and Level of Service definitions are not universally understood or accepted. The author proposes a detailed list of data requirements for modeling. There is a description of validation methods and a flow chart of data/assumptions for modeling. While useful, it was felt that the level of detail related to simulations was beyond what was appropriate for the Guidebook.

Paper 26 – “Management and Financial Considerations in Terminal Planning and Design” - Mark Nagle - Leigh Fisher Associates

Team Recommendations - The paper gives an overview of the non-physical aspects of terminal planning. There are some useful descriptions of rates and charges, lease agreement forms, exclusive use/preferential use, and funding sources etc. The paper was incorporated into the Guidebook in Appendix C.

Paper 27 – “Passenger Flows at Airports” - The Human Element - Mike O'Brien
– IATA

Team Recommendations - The author considers the increased security measures at airports have an undesirable impact on the passenger flow. The author proposes a short list of things to do to improve the screening process. The Team considered use of this paper for the Guidebook as questionable with the changes that have occurred in security.

Paper 28 – “Airport Terminal Apron and Gate Areas Research Paper: Representative Terminal Configurations” - Colleen Quinn / Frederick Busch -
Ricondo & Associates / Orlando Int. Airport

Team Recommendations - The paper gives a qualitative overview of functions of the apron, operational efficiencies, and flexibility. There is a discussion about different configuration types of terminal building design from the aircraft parking perspective. A lot of detail is given about different systems like loading bridges, 400 hz ground power systems, preconditioned air and related operations like Ground Service Equipment (GSE), catering etc. Some of this influenced discussions in the Guidebook.

Paper 29 – “Implementation and Phasing Considerations in Terminal Planning - Jim Robinson” - Leigh Fisher Associates

Team Recommendations - This paper addresses approaches to develop implementation strategies and phasing plans during the planning of a terminal development program. The author gives a description of impacts on passengers during construction, temporary facilities, security, and who to get involved at what stage. Some portions influenced content of the Guidebook.

Paper 30 – “Terminal Planning Implications of Emerging Passenger Processing Technologies” - Jim Robinson / Derrick Choi - Leigh Fisher
Associates

Team Recommendations - The paper presents an overview of changes in passenger behavior due to availability of internet, emergence of Low Cost Carriers (LCCs), enhanced security, etc. The author outlines advantages and disadvantages of current technology applications (airline exclusive kiosks, Common Use Terminal Equipment (CUTE), Common Use Passenger Processing System (CUPPS) etc.) and emerging technologies (Radio-frequency identification (RFID), biometrics, smart cards etc.) on passenger processing. Some portions of the paper influenced content of the Guidebook.

Paper 31 – “Boarding Gate and Holdroom Facilities for Airport Passenger Terminals” - LaVern Rollet - Leo A. Daly

Team Recommendations - The author summarizes boarding gate and holdroom facilities in airport passenger terminals. The paper has some useful diagrams on seating configurations and passenger flow in the holdrooms, some of which influenced content of the Guidebook.

Paper 32 – “Process Flow Chart: Development of an Airport Passenger Terminal Building Concept” - Joseph Romano – Gensler / **“Developing a Building Concept for Airport Passenger Terminals”** - Joseph Romano – Gensler

Team Recommendations - The author proposes lists of things to consider from conception through functional design. There is a typical process flow chart depicting development of airport passenger terminal building concept.

Paper 33 – “Terminal Groundside Access Systems” - Fred Silverman - PB Aviation

Team Recommendations - The author thoroughly describes all the landside planning components and systems. The paper has extensive lists of data to be developed; relationships to terminal peak hour data; and flow charts of landside terminal planning process. There are some specific dimensions and performance criteria which influenced content of the Guidebook.

Paper 34 – “Developing a Building Concept for Airport Passenger Terminals: Terminal Configuration” - Ron Steinert – Gensler

Team Recommendations - The paper describes the planning process of developing an airport passenger terminal building concept and has an illustrative flowchart for the process. The paper influenced the terminal building concept section in the Guidebook.

Paper 35 – “The Air Terminal: Program to Concept Design” - Marilyn Taylor - Skidmore, Owings, & Merrill

Team Recommendations - The paper outlines the process, and the steps by which a program for a terminal is made into a concept design. The paper indicates some specific but generalized information.

Paper 36 – “Airport Terminal Programming Process” - Keith Thompson – Gensler / **“Developing a Space Program for Airport Passenger Terminals”** - Keith Thompson – Gensler

Team Recommendations - The author does not go into details of programming of specific areas, but describes how the program changes through each level of design. It also has an illustrative flowchart for the airport terminal programming process. The paper has a good introductory section on the types of information and factors to consider for the airport terminal programming process which was incorporated into the Guidebook.

Paper 37 – “Interdependence of Security and Terminal Design” - Keith Thompson –Gensler

Team Recommendations - The paper gives an overview of macro and design level impacts including structural and setback issues, and explosives detection screening and security screening checkpoint. However, some of the content is now outdated.

Paper 38 – “Flexibility in Airport Terminal Design” - Tony Vacchione - Skidmore, Owings, & Merrill

Team Recommendations - The author discusses what flexibility means, why it matters, and how it can be achieved. He illustrates by presenting a case study comparing the TWA terminal at JFK with the main terminal at Washington Dulles International Airport, Washington DC. Some sections influenced content of the Guidebook.

Paper 39 – “Developing a Space Program for Airport Passenger Terminals” - Regine Weston - Weston-Wong Aviation Consultants

Team Recommendations - The author has adopted a general approach for the quantification of users (i.e. passengers, visitors, employees) of terminals. She gives emphasis on underlying schedule assumptions and factors. In each section, the author has introduced a “shortcut” which can be utilized if some of the data is not readily available. Some sections influenced content of the Guidebook.

Paper 40 – “Passenger Flow Dynamics and Level of Service in Airport Terminal Buildings” - Regine Weston - Weston-Wong Aviation Consultants

Team Recommendations - The author provides a very extensive and technical discussion of what affects passenger flow. Major portions of the paper were incorporated into Chapter VI of the Guidebook.

Paper 41 – “Operations and Maintenance (O&M) Considerations in Terminal Planning and Design” - Norm Witteveen – HNTB

Team Recommendations - The author outlines checklists for each Operations and Maintenance issue to be considered for each of the functional areas when doing detailed design. The paper was incorporated into the Guidebook in Appendix C.

Paper 42 – “Accommodating Aging Population Needs in Airport Terminals”
- Harry Wolfe - Maricopa Association of Governments

Team Recommendations - The author uses many references and tables to describe issues dealing with seniors using airports. He suggests operational and physical changes to deal with mobility impaired passenger.

SURVEY RESULTS

During the period of approximately six weeks starting from October 19, 2007 to November 26, 2007, Landrum & Brown distributed the internet surveys by email, on the topic of Airport Passenger Terminals, to the airport industry stakeholders and airport organizations.

The survey was designed as an interactive web-based questionnaire with a series of multiple choice, and short answer questions. The purpose of this questionnaire was to gather information about what the industry considers to be the current issues and emerging trends as well as to identify what is currently being used as guidelines, standards and checklists.

The survey consisted of 11 questions aimed at obtaining information on planning/design standards, guidelines, check lists, current issues, and emerging trends from airport personnel and industry sources to be included in the *Airport Passenger Terminal Planning Guidebook*.

The respondents were asked to provide the information on the following topics:

- Set of standards, guidelines, and checklists used when planning and/or designing terminal facilities and their sources.
- How well these standards, guidelines, and checklists address current airline/airport industry conditions?
- The most pressing issues currently facing the industry relative to the planning and design of airport passenger terminals.
- How these current issues and emerging trends impact terminal designs?
- The terminal planning issue most often overlooked or addressed incorrectly.
- Some potential solutions to address the issues and trends.

We received some 40 responses to the TRB 07-05 questionnaire with varying degrees of information on each question. The following is an information summary of the result of the responses for the 07-05 Terminal Guidebook project.

The first four questions of the survey were intended to obtain identifying information like name, organization, phone, and email contact of the respondent. The remaining questions and their responses are as follows:

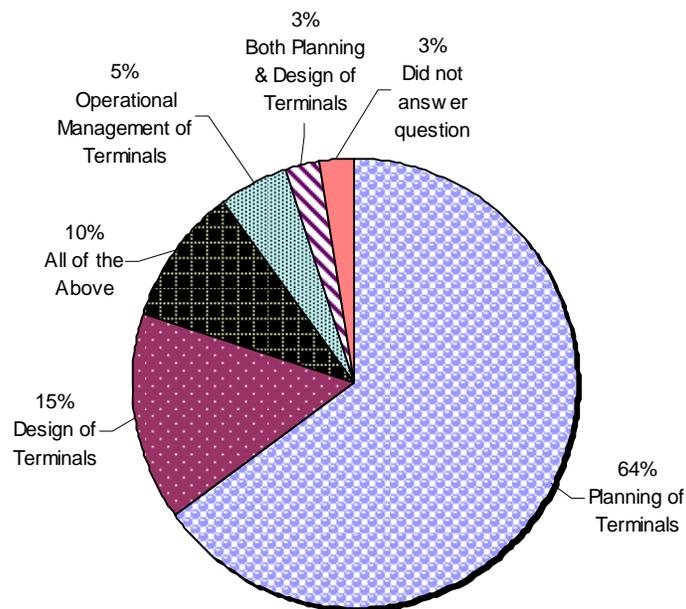
Question 5: Does your primary interest about terminal standards, guidelines, and checklists focus on (please check)

- The planning of terminals
- The design of terminals
- The operational management of terminals
- Other _____

The responses to Question 5 are as followed with the primary interest of respondents percentage graphed in **Figure 3.1**:

Responses	Number
Planning of Terminals	26
Design of Terminals	6
Operational Management of Terminals	2
All of the above	4
Both Planning and Design of Terminals	1
Did not answer question	1
Total Number of Responses	40

Figure 3.1
PRIMARY INTEREST OF RESPONDENTS



Question 6: What standards, guidelines, and checklists do you use when planning and/or designing terminal facilities? Please list them and describe their source of origin.

Question 7: How well do you think the standards, guidelines, and checklists you are using address current airline/airport industry conditions?

The responses to the above questions are combined and listed in **Table 3.1**.

Table 3.1
LIST OF STANDARDS, GUIDELINES, AND CHECKLISTS USED

NAME OF STANDARD	SOURCE	RELEVANCE TO CURRENT INDUSTRY CONDITIONS
Airport Development Reference Manual (18 responses)	IATA	<ul style="list-style-type: none"> · Good starting point. · Too conservative in space assumptions. · Predates widespread kiosk and web check-in, etc. Needs discussion of alternative flows and configurations with respect to self-service options. · THE REFERENCE MANUAL. · Generally good. · Average - some portions applicable, others not as much. · Minimum standards (methodology). · Some information is outdated due to new processing requirements. · Poorly addresses new e-ticketing realities. · May not be applicable to US Airports. · Not always relevant. · Good baseline for comparison with actual facilities. · Reasonably well; better information needed regarding the evolving impact CUSS/CUTE/Online Check-in, Passenger Screening Pressure points and baggage. · Dated, and do not address variances between pax characteristics at different airports. · Average, more international focus than US.
Advisory Circular 150/5360 (5 responses)	FAA	<ul style="list-style-type: none"> · Outdated manual dating to late 1980s. · General guidelines. · Dated in certain parts. · Poor. · General but not comprehensive, need to know more.
Airport Planning and design (3 responses)	Robert Horonjeff / Frank McKelvey	<ul style="list-style-type: none"> · Dated in certain parts. · Minimal. · Good general resource guide.
Pedestrian Planning and Design (2 responses)	Fruin	<ul style="list-style-type: none"> · Good basis, but we modify to airports based on our in-house research activities. · Not airports.
The Apron Terminal Complex	FAA, Sept 1973	Not well.

Table 3.1 (continued)**LIST OF STANDARDS, GUIDELINES, AND CHECKLISTS USED**

NAME OF STANDARD	SOURCE	RELEVANCE TO CURRENT INDUSTRY CONDITIONS
Apron and Terminal Building Planning Manual	FAA, July 1975	Not well.
Proprietary Spreadsheets	Ricondo and Associates	Good detail and based on experiences of many airports. The only drawback is that they don't account for everything (gaming in the terminal) and it works on averages.
Empirical data and historical trends	Airport Authority	Historical data is good but it doesn't help in predicting future changes.
TSA field guide	Fruin	OK for templates, but not a proven track record yet.
Airport and airline surveys of actual operational conditions	NFPA	Timely and pertinent to our analyses.
Analysis of airline operating practices and flight schedules	Arena terminal simulation modeling	Timely and pertinent to our analyses.
Facility Operating Requirements for Canadian Inspection Services	Revenue Canada (now CRA), 1998	Predates introduction of NEXUS-type kiosks, requirements for fingerprinting / photographing of some arriving passengers. Needs to include provision for space and equipment for biometric scans, machine-readable travel documents, etc.
Passenger Terminal Building Design Manual	Transport Canada, 1982	Standards for space, wait time, etc., need to be updated to allow for impacts of new check-in and other passenger processing technology and resulting variations in passenger flows.
ADA-ABA Accessibility Guidelines	United States Access Board	Current standards applicable to all public buildings.
FAA Advisory Circulars (as they apply)		Lacks clarity and detail.
NFPA		Valuable.
Local building codes		Not specific to airports but regulatory.
Only small renovations to date except for FIS work	General planning documents & consultants	Depend on consultants' expertise and experiences.
GOAA Balanced Facility Requirements	Greater Orlando Aviation Authority	Good.
Highway Capacity Manual	TRB	Fair, struggle with unique nature of airport traffic.
IATA	TP 312	
Canadian Building Code	National Fire Code	

Table 3.1 (continued)
LIST OF STANDARDS, GUIDELINES, AND CHECKLISTS USED

NAME OF STANDARD	SOURCE	RELEVANCE TO CURRENT INDUSTRY CONDITIONS
Planning & Design for Terminal - Airport Standards Manual	PA NYNJ	Useful but needs to be updated.
Highway Capacity Manual	AASHTO	Not applicable to airports' special needs regarding unfamiliarity and other distractions.
Ticket counter/bag claim device	Use collection of existing data and extrapolate	Existing data best source of what is currently happening, not clear on what the future holds.
Measuring Airport Landside Capacity	TRB/NRC, 1987	Ok.
FAA Advisory Circulars - Design		Good for airside/less helpful for terminal/landside.
IATA standards		Airline info and airport specific data is better in general.
Passenger Intercept Surveys		Very good, but you never truly know the passengers frame of mind when completing survey - however, this is true of all social science.
Peak Week Data		Good, but sometimes the surveyors are not the best, and validity of data can be skewed due to inconsistent data collection methods.
USGBC		Well
Traffic Models	Synchro, EMME/2, ALPS,	The off the shelf standard transportation models are often hard to apply to airports.
Recommended Security Guidelines for Airport Planning, Design and Construction	TSA June 2006	Very well circa 2006, but needs updating.
Access Control Standard 207	RTCA, Inc. 2001 - in revision	Revised standard will be very worthwhile.
Division 28 - Electronic Safety & Security	Construction Standards Institute, 2004 edition	This is a baseline spec for A&E design and construction.
TSA Recommended Security Guidelines	TSA (FAA)	Very Good - very broad - needs more current updates.
RTCA Access Control Standards	RTCA	Good - hard to keep up with technology, IT standards.
A/Cs, CPB Guidelines, ICAO Annex 17/Manual	FAA, CBP, ICAO	FAA too old; CBP sometimes conflicts, ICAO typically not sufficiently US oriented.
The TCI manual	Proprietary	We developed this stuff over a 20 year period so I think it works pretty well. We are always modifying the details to fit each airport so it is very flexible.

Table 3.1 (continued)
LIST OF STANDARDS, GUIDELINES, AND CHECKLISTS USED

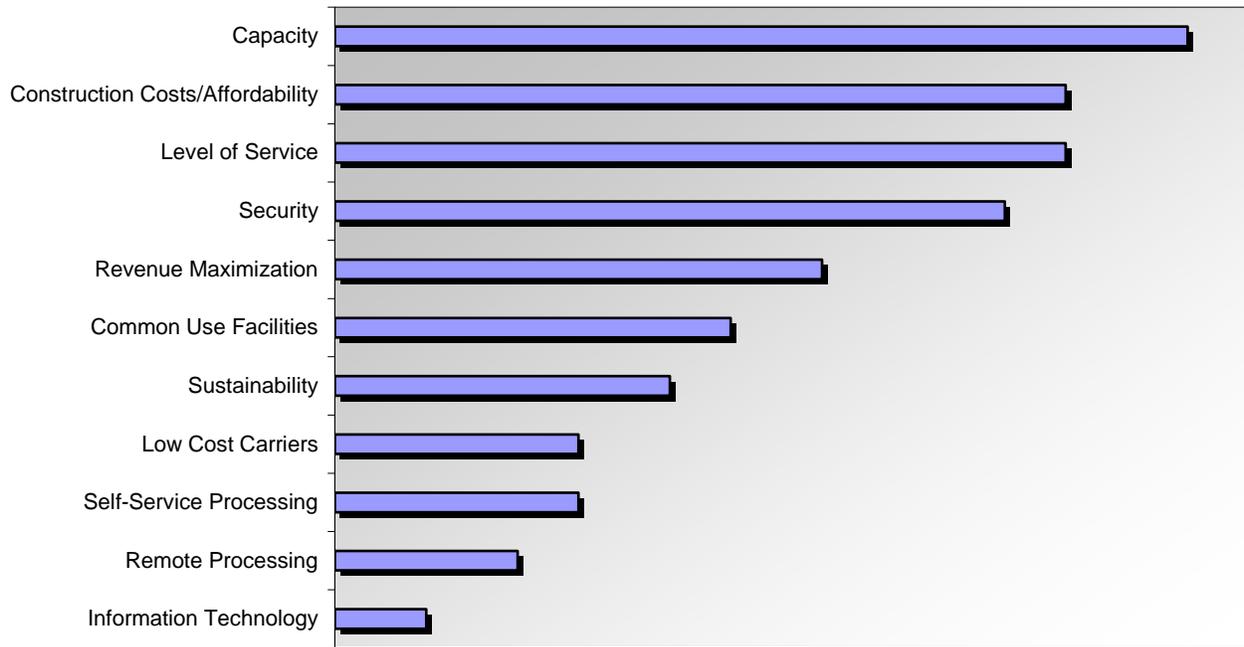
NAME OF STANDARD	SOURCE	RELEVANCE TO CURRENT INDUSTRY CONDITIONS
The Airport Passenger Terminal	Walter Hart, 1991 Kreiger Publishing Company	Very good source for certain planning layout information.
The Airport, Architecture-Urban Integration-Ecological Problems	Edward G. Blankenship, 1974, Praeger Publishers	Excellent treatise on terminal planning but is now outdated since its publishing in 1974.
Airport Planning Guidelines, Calculations, Standards	BAA & own network	Own work at SEA is most applicable.
Consultants		Fairly well.
Internal Guidelines and Lessons Learned		Relevant to our personal situation.
Benchmarking	World class airports	Fair, but require significant explanations/modifications to local conditions.
Generally accepted practices	Unpublished	Fair
Various In-House Design Guidelines	In-House	Limited as it comes from our own airport experiences.
In-house terminal planning standards	Based on actual development's performance	Have proven adequate and flexible in meeting demand.
No standard used (2 responses)		

Question 8: Listed below are several major categories of industry issues and trends. Please add any of your own categories on the open lines below and then rank your top five by importance with 1 being your top choice.

- Capacity
- Construction Costs/Affordability
- Common Use Facilities
- Level of Service
- Low Cost Carriers
- Remote Processing
- Revenue Maximization
- Security
- Self-Service Processing
- Sustainability
- Information Technology
- Other _____

Figure 3.2 summarizes the number of times the given categories were rated as important issues and trends. For the purposes of the following graph, the ranking of the categories in the individual response were not taken into consideration. The graph indicates that the capacity is the most rated category in the industry issues and trends.

Figure 3.2
Issues And Trends In Order Of Rating



Question 9: For the five types of issues you listed in Question 8, please describe the single most pressing problem you believe faces the industry.

Table 3.2 is a compiled listing of what the industry regards as pressing problems in relation to the corresponding issues.

Table 3.2
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
Capacity	<ul style="list-style-type: none"> · Gates and holdrooms must be compatible with widely variable mixes of aircraft types and routes/sectors. Schedule variability means that a terminal may have excess capacity for one aircraft/sector combination, but a shortage for another aircraft/sector combination on a given day, but the reverse may be true on a different day (or in a different season). · Processing speed. · Ultimate flexibility in light of changing fleet mixes and potential airline mergers. · Overcoming staffing issues through automation. · Building facilities to accommodate future demand. · Peak hour throughput. · Redevelopment options. · Getting real data on demand and processing rates. · Peak hour demand. · Efficient management of limited capacity. · Curbfront capacity and bag check in. · Roadway capacity into and out of the airport. · Industry-wide need to plan for terminal capacity to handle 2 to 3 times current passenger throughputs. · Airlines don't seem willing to pay to provide additional facilities. · Need the capacity, airlines learn to live with more.

Table 3.2 (continued)
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
Capacity, Continued	<ul style="list-style-type: none"> · Once again, we are back at this as being the most pressing need, but here at H-JAIA we are moving 86 MAP through a facility designed for 55 MAP. · Not enough emphasis on this. · Ability to serve. · Ability to accommodate growth and minimize delays. · Trying to keep the facilities in line with a growing market while the carriers are unsupportive. · Space limitations. · Providing additional terminal capacity at a cost that can be implemented. · When and what is hard to predict. · System. · Ability to expand efficiently. · Disaster recovery is rarely addressed in facility design. · Adding capacity while containing development cost.
Construction Costs/Affordability	<ul style="list-style-type: none"> · Funding sources are limited for major terminal improvement programs. · Impact on rates and charges to airlines. · Cost Escalation. · Can airlines afford to pay the rates? · Price/value relationship. · Appropriate facilities must be ready when needed. Building too much capacity or too soon means carrying costs/debt before revenue growth can compensate. Building too little or too late can cost business as passengers (and thus airlines) are less likely to use a congested airport. · Change order containment. · Type of construction material and cost benefit analyses. · Containment, Cost creep, delays in project delivery. · Convincing the airlines to invest in the future. · Hard to estimate due to increasing costs. · Construction cost escalation. · Airline negotiations/support. · Cost per PAX vs Revenue Stream. · The cost of steel, asphalt, and concrete has reduced our buying power substantially, while grant funding levels and PFCs have not increased. Therefore, maintaining the existing facilities is keeping us from doing other projects. · Unpredictable escalation. · Trying to afford all the great things that the city and management want on the limited budgets available. · Effective packaging. · Cost.

Table 3.2 (continued)
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
Construction Costs/Affordability, Continued	<ul style="list-style-type: none"> · Affordability of work. · Improved sharing of actual data. · Airport fiscal control and project management - early and good planning is essential!
Common Use Facilities	<ul style="list-style-type: none"> · Adequate sizing to balance needs vs. cost. · Maximize the capacity of a terminal without new construction. · Ability to adapt. · Transitioning to common use environment and getting over opposition to common use facilities. · Adequate space planning, adjacency requirements, signing/way finding for passengers, how to make this work given the layout of our terminal complex(s). · Airline acceptance. · Long-term leases. · Use everything more than 2-3 times per day. · Not have exclusive use facilities.
Common Use Facilities	<ul style="list-style-type: none"> · New guidance on how to implement this strategy, and methods to obtain carrier support.
Level of Service	<ul style="list-style-type: none"> · Not explicitly accounted for in most terminal planning and design processes. · Consistent, effective, reasonable prices. · Getting an agreed upon standard so all stakeholders are on board with program requirements. · Combination of all other items. · Lack of understanding of what LOS really means. · Lack of airline support. · Maintaining an acceptable level of service while trying to keep costs down. · Hold room space and concessions. · Retrofit of older terminals becomes costly and disruptive. · Means/methods of meeting expectations of diverse traveling public re PAX travel paths, wait times, and diverse concessions. · Consistent definition. · Consistent Standards. · Customer Service. · Maintaining high LOS while accommodating more and more PAX and ops. · Desire a high LOS with low cost to air carriers. · Providing service at an acceptable level of service. · Ability to serve. · As noted above, passenger wait times and congestion must be "reasonable" to avoid loss of revenue over time. Also, poor level of service can have a negative effect on the local economy (reduction in tourism, new / expanded business opportunities, etc.)

Table 3.2 (continued)
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
	<ul style="list-style-type: none"> · Passenger Experience with Operational Efficiency. · Cost. · Theoretical versus real world acceptability of LOS. · Ability to communicate issue. · Varied expectations based on price point for ticket.
Low Cost Carriers	<ul style="list-style-type: none"> · Reno-Tahoe is dominated by low cost carriers so everything we do that might increase rates and charges is closely scrutinized. · Changing operating characteristics. · Need to work in the business model into CIP. · Keeping construction & operating costs down. · Balancing LOS goals against costs.
Remote Processing	<ul style="list-style-type: none"> · Impact on sizing ATO. · Standards of how to accommodate this developing trend. · Increasing ability to process PAX off-airport or outside the terminal area will enable airports to build less and improve LOS.
Remote Processing	<ul style="list-style-type: none"> · Same as internet and where, hotels? Rental car companies? On-airport garages? Chain of custody for bags/security?
Revenue Maximization	<ul style="list-style-type: none"> · Keeping airline rates and charges as low as possible by maximizing non-airline revenue sources. · Maintaining a competitive environment (CEP). · Metrics. · Impact on rates and charges to airlines. · Airports need this to keep costs to airlines down. · Continuing paradigm shift from PAX processing. · Availability of well-located and sized space. · Focusing passenger flows past concessions. · Terminal facilities which combine expedient and efficient processing with the maximization of non-aeronautical revenue through optimal facilities for sales and service offerings and amenities. · Non-aeronautical revenues. · Identifying local non-traditional opportunities: i.e. fueling, ground services, and guidance on how to implement. · Keeping it overall affordable for the passenger. · Non-airline revenue development is critical to airport finance, yet competition for terminal space in older terminals is an issue. · Factors affecting concession revenue and delivery of goods. · Lower Cost per Enplaned PAX.
Security	<ul style="list-style-type: none"> · TSA staffing levels. · This is clearly the one and it is in constant change. · Security space constraints. · Not usually addressed early in the A&E design process. · Who controls what: IT vs. Security vs. Ops, vs. Management. · Centralization vs. decentralization of security screening. · TSA staffing levels and impacts of unfunded mandates.

Table 3.2 (continued)
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
	<ul style="list-style-type: none"> · Dealing with the Constantly Changing Environment. · Efficient processing. · Finding adequate space to house the in-line baggage screening system, security checkpoints and TSA staff facilities. · Adequate space to accommodate, yet allow efficient flow for pax and operations. · Document checking and IATA's desire to US-VISIT exit kiosks in the SSCP. · Processing times. · Adaptability · Efficiency · Unfunded mandates, impacts to LOS · Effective, consistent, understandable processes · Where does it end? The Israel model.
Security	<ul style="list-style-type: none"> · Meeting security needs while providing high quality service to passengers · TSA staffing and facility requirements · Since the location and space for security facilities (especially passenger screening) is constrained by building configuration, space utilization must be optimized and staffing levels must make use of all available equipment. · Meet changing TSA requirements. · Baggage screening · Trying to keep up with the ever changing security directives and their impact on existing terminals with little architectural flexibility · TSA not funding the real costs · Evolving technology and staff utilization
Self-Service Processing	<ul style="list-style-type: none"> · How to do adequate space planning in existing and future facilities, what is ATO requirement · Airline business models are in a high state of flux · Impact on sizing ATO · Belief by the airlines that it will solve all their problems and possible lack of terminal space in the future if rosy predictions don't pan out · Further expansion and self service bag tagging · Kiosks and remote check-in stations · Varied business models and brand differentiation
Sustainability	<ul style="list-style-type: none"> · Ongoing maintenance. · Achieving sustainability goals economically. · Cost-benefit analyses. · Life cycle cost. · Must do it, but it will add to initial cost. · How to effectively make the airport "greener." · Can the industry be sustained? · Cost/Benefit and Maintenance.

Table 3.2 (continued)
AIRPORT INDUSTRY PRESSING PROBLEMS

ISSUE & TRENDS	PROBLEM
	· Fusion of environmental and financial performance
Information Technology	· Security is speculative overhead - cannot define risk that far ahead. · Importance is not well understood by A&E's. · RFID applications. · Providing the best information to passengers.
Others	
Just in time development	Inability to incrementalize growth.
We are a small rural GA airport.	
Limiting inconvenience to passengers, public	Insulating PAX from construction.
Ground Access	Transit Access to airports.
Airlines' ability to afford (through rates and charges) needed improvements	Too many SWA airports are proposing MAJOR improvements--how can SWA afford?
Life Safety Code compliance	Causes challenges in working with older buildings.
Internet Check in	Predicting the split between pax check-in online vs traditional methods (travel agent, ticket counter, kiosks, airline reservation) to do space planning.
Pretty Architecture	Form should follow function.
Maintenance of aging facilities	The core of our terminal building is 50 years old and maintaining this facility to an acceptable is requiring more resources however, we can't afford the cost of new either.
Asset Management and Facility Commissioning	Cost avoidance.

Question 10: What single terminal planning issue do you believe is most often overlooked or addresses incorrectly?

Question 11: What do you see are some potential solutions to addressing the issues and trends you have previously listed?

The responses to Question 10 and Question 11 have been compiled and listed in **Table 3.3**.

Table 3.3
POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Capacity	Ultimate flexibility in light of changing fleet mixes and potential airline mergers.	Plan to develop and manage common use gates and baggage handling facilities.
	Getting real data on demand and processing rates.	Better data.
	Industry wide need to plan for terminal capacity to handle 2 to 3 times current passenger throughputs.	Include professional cost estimators on planning team.
	Relating passenger capacity and passenger processing timeframes.	Develop metrics to relate capacity to target PAX processing timeframes.
	Relating passenger capacity and passenger processing timeframes.	Address curb and road capacity tools to better represent airport conditions.
	Capacity.	Flexible facility design concepts.
	Adding capacity while containing development cost.	More involvement of airports, airlines, supply chain in guidelines, and less consultant.
Construction Costs/Affordability	Cost per PAX vs Revenue Stream.	Balance revenue streams with affordable programs.
	Unpredictable escalation.	The airlines need to be less possessive about contributing to the design of common use facilities.
	Improved sharing of actual data.	Share database of airport cost information (per SF and detailed level).
	Implementation impacts - phasing/cost.	Advanced design during planning.
	Can airlines afford to pay the rates?	Re-regulation of the industry.
Common Use Facilities	Airline acceptance.	Better data
	New guidance on how to implement this strategy, and methods to obtain carrier support.	Facilitated networking amongst Owners, and updated Guidance Manuals on what is working (or not) in obtaining carrier cooperation to instigate and effectively manage common use facilities.
Common Use Facilities	Common Use Facilities.	Use everything more than 2-3 times per day.

Table 3.3 (continued)

POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Level of Service	Not explicitly accounted for in most terminal planning and design processes.	Emphasize more detailed planning through the use of project definition manuals containing 5% to 10% design in critical areas.
	Means/methods of meeting expectations of diverse traveling public re PAX travel paths, wait times, and diverse concessions.	Facilitated networking amongst Owners, and updated Guidance Manuals on what is working (or not) in providing for flexibility, etc.
	Theoretical versus real world acceptability of LOS.	Better industry guidelines need to be developed to avoid rediscovery / reinvention.
	Customer Service.	Program Verification processes.
	Varied expectations based on price point for ticket.	Integration of current ACRPs into a synthesizing document.
	Level of Service.	Develop nationally accepted standards for Level of Service.
Remote Processing	Impact on sizing ATO.	Address the impacts of remote processing; downsized ATOs.
	Maintaining a competitive environment (CEP).	Risk/Gap Analysis.
Revenue Maximization	Identifying local non-traditional opportunities: i.e. fueling, ground services, and guidance on how to implement.	Facilitated networking amongst Owners, and updated Guidance Manuals on what is working (or not) at other airports re: non-traditional potential sources.
	Airports need this to keep costs to airlines down.	Reduce cost of operations with LEEDS buildings.
Security	Unfunded mandates, impacts to LOS	Lessons Learned.
	TSA staffing levels and impacts of unfunded mandates.	Optimizing use of developing screening technologies to reduce staffing and wait times, all with required federal funding for equipment.
	TSA staffing and facility requirements.	Include ground access as part of terminal planning and design.
	Relating passenger capacity and passenger processing timeframes.	New technology to speed and improve accuracy of security process.
	Where does it end? The Isreal model.	Improve the security situation.
	Evolving technology and staff utilization.	Leadership updating 20 yr old FAA guidelines and integration with ACRP, TSA, US.

Table 3.3 (continued)
POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Self-Service Processing	Airline business models are in a high state of flux.	Better data.
	Impact on sizing ATO.	Decentralized Check-in Processes.
	Further expansion and self service bag tagging.	Implement self service bag tagging in conjunction with CUSS and remote check-in.
	Varied business models and brand differentiation.	Process that leads to industry accepted guidelines with balanced perspectives.
Sustainability	Cost/Benefit and Maintenance.	Incorporate sustainability into planning and design process.
	Can the industry be sustained?	Maximize the use of what one has before building new.
	Fusion of environmental and financial performance.	Focus on ops research & business mgt, not just architecture & planning factors.
Others	Aging Population: Need to accommodate with shorter walking distances, etc.	Include specific criteria for aging populations in planning requirements, much like ADA requirements.
	Information technology systems - decision makers are hesitant to invest in the future of this area.	Increase AIP and/or PFC funding caps so that airports can make greater investments in their infrastructure.
	Ground Access Interface: Need to increase access capacity by a factor of 2 to 3X.	Consider remote terminals as part of the solution set.
	Passenger Screening Trends: Sizing/Flexibility of this area. Pressure point usually undersized or badly arranged.	Treat PAX Screening as a major functional component of the terminal plan.
	Holdroom size and gate usage. Airports design for flexibility and change while carriers want specific design for their current fleet. Ask us to design for RJ's and then change the fleet mix.	A healthier industry with more money to spend to address the problems.
	Physical security.	Include physical security and IT integration at the beginning of the design process.
	How the roadway curbs work with the terminal design.	ACI educates airport owners on terminal planning.
		Roadway curb models for airports that are industry standard.
How to integrate the business model into the terminal design guidelines.		

Table 3.3 (continued)
POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Others	How the roadway curbs work with the terminal design.	How to create flexible design guidelines.
	Interpretation of emerging industry trends is subjective, and inaccurate forecasting can lead to over-building.	Continuous monitoring of terminal operating conditions.
		Continuous analyses of airline industry trends.
		Continuous coordination with terminal stakeholders.
		Ask "what if" to provide maximum flexibility in improvement decisions.
	Attention to details for the Operational/Work areas and Quality of the Airport staff experience is overlooked in the design process.	Innovative thinking for the airports of the future processing concepts.
		Through understanding of the airport operations.
		Quality of design for both Passenger and Airport staff. For eg. Bringing daylight to operational areas could improve the work experience.
	Changing technologies.	Common use of facilities.
		Level of service standards.
		Flexibility.
		Innovative funding.
	Life cycle costs.	Sharing of data between airports.
		Updating guidebooks and standards to be more flexible to future changes.
		Use of simulation modeling to help inform space layout decisions.
	Electronic passenger processing.	Security is up to TSA.
		Electronic processing should be constantly reviewed and treated in the terminal.
		Airports should prepare for less investment by legacy airlines.
Airports should develop sources of revenue.		

Table 3.3 (continued)

POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Others	Define the different pathways a passenger can use from his car to the aircraft and provide adequate signs/way finding to keep them moving during peak times to enhance efficiency prior to considering expansion.	Develop in-house or consultant teams to monitor performance of terminal facilities during peak times.
		Have periodic debriefings with airlines to discuss findings and recommendations of in-house performance monitoring.
		Use the media to education the public on airport capacity issues and what is being done to address them.
		Update master plans in a balance approach from the garage to the gate to the airfield to determine actual airport capacity
		Examine airspace capacity issues' impact on airport facilities (flow control, etc.)
	Overall layout (PAX flows, gate locations) to maximize service levels and efficiency.	Increased focus on PAX service levels
		Assessing the tradeoffs between airport commercial maximization and airline operations
	Facilities must be flexible. Regulations and airline practices can change faster than facilities can be constructed or modified, so detailed plans should not assume too much. At the same time, providing flexibility adds to design and construction costs, so some compromises are unavoidable.	Infrastructure should allow (relatively) easy reconfiguration, i.e., counters, kiosks, etc., should be moveable / removable without major construction effort. This means that cabling, etc., must pre-installed to support configurations other than the one chosen for initial operations. Some facilities (involving baggage conveyors) will necessarily be subject to significant constraints as to location, but introduction of shared baggage drops may help with overall flow issues associated with common-use check-in kiosks, etc.
		Airlines and government agencies need to agree to provide adequate staffing. Often available counters / workstations go unused in spite of long wait times and congestion.

Table 3.3 (continued)
POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS	
<p>Others</p>	<p>Facilities must be flexible. Regulations and airline practices can change faster than facilities can be constructed or modified, so detailed plans should not assume too much. At the same time, providing flexibility adds to design and construction costs, so some compromises are unavoidable.</p>	<p>More uniformity in security standards and procedures would allow passengers to flow more efficiently because they would know what to expect. Also, once an efficient configuration has been identified (for a particular flight sector / market type), it should be widely applied (communicated to other airports / government security agencies) to optimize use of space, equipment, and personnel.</p>	
		<p>Faster turnaround times for go-ahead, design, and construction of facilities would improve the likelihood that a facility would be "right" for the conditions in effect when the facility becomes operational. Recent experience has shown that traffic characteristics can change radically in only a few years, making configurations that were optimal when designed less efficient than anticipated.</p>	
		<p>The selection and placement of concessions should be approached in a systematic way to ensure that they are available to passengers when and where they are needed (i.e., en route from check-in through security to holdrooms; interspersed with holdrooms). This would improve the comfort level for passengers and increase non-aeronautical revenue opportunities.</p>	
		<p>Terminal curb and access portals.</p>	<p>Simplified technology applications.</p>
		<p>Baggage check-in and processing.</p>	<p>Terminal Privatization.</p>
		<p>Roadway Curb front Operations.</p>	<p>Remote check-in and passenger process.</p>
	<p>Support infrastructure for revenue producing services.</p>	<p>Relaxed TSA regulations (profiling).</p>	
		<p>More space needed.</p>	
		<p>Better transit access to airports.</p>	
		<p>Better enforcement of curb front operations.</p>	
		<p>Better organization of planning/design processes to involve more disciplines</p>	
		<p>ACRP07-05 results</p>	

Table 3.3 (continued)

POTENTIAL SOLUTIONS TO AIRPORT INDUSTRY PROBLEMS

ISSUE & TRENDS	PROBLEM	SOLUTIONS
Others	Overall layout (PAX flows, gate locations) to maximize service levels and efficiency	Increased focus on PAX service levels
		Assessing the tradeoffs between airport commercial maximization and airline ops
	Security / safety typically not considered early enough in planning and design process; aesthetics often not security-compatible	Higher priority for EARLY security and safety involvement in planning and design
		Attention to dual-function solutions, i.e., safety & security uses for technology
		Better education of regulatory bureaucracy (TSA) and political pressure points to understand operational and financial consequences of their actions
	Lack of flexibility in design	Better education of airport management
		Higher pay for consultants
	Appropriately assessing LOS issues	Building lower cost terminals
		Taking full advantage of existing terminal infrastructures to maximize capacity and increase revenues
		Better management of airport and terminal planning projects
	Financing for the future	No comment provided
	Outbound baggage handling and inspection systems	No comment provided
	Mechanical systems (heat, a/c, wiring, etc.)	No comment provided
	Queuing	No comment provided
	Sustainability, green development	No comment provided
	Partnering with the industry to identify best terminal planning practices	No comment provided
Creative thinking about future passenger processing	No comment provided	
Grand Central-like FIDS in Airport terminals	No comment provided	
Demand management solutions that more efficiently allocate capacity at constrained airports	No comment provided	
Insufficient planning detail to support cost estimates or environmental processes.	No comment provided	

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Chapter IV summarizes the conclusions drawn from the synthesis of all the research project efforts.

CONCLUSIONS

The primary deliverable, or conclusion, of this Final Report is the Terminal Planning Guidebook. This has been produced under the assumption that it will be distributed both electronically in a Portable Document Format (PDF) and by conventional print media.

It was determined early on with Robert David (our original ACRP Senior Program Officer) that there would need to be close coordination between ACRP 07-05 and ACRP 07-04, *Spreadsheet Models for Terminal Planning and Design*. While these have remained discrete projects, some project effort and products were shared between these two complimentary research projects. The reason behind this decision was that both of these projects were led by Landrum & Brown and the end deliverable of the 07-04 project would be an integral part of the terminal complex programmatic elements in the Guidebook. This has been accomplished and the two work products have been closely tied.

In the Guidebook, there are references to the Spreadsheet Models, and in the electronic version of the Guidebook, the user can link directly with the models. Similarly, the User's Guide for the Spreadsheet Models incorporates text and descriptions from the Guidebook, so that an independent user of the models can have the necessary background without needing the full Guidebook.

At the start of the Guidebook project there were nine other TRB ACRP research projects that were deemed by our Team to have potential relevance to the 07-05 project results. As of July 2009 this list had grown to 16 ACRP research projects that are listed in Appendix B of the Guidebook. The challenge in this regard to the 07-05 project was that most of these ACRP projects were not at a point of completion so their findings were unavailable to the 07-05 research team prior to the Guidebook's completion date. Our Team coordinated with the principal investigators of all of the initial nine research projects in an attempt to incorporate significant findings as available. This was done through an E-mail survey in order to gain an understanding of each project's status. While most all of these ACRP projects, which have yet to be published, do have some relevance to the Guidebook, they were not considered essential to our research project results and their findings could not be integrated into the final Guidebook without further delaying the completion of the Guidebook. Thus, we direct Guidebook users to the location of pertinent information, or links for this specialized technical information.

There were several key decisions made at the interim review meeting with the 07-05 Panel on April 29th and 30th. These affected the finalization of the Guidebook. It should be noted that in an effort to continue the close coordination between the 07-05 and 07-04 projects, Panel members from both studies were in attendance and commented on both projects. These decisions included the following:

1. Organization of the Guidebook – An FAA liaison to the Panels proposed a significantly different organizational structure than used for the Draft presented at the interim review meeting. This FAA liaison suggested an outline that was closer to that used in the previous FAA terminal planning Advisory Circular published during the seventies and eighties. The Team and Panel considered this structure and the required re-writing of the Draft. The organization of the Guidebook ultimately combined features of both approaches.
2. Number System for Sections of the Guidebook – The Panels agreed that a more conventional numbering system would assist Guidebook users to more quickly locate topics from a topic index. The final Guidebook has been built around a more conventional numbering system for its organizational structure.
3. Issues and Trends - A summary of the emerging issues and trends has been included as an appendix to the Guidebook. An appendix on this topic was determined to be the best approach because it will very rapidly be changing and evolving. The concern was that this one part of the Guidebook will quickly become outdated and if included within the main text may indirectly begin to undermine the Guidebook's credibility to potential users.
4. Color Document - The Panels recommended that the TRB produce the Guidebook in color rather than the standard black and white format. Many of the graphics read better in color and because it is expected that most users will use the PDF version, it made sense to produce the graphics in the form which best expresses the content. While this was considered by the TRB, it is more likely that only a select number of exhibits will be produced in color.
5. Airport Stakeholders Group 2 (ASG2) – It was decided that we would not establish the small six person ASG2 review panel as our Team had initially proposed in our Work Plan. It was agreed that by combining the 07-05 and 07-04 Panels a sufficient number of airports would be represented.

Notification to the Authors of the FAA "White Papers" – It has been our research Team's recommendation that the authors of the FAA "white papers" be contacted to notify them of the potential use of their materials in the Guidebook. While the FAA has the rights for the use of these materials, it seemed appropriate to contact those individuals whose write-ups may potentially be used. As of the date of this Final Report, these letters have not been sent by the FAA.

RECOMMENDATIONS

The Team recognizes that terminal planning is a field which is constantly evolving and changing as a result of both industry trends and governmental regulations/mandates. As such, the Guidebook represents state of the industry practices in effect in the 2008/09 time frame. It is our recommendation that the TRB consider a means to regularly update the content of the Guidebook.