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ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: PLANNING AND DESIGN OF AIRPORT TERMINAL BUILDING FACILITIES AT NONHUB LOCATIONS

1. PURPOSE. This advisory circular provides guidance material for t planning and design of airport terminal buildings at nonhub locations.

2. RELATED READING MATERIAL. Appendix 1 contains a listing of documents containing supplemental material relating to terminal building planning and design. Ordering information is also contained therein.

3. BACKGROUND. Advisory Circular (AC) 150/5360-7, Planning and Design Considerations for Airport Terminal Building Development, provides guidance for the planning and design of airport terminals. The material contained within it is applicable to all airports serving air carriers, regardless of size. Because of this wide range of coverage, the material is necessarily very general in nature and of limited usefulness in providing detailed planning guidance, particularly for less sophisticated, low activity airports. To remedy this, a contract was awarded to the airport facility consulting firm of Arnold Thompson Associates, Inc., to provide assistance in the development of guidance material for the planning of terminal building facilities at nonhub locations. The nonhub category of airports was chosen as it represents a range of airports with relatively unsophisticated and uniform characteristics. The results of this contractual effort are presented in this circular.

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CONTENTS

Chapter 1. INTRODUCTION

Paragraph		Page
1.	Description of a Nonhub Airport	1
2.	Functions of a Nonhub Airport Passenger Terminal	1
3.	Use of This Guidance Material	1
4.	Project Coordination	2
5.	Reference Documents	3
6.	Metric Units	4

Chapter 2. FINANCIAL CONSIDERATIONS

7.	Importance of Financial Planning	5
8.	The Economic Importance of the Airport to the Local Community	5
9.	Financial Feasibility	5
10.	Funding Sources	5
11.	Revenue Estimating Techniques	7
12.	Annual Terminal Building Costs	8
13.	Sample Estimation of Economic Feasibility	8

Chapter 3. TERMINAL LOCATION FACTORS

14.	Airfield versus Landside	11
15.	Relationship of Terminal to Airfield	11
16.	Relationship of Terminal to Other Airport Facilities	13
17.	Physical Siting Considerations	15
18.	Relationship of Terminal to Roadways	16

Chapter 4. PLANNING CONSIDERATIONS

19.	Terminal Roadway System	19
20.	Circulation and Functional Relationships	19
21.	Aircraft Parking Configurations	21
22.	Single Versus Multilevel - Vertical Aspect	21
23.	Flexibility and Expansibility	24
24.	Aesthetic Considerations	24

Chapter 5. PEAKING AND DEMAND FORECASTS

25.	Passenger Forecasts	29
26.	Peaking Characteristics	30

Chapter 6. FACILITY REQUIREMENTS

Paragraph		Page
27.	Facility Requirements Graphs	33
28.	Aircraft Parking	33
29.	Auto Parking	35
30.	Terminal Curb	37
31.	Public Areas	37
32.	Airline Space Requirements	41
33.	Concessions	45
34.	Airport and Building Services	49
35.	Federal Inspection Facilities	50
36.	Minimum Size Terminal Requirements	50

Chapter 7. SPECIAL CONSIDERATIONS

37.	Provisions for the Handicapped	51
38.	Energy Conservation	52
39.	Noise Attenuation	52
40.	Maintenance Considerations	53
41.	Symbol Signs	53
42.	Airport Security Considerations	53
43.	Environmental Impact Analysis	55

APPENDIXES

Appendix 1. Bibliography 1

Figure		
2-1	Sample Financial Feasibility Worksheet	9(and 10)
3-1	Imaginary Surfaces, FAR Part 77	14
4-1	Terminal Site Relationship Diagram	20
4-2	Diagram of Passenger Terminal Circulation and Functional Relationships	22
4-3	Aircraft Parking and Terminal Considerations	23
4-4	Example of Terminal Planning Deficiencies	25
4-5	Example of a Functional Terminal Layout	26
6-1	Airline Aircraft Parking Positions	34
6-2	Public Automobile Parking	36
6-3	Lobby and Waiting Area	39
6-4	Ticket Counter Queuing Space	40
6-5	Airline Ticket Counter Length	42
6-6	Airline Space Requirements	43
6-7	Baggage Claim Public Space	46
6-8	Baggage Claim Counter Lengths	47
6-9	Concession Space	48

CHAPTER 1. INTRODUCTION

1. DESCRIPTION OF A NONHUB AIRPORT. The Civil Aeronautics Board (CAB) classifies geographic areas of domestic air traffic in the United States by each area's percentage of the total enplaned revenue passengers in all services and all operations of the U.S. certificated route air carriers. Geographic areas served by scheduled airlines which produce less than 0.05% of the annual U.S. total enplaned passengers are termed "nonhub." Airports within these geographic areas are referred to as "nonhub airports As an example, in Calendar Year 1978, geographic areas generating less than approximately 132,000 domestic enplaned passengers were in the nonhub category. Generally at nonhub airports, enplaned passengers and deplaned passengers are equal in number. Therefore, total annual passengers can be assumed to be twice the enplaned figure.

2. FUNCTIONS OF A NONHUB AIRPORT PASSENGER TERMINAL. The passenger terminal at an airport is the interface between ground and air transportation. As such, its primary purpose is to provide for the safe, efficient, and comfortable transfer of passengers and their baggage to and from aircraft and various modes of ground transportation. To accomplish this, essential elements such as ticketing, passenger processing, baggage handling, and security inspection are required. These are supported by food service, car rental, shops, rest rooms, airport management, and other ancillary functions. An airport passenger terminal is similar in many ways to other transportation terminals but has some distinctly different characteristics. The ground time of aircraft is kept to a minimum; and therefore, facilities must be able to accommodate compressed peak passenger and baggage conditions. Airports are generally remotely located from urban centers, requiring the use of private automobiles. This creates the need for adequate roadway access and parking facilities to a greater extent than at other urban transportation terminals. The terminals at nonhub airports not only serve scheduled airlines but, in most cases, also accommodate charter flights, commuter airlines, air taxis, and general aviation activities. In addition, some airports may handle international operations and be designated an international airport of entry or landing rights airport and thus require Federal Inspection Services and facilities in the terminal.

3. USE OF THIS GUIDANCE MATERIAL. This advisory circular is designed to be used as a general reference by planners. The planning and design of a small terminal building can be complicated since so many factors are involved. The information presented is intended to make the planner aware of the most important considerations, to avoid major errors, and to aid in providing a basis for the development of preliminary studies. The guidelines set forth in this circular cannot take in all factors and may require modification as individual project circumstances dictate.

4. PROJECT COORDINATION. Building a new or expanding an existing airport terminal facility requires considerable coordination and input involving a number of airport users and other interested parties. Consequently, it is both important and necessary that the architect/engineer develop and maintain a line of communication with all these groups from the earliest stages of the project to its ultimate conclusion. The requirements and input of each group will differ somewhat and, in some cases, may conflict with each other or with the design concept. These differences require resolution and/or compromise prior to the design stage. To avoid overlooking important user requirements resulting in costly and time-consuming design changes, it is often prudent to establish a facilities development advisory committee for the terminal project. This advisory committee should be composed of airport management representatives, airline facilities planning representatives, selected building tenants and concessionaires, and other airport users and parties having particular interest in the facility. The airport manager or a representative of the airport owner should normally chair this committee. Regardless of whether or not such a committee is established however, the architect/engineer, as the designer of the facility, has a responsibility to insure that coordination is achieved with those persons and/or organizations having necessary input from the initial studies through final design. Examples of interested groups include:

a. Airport Management. The airport manager and the staff are usually the primary contacts for the architect/engineer in planning and designing a terminal facility. Usually the manager of the appointed representative will serve as the focal point for project coordination. As the chief administrator of the airport, the airport manager has detailed knowledge of airport activities and operational requirements as well as other factors that will influence the final design. In all likelihood, he/she is a source of financial data on airport revenues and outlays; is aware of budgetary limitations as well as local governmental considerations; and can provide insight into local community values and cultural characteristics that might influence the building design and architecture. The airport manager may also have a wealth of experience in prior airport design and construction projects of a similar nature and thus can be extremely helpful and contribute a great deal as an active member of the design team.

b. Airlines. As the primary airport terminal building occupants, the airlines have very specialized requirements for space and facilities within the terminal area. It is therefore extremely important that their input, cooperation, and participation in the review process be sought and maintained throughout the design period. The airline facilities planner, in addition, can provide valuable information on passenger and aircraft-type forecasts and is a source of technical expertise on many aspects of airport designs. For this information and assistance, the headquarters of each airline operating into a particular airport should be contacted directly.

c. Federal Aviation Administration (FAA). Federal funds are available for the planning, design, and construction of airport facilities at public airports (see paragraph 10). Whenever such funds are utilized, there is a requirement that Federal standards and environmental requirements be met. If is therefore suggested, particularly when the architect/engineer is unfamiliar with FAA grant procedues, that the appropriate FAA Airports District or Regional Office having jurisdiction over the airport be consulted during the early stages of the project. Also, where FAA air navigation facilities are located on the airport, appropriate FAA field offices should be contacted and consulted to insure that the terminal design does not interfere with the operation of existing or planned FAA facilities and that FAA facility requirements to be furnished by the airport operator are incorporated in the design. The airport manager will be cognizant of the appropriate FAA field offices to contact. (See AC 150/5000-3, Address List for Regional Airports Divisions and Airports District/Field Offices, current edition.)

d. Local and Regional Public Agencies. In a case of a new terminal facility, local and regional planning and public agencies should be contacted to insure that the facility location does not conflict with local plans and building code restrictions. Since airport access is a major concern in locating a terminal facility, it is particularly important that coordination with local and state highway departments be maintained.

e. Terminal Building Occupants. In addition to airlines, a number of tenants rent space in the terminal building or adjacent to it. They include concessionaires, food service operators, air taxi and fixed base operators, and rental car and parking lot operators. These tenants have specialized needs and should be consulted as to their facility requirements.

f. Others. Each airport's operating body, such as commissions or authorities, will have particular characteristics that may impose additional coordination requirements with individual or specialized groups. In addition, the airport may employ terminal planning and/or financial consultants to serve as part of the project team. Close cooperation between team members is essential to the success of the project.

5. REFERENCE DOCUMENTS. Before the planner/engineer commences the preparation of an airport terminal development program, familiarization with the following reference documents is essential.

a. Airport Master Plan. Most airports will have a current master plan on file. Such a plan depicts the ultimate development of a specific airport and serves as the basis for the detailed design and engineering of all public airport improvements. It presents the research and logic from which the plan evolved in a graphic form and includes a written report. Master plans are applied to the expansion of existing airports and to the site selection and planning of new airports. They provide much useful information to the terminal planner with respect to the airfield and associated facilities.

Included in the master plan are aviation activity forecasts, dimensional layouts of existing and future runways, taxiways, aprons, terminal areas, approach zones, air navigation aids, and financial and environmental considerations. No major airport expansion or terminal development should be undertaken without having a current, comprehensive master plan. Details on the contents of airport master plans are contained in AC 150/5070-6, Airport Master Plans, current edition.

b. Advisory Circulars. FAA issues advisory circulars as a means of providing guidance materials and promulgating standards on aviation and airport matters. These circulars provide essential information on the design and construction of airport facilities, particularly when Federal funds are involved in the development of the airport. The advisory circulars which are considered most relevant to the terminal planner and which provide necessary supplemental guidance material are referenced in appropriate paragraphs of this circular and in the Bibliography listed in Appendix 1.

c. Federal Aviation Regulations (FAR). In some instances, FAA advisory circulars may not adequately cover a subject sufficiently in depth. Consequently, it sometimes is necessary to refer directly to the pertinent FAR's. FAR's of interest to the terminal planner are listed in Appendix 1.

d. FAA Reports. There are several Department of Transportation (DOT) and FAA reports available which provide useful information relating to terminal complex projects. These reports, together with ordering information, are also listed in Appendix 1.

6. METRIC UNITS. To promote an orderly transition to metric units, the text and drawings include both English and metric units. The conversion to metric units herein does not always result in exact equivalents.

CHAPTER 2. FINANCIAL CONSIDERATIONS

7. IMPORTANCE OF FINANCIAL PLANNING. The financial aspects of new, expanded, or modified passenger terminals should be given careful consideration beginning in the early stages of planning. The revenue-producing capability of passenger terminals designed for passenger volumes at nonhub communities is often limited, and only modest amounts of Federal aid for such projects are currently available. Prudent financial planning requires a hard look at an airport's capability to produce revenues and careful consideration of sources of capital funds at the local, state, and Federal levels. Revenues and capital will be limited; and such limitations must be considered in selecting terminal size and design criteria, materials to be used in construction, and planning of the project.

8. THE ECONOMIC IMPORTANCE OF THE AIRPORT TO THE LOCAL COMMUNITY. The value of the airport to the community is often a factor in the ability to raise local capital funds, especially if tax monies are required. A thoughtfully designed survey of the business community to define the airport's economic contribution often produces enlightening results and can become an important element in any campaign to raise local funds. Local citizens do not always realize how valuable a financial asset their airport is. In all cases, it is better to be prepared with facts and figures about the cost of construction for various alternatives, combinations of capital available, potential revenues from the facility, and general economic benefits which will accrue to the local community as a result of airport development.

9. FINANCIAL FEASIBILITY. A financial feasibility study should be made in the early stages of planning to indicate whether the project can be self-supporting from its own revenues or, if not, the extent to which annual financial support will be required from the airport operator. Some financial aspects of an airport terminal building project are discussed below.

10. FUNDING SOURCES. There are a number of possible funding sources and financial mechanisms that are utilized for funding the project costs of terminal development. The most common of these are discussed below.

a. Federal Grants-in-Aid. There are three common types of Federal grants-in-aid that are utilized for airport terminal area projects. These include:

(1) Airport Planning Grants. Terminal area planning can be undertaken as part of a complete airport master plan under the Planning Grant Program (PGP). This program provides Federal funds to airport operators to undertake airport master planning studies.

(2) Airport Development Aid Program (ADAP) Grants. Grants for detailed planning, design, and construction of terminal buildings are available under the ADAP program. These grants normally cover 50% of the cost for the design and construction of nonrevenue-producing public-use areas in terminal buildings serving air carriers. Other eligible terminal facilities, including access and circulation roads and security facilities, may be eligible at a higher rate of Federal participation. Details on the program can be found in FAR Part 152 and AC 150/5360-6, Airport Terminal Building Development with Federal Participation, current edition.

(3) Economic Development Administration (EDA) Grants. EDA grants are available for detailed planning, design, and construction of passenger terminals when communities meet certain economic criteria, such as high rates of unemployment. Details on the EDA programs are available from FAA Airports District Offices and Regional Offices of EDA.

b. State Grant Programs. Many states have grant programs that assist local communities and airport operators in funding eligible support and airport access projects. Funds obtained from these state grants usually can be used by an airport operator and counted as part of the required participation in the project cost when applying for PGP or ADAP grants. State Departments of Transportation (DOT), State Highway Departments, or aviation agencies can provide information concerning the availability of these grants.

c. Financing Methods. Financing the capital costs of airport terminal facilities includes such methods as revenue bonds, general obligation bonds, bank loans, and contributions from the airport sponsor or prospective tenants. Competent legal counsel and financial advice are essential in determining the financing method or combinations most advantageous to the airport. It should be noted that no part of the Federal share of projects is to be included in user charges.

(1) Revenue Bonds. Revenue bonds can be considered if it is reasonably estimated that the terminal facility can produce revenues in amounts equal to the annual costs of operations and maintenance plus 125% of the amount of annual principal and interest due on the bonds. Revenue bonds, because they are backed only by the revenue-earning capability of the terminal facility, or in some instances the whole airport, will carry a higher annual interest rate than general obligation bonds. However, revenue bonds will usually carry a lower rate than available through a bank loan.

(2) General Obligation Bonds. General obligation bonds are usually authorized to be issued for financing airport facilities. As these bonds are backed by the full faith and credit of the local community, they carry a lower annual interest rate than revenue bonds. Since each community

will have a statutory limit on the principal amount of general obligation bonds outstanding at any one time, financing of airport facilities with these bonds must compete with the financing needs of other capital projects in a community.

(3) Bank Loans. Bank loans are sometimes available in limited amounts for short periods (normally about 5 years' maximum) at prevailing interest rates. These rates will usually be higher than required either for general obligation or for revenue bonds. Banks loans are most often used for interim financing of airport capital projects and are usually retired with the proceeds of long-term borrowings on completion of the project.

(4) Advances from the Airport Sponsor of Prospective Tenants. A number of smaller airports have been able to arrange for contributions from the airport sponsor or prospective tenants to reduce the amount of long-term borrowings required to construct a project. It should be recognized that contributions from prospective tenants amount to prepaid rentals for space to be occupied, and appropriate reduction in rental revenues should be expected.

11. REVENUE-ESTIMATING TECHNIQUES. Airport management has various sources available for estimating the future annual revenues that activities in the terminal building will produce to be used to pay for the annual costs of operation, maintenance, and cost of borrowing. Preliminary discussions and eventual final negotiations with airline tenants will fix the rental rate per square foot, which they will pay annually. As concession revenues vary with traffic levels and their location with respect to traffic flow in the building and depend more on the vagaries of passenger preferences and habits, these revenues are more difficult but not impossible to estimate. It is especially important for airport management to weigh carefully revenue/passenger volume data and trends at other airports against its own good judgment about the pecularities of its own airport, the nature and terms of its own concession contracts, and the habits of local citizens. (Some small airports have rather substantial restaurants frequented mostly by local citizens and/or airport employees.) Each airport situation has at least some factors which are unique and which, therefore, must be carefully considered by airport management. In communities where an air carrier airport does not exist and the terminal is therefore part of an initial construction project of the air carrier facility, estimation of terminal revenues is more difficult. A reasonable approach in such a circumstance is to gather and examine terminal revenue histories from other airports which have a terminal size, an activity level, and passenger characteristics similar to that being constructed. As a further check when resorting to data from other airports, contacting organizations such as the Airport Operators Council International and the American Association of Airport Executives, which maintain data files on airport financial characteristics and trends available to members, would be helpful.

12. ANNUAL TERMINAL BUILDING COSTS. The architect/engineer retained to plan the terminal facility is a good source of estimations for annual costs of operating and maintaining the terminal. Operation cost records are good guides for estimating future costs. Assistance by the financial officers of the airport sponsor or of the sponsor's financial advisor to estimate the annual costs of principal, interest, and coverage, if required, would normally be required and is recommended.

13. SAMPLE ESTIMATION OF ECONOMIC FEASIBILITY. Figure 2-1 illustrates a sample worksheet display comparing annual terminal costs and revenues to determine estimated financial results. Dollar amounts are not used as each situation has significantly different cost and revenue characteristics. This does not affect the worksheet's usefulness as a guide, but it should be understood that other display formats may be used. If, on an annual basis, the worksheet results show an excess of costs over revenues (deficit), there are four principal avenues for overcoming this situation: seeking greater contributions in aid for the terminal's initial cost, thus reducing the net amount financed; relying on annual contributions in amounts equal to indicated deficits; increasing revenues from tenants and concessionaires; or finally, in combination with any or all of the above, scaling down the program. Completion of this worksheet or facsimile should provide an indication whether the project can reasonably be estimated to be self-supporting or operate at a deficit and, if so, provide a basis for working out agreements for annual contributions to support operating costs.

COST OF CONSTRUCTION: $ DATE OF INITIAL OPERATION:

LESS CONTRIBUTIONS IN AID ________ USEFUL LIFE:__________YEARS

NET AMOUNT FINANCED

ANNUAL REVENUE	YEAR 1	YEAR 2	YEAR 3	ETC.	ETC.
Airline Rents Concession Fees & Rents Rental Car Food/Beverages Parking Lot ETC.					
TOTAL REVENUE					
ANNUAL COSTS Interest, Principal and Coverage Operations Maintenance Other					
TOTAL COSTS					
Excess Revenues					
Excess Costs (deficit)					
(Annual Support Required)					

FIGURE 2-1. SAMPLE FINANCIAL FEASIBILITY WORKSHEET

CHAPTER 3. TERMINAL LOCATION FACTORS

14. AIRFIELD VERSUS LANDSIDE. In many cases the site selection for a new passenger terminal is accomplished in the airport master plan. In some instances, however, the terminal area may be only generally located, while in others a number of alternative sites might be shown. The actual terminal location is usually resolved in the design phase where all planning problems must be solved and where the architect/engineer influence is the greatest. It is not always possible to locate the terminal so that ideal relationships are achieved between present and future airfield and landside facilities. In making a trade-off between building a terminal close to the runways thereby limiting future aircraft parking or not leaving adequate space for automobile parking and roadway expansion on the landside, a decision must be made as to which compromise creates the least impact to the airport with respect to safety, efficient operation, and future expansion.

15. RELATIONSHIP OF TERMINAL TO AIRFIELD. The following considerations affect the relative location of the terminal building with respect to the airfield.

a. Aircraft Considerations. The taxiing and parking of air carrier aircraft and the size and type of airplanes have an effect on the location of the passenger terminal on the airport. Such considerations include:

(1) Aircraft Circulation. Aircraft taxiing routes for takeoff should be as direct as possible from the passenger terminal to the ends of the primary runway. Landing aircraft should exit from the runways onto taxiways as quickly as possible in order to minimize taxiing distances to the terminal and to clear the runway for use by other aircraft. It is therefore desirable to locate the passenger terminal centrally with respect to the primary runways and in such a manner as to avoid, if possible, the necessity of landing or departing aircraft crossing active runways when taxiing to and from the parking apron. This will minimize costly and time-consuming taxiing of aircraft and conserve fuel.

(2) Aircraft Parking. An aircraft parking apron is located adjacent to the passenger terminal. The loading and unloading of passengers, baggage, cargo, and mail as well as the fueling, servicing, and light maintenance of aircraft take place at the aircraft parking apron. The distance between the passenger terminal and adjacent runways and taxiways is determined in part by the depth of apron required for the maneuvering and parking of aircraft. Adequate depth for the apron should be preserved for maneuvering and parking of both current and future aircraft and for apron activities. Paragraph 21 contains guidance material on aprons and aircraft parking.

(3) Aircraft Types. A variety of types of aircraft are presently used by domestic air carriers. These aircraft vary considerably in size, weight, and passenger capacity. The type of aircraft in use and expected in the future governs runway and taxiway separations and establishes building and obstacle clearances and setback requirements. The size of the aircraft determines the area of ramp required for aircraft parking and maneuvering, and the aircraft capacity influences the sizing of passenger handling and services within the terminal building. Generally, nonhub air carrier airports are served by a mix of small- and medium-sized aircraft. This could include, for example, the Nord 262, FH 227, BAC 111, YS 11A, DC9-10, 30, 40, 50, 80, B737-100, 200 and B727-100, 200 type aircraft in addition to smaller commuter aircraft. Larger aircraft such as the B720, B707, and DC8, which are frequently used for charter service may be anticipated as well if the airport has a recreational or other special character. The planning of the terminal facility location should take into account the largest type aircraft using or anticipated to use the airport on a scheduled basis. Data on aircraft size and weight can be found in AC 150/5325-5, Aircraft Data, current edition.

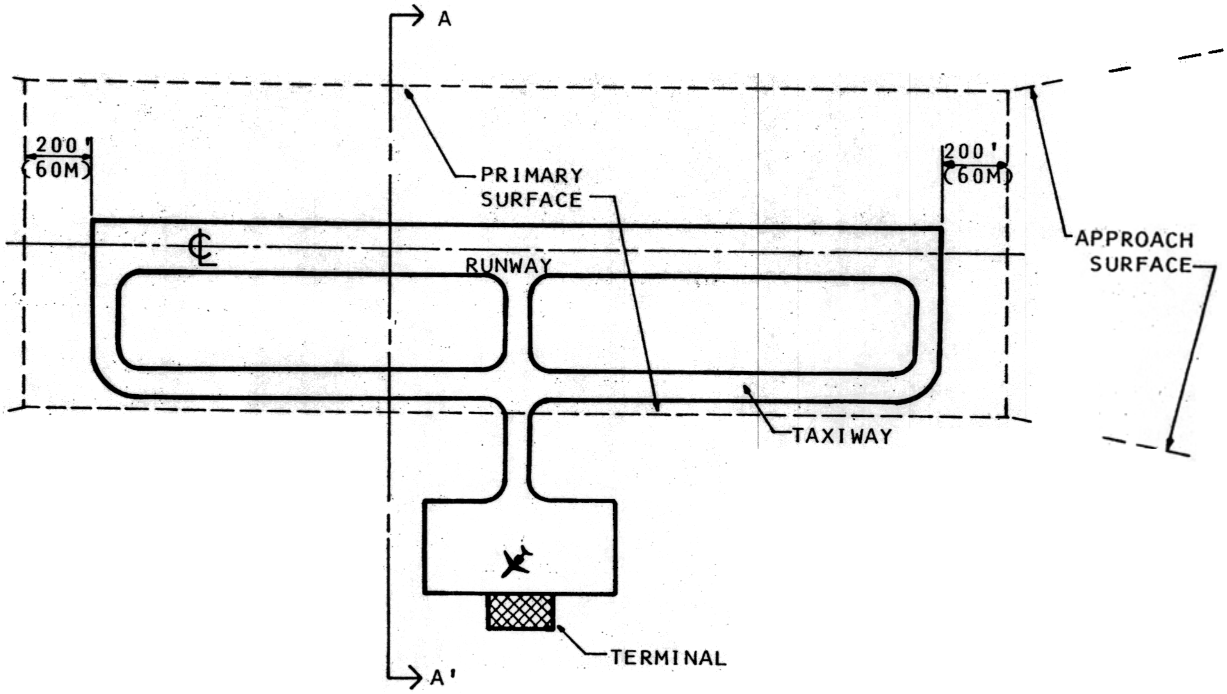
b. FAA Design Standards. FAA has established geometric design standards for airport runways and taxiways. Among other things, these standards include minimum clearance distances between runway centerlines and buildings (building restriction line) and between taxiway centerlines and aircraft parking aprons and obstacles. These standards will influence the terminal building location. The terminal planner must be cognizant of building clearance limitations as they apply to existing airport facilities and must consider future airport and aircraft developments. Such considerations will insure that the terminal building and support facilities do not limit the future development and expansion of the airport. For air carrier airports, these design standards are described in AC 150/5335-4, Airport Design Standards--Airports Served by Air Carriers--Runway Geometrics, current edition; and AC 150/5335-1, Airport Design Standards--Airports Served by Air Carriers--Taxiways, current edition. For general aviation airports, similar geometric design standards have been established and are discussed in AC 150/5300-4, Utility Airports--Air Access to National Transportation, current edition, and AC 150/5300-6, Airport Design Standards, General Aviation Airports, Basic and General Transport, current edition.

c. FAR Part 77 Obstruction Standards. Obstruction standard requirements are contained in FAR Part 77. A number of imaginary surfaces relating to each runway have been established in order to provide a basis of judging whether an object or building presents an obstruction to air navigation. The size of the surface is determined by the category of each runway and by the approach system to be used. Terminal buildings are usually located along the side of a runway and are, therefore, most likely to be affected by the primary and transitional surfaces. The primary surface extends outward at zero slope on both sides of the runway centerline and 200 feet (60 m) beyond each end. The width of this surface can vary from 500 feet (150 m) for a noninstrument runway to 1000 feet (300 m) for a precision instrument runway. The transitional surfaces extend upward from the edge of the sides of the primary surface at a ratio of 7:1. No portion of the terminal structure or tail surfaces of parked aircraft should penetrate this imaginary surface. Depending on how aircraft are parked, the 750-foot (225 m) building restriction line, recommended by the FAA, may not be adequate. A diagram of this imaginary surface is shown in Figure 3-1. A terminal building located near the end of a runway can also be affected by the approach surface which extends outward and upward from each end of the primary surface at slopes varying from 50:1 for precision instrument approach runways to 20:1 for noninstrument runways. In determining allowable clearances for siting terminal facilities, consideration of future runway instrumentation is important. The airport master plan can be helpful in this respect.

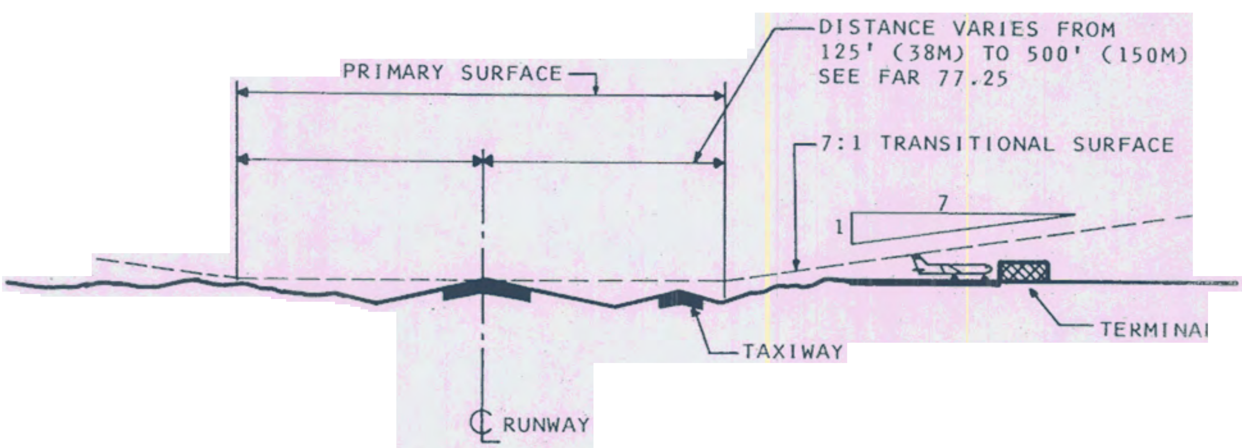
d. Waivers. Many airports in existence today were constructed before current clearance standards were established. It is recognized that site limitations often make it impossible to meet all recommended clearance and spacing requirements. For example, under some circumstances, the tail structure of aircraft temporarily parked at gates may be allowed to penetrate the transitional surface. When a standard cannot be met and a possible obstruction to air navigation occurs, advice should be sought from the FAA. Subsequent studies may prove that the deviation does not jeopardize air safety and a waiver could be granted. If the deviation involves a building or other fixed structure, obstruction marking and/or lighting as outlined in AC 70/7460-1, Obstruction Marking and Lighting, may be required.

16. RELATIONSHIP OF TERMINAL TO OTHER AIRPORT FACILITIES. Those principal fixed elements of a passenger terminal complex, which are discussed in this chapter, should be located to allow for future expansion of each, with no encroachment on the passenger terminal or adjoining facilities. Figure 4-1 illustrates a desirable relationship of the basic facilities in the passenger terminal complex.

a. FAA Air Carrier Control and Terminal Navigation Facilities. The airport traffic control tower requires unobstructed visibility of all approach areas, runways, and taxiways. If the control tower is located remotely from the passenger terminal, the terminal building and its appurtenances must be located and limited in height so as not to interfere with sight lines from the tower to these critical portions of the airport. In addition, buildings and other new or planned structures may interfere with the operation of various FAA communication and navigation facilities located on the airport. Guidance concerning these facilities can be found in AC 150/5300-2, Airport Design Standards--Site Requirements for Terminal Navigation Facilities. If FAA facilities are located on the airport, the FAA field office(s) operating these facilities should be contacted for guidance and coordination.



PLAN



SECTION A-A'

FIGURE 3-1. IMAGINARY SURFACES, FAR PART 77

b. Other Airport Activities. The terminal building site should be located in an area of the airport of adequate size for present and future roadway systems and parking facilities and to accommodate other related airport activities which would benefit from proximity to the passenger terminal. Other terminal-related functions include the following:

(1) Air Cargo Facilities. At most nonhub airports, cargo is carried in the lower compartments of passenger aircraft and processed through the passenger terminal. In some special situations at the larger nonhubs or those that have a sufficient volume of air cargo, a separate cargo building may be desirable. Such a building should be located in reasonable proximity to the passenger terminal to facilitate direct movement of cargo between the cargo building and the aircraft parked at the passenger terminal.

(2) Aircraft Refueling Facility. When provided, it is important for an aircraft refueling facility to be located in reasonable proximity to the terminal area in order to minimize the distance that fuel must be transported by tanker trucks. Access to the facility separate from the public entrance road is desirable. Refueling services are often provided by a fixed base operator.

(3) Rental Car Storage and Maintenance. Rental cars returned to the passenger terminal are moved to a maintenance facility for cleaning and servicing. As cars are ready for rental, some are driven to the terminal area, but the majority will be stored at the maintenance facility until needed. For efficient rental car operations, this facility should be situated convenient to the terminal area.

(4) Crash/Fire/Rescue. Emergency equipment is often manned by employees who have additional responsibilities requiring work in and around the terminal area. In such cases, crash/fire/rescue equipment should be housed in proximity to the terminal consistent with required response times and access to the landing facilities.

17. PHYSICAL SITING CONSIDERATIONS. Site characteristics that may influence the location of the terminal area are as follows:

a. Terrain. Topographical conditions can be a major factor in the selection of the passenger terminal building site. Utilization of relatively level land with good drainage characteristics will usually prove economically advantageous; however, an existing terrain feature such as a grade differential between the landside of the terminal and the aircraft ramp can often be incorporated into the terminal concept. Economic advantages from the reduction of potential construction costs with respect to terminal site selection by utilizing existing topography will be an important factor in any comparison of site alternatives.

b. Existing Conditions. Existing structures and utilities must be carefully inventoried and considered in the planning of new or expanded passenger terminals. In some cases, existing facilities or utilities which are not related and are restrictive to passenger terminal development can be demolished, abandoned, or relocated to a more suitable area of the airport. In other instances, existing conditions will limit the number of possible alternative terminal solutions.

c. Expansion Potential. In order to insure the long-term success of a new passenger terminal or an addition to an existing terminal, potential expansion beyond forecast requirements should always be taken into consideration. In the planning stage, the terminal should be conceived of in its ultimate form with reasonable allowance for growth and changes in operation beyond forecasted needs. The utilization of this principle when selecting a terminal site or an expansion scheme will preserve adequate space around the terminal for orderly construction of succeeding stages. Minimum sizing of terminal areas is discussed in paragraph 36.

d. Environmental Impacts. The location of a terminal building facility or a major expansion of an existing one may result in significant environmental impacts. If this is the case, an environmental impact assessment report is required and building and siting alternatives must be evaluated and incorporated in the report. The requirements for environmental impact documentation are discussed in paragraph 43.

18. RELATIONSHIP OF TERMINAL TO ROADWAYS. The roadway system must be considered concurrently with the planning of the terminal building and auto and aircraft parking.

a. Connection to Highway Network. Access to the airport terminal area is required by air travelers, employees, greeters, visitors, truckers, and ground transportation companies. The private automobile continues to be the major mode of transportation to smaller airports and, as a result, air travelers and terminal area employees will be the main contributors to terminal area traffic. The passenger terminal should, therefore, when possible, be located on the side of the airport nearest to the population center generating the major source of traffic to the airport or the highway serving it. The location of the terminal with respect to the highway should allow sufficient distance to accommodate present and future vehicular traffic concepts such as diamond intersections and the ultimate terminal area development. Inadequate space for proper roadway alignment and possible interchanges is one of the most inhibiting factors of future terminal development.

b. Terminal Access. The terminal roadway system includes the roadway serving the terminal building and associated parking areas, and the service roads which provide access to terminal support facilities, to the airfield, and other nonpublic areas. Provision for adequate vehicular access, efficient circulation, and parking is essential to the success of a passenger terminal. Appropriate allotment of space in the terminal site for this purpose is a paramount planning consideration.

CHAPTER 4. PLANNING CONSIDERATIONS

19. TERMINAL ROADWAY SYSTEM.

a. A single intersection from an off-airport highway generally serves the connecting roadway which directs traffic to the terminal access roadway and the service roads. Service and employee vehicles not destined for the terminal should be diverted onto service roads as soon as possible in order to reduce the possibility of congestion and unnecessary conflict. It is recommended that the passenger terminal roadway consist of a simple one-way loop system circumscribing the public parking area and passing the terminal in a counterclockwise direction to permit right-side loading and unloading of vehicles.

b. To minimize the number of vehicles passing directly in front of the terminal building, parking lot entrances should, where possible, be located prior to the terminal. For the same reason, parking lots should exit onto the roadway system at locations beyond the terminal. It should be possible for automobile drivers who are dropping off passengers at the terminal to have easy access to the parking area. A recirculation roadway ramp linking the ingress and egress portions of the access roadway system should be provided for this purpose. A second parking lot entrance located beyond the terminal should also be considered.

c. At lower activity airports, a multilane roadway can serve both the ticketing and baggage claim areas. This roadway should provide lanes at the terminal curb for cars to park while loading or unloading, for the maneuvering of vehicles, and for through traffic. Traffic leaving the terminal area will follow the remainder of the loop roadway to the connector road and to the highway intersection.

d. Ample separations between locations where drivers must make directional decisions should be provided to avoid confusion. No more than two choices should have to be made by the driver at any location, and adequate directional signing should be incorporated in the roadway system.

e. A schematic roadway system is depicted in Figure 4-1. The diagram is also illustrative of functional relationships of the principal elements of the passenger terminal complex.

20. CIRCULATION AND FUNCTIONAL RELATIONSHIPS. Routes to and from parking lot(s) and the terminal should be made obvious, must be well signed, and free of obstructions. The simplified direct flow for passengers and visitors is a primary objective in terminal planning. It is important that primary terminal functions and ancillary activities be located with respect to their sequence in the terminal. For example, passengers should not have to carry baggage excessive distances from curbside to the baggage check-in facility. Or upon retrieval at the claim area, passengers should not be expected to transverse long distances. Concessions and rest rooms should be located adjoining primary circulation routes. Enplaning and deplaning passenger

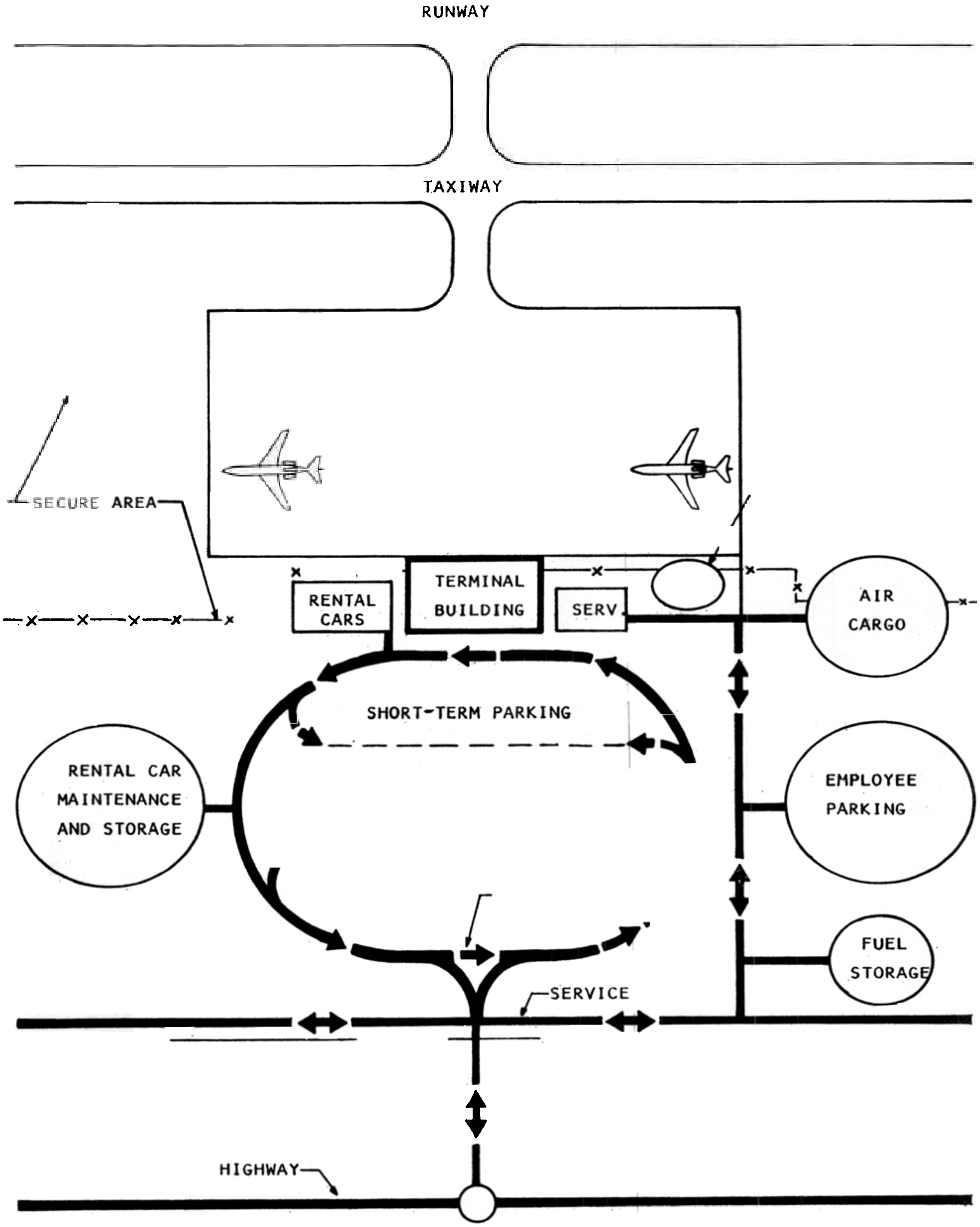


FIGURE 4-1. TERMINAL SITE RELATIONSHIP DIAGRAM

circulation should be separated to the extent practical. Conflicts between the movement of baggage and pedestrians should be avoided. Functional relationships of key elements and the passenger and baggage flows are shown in Figure 4-2.

21. AIRCRAFT PARKING CONFIGURATIONS. Aircraft parking variations and the resulting terminal configurations are shown in Figure 4-3.

a. Linear. When the number of aircraft parking positions does not exceed four to six, the linear aircraft parking layout is efficient. In this configuration, aircraft parking positions are located in a single row, usually parallel to the terminal. Aircraft are served by a centrally located departure lounge(s) within the terminal. To protect passengers from inclement weather, enclosed concourses or covered passageways extending from the departure lounge(s) toward the aircraft parking positions are desirable.

b. Pier. The pier concept consists of a canopy walkway, an enclosed corridor, or a building pier with aircraft parked on either side. This layout becomes efficient when a larger number of aircraft parking positions are required or the site limits linear expansions.

22. SINGLE VERSUS MULTILEVEL - VERTICAL ASPECT.

a. Ground Level Boarding. At most nonhub airport terminals, passengers board aircraft by walking short distances from the terminal or departure lounge across the aircraft parking apron. Access to the aircraft is provided either by mobile stair unit or by stairways that are self-contained in the aircraft. Inclined loading bridges are also employed at some locations. The loading bridge is able to adjust to the varying aircraft door heights and swing clear of maneuvering aircraft. The slope of the loading bridge should not exceed 8%. This method of boarding offers a higher degree of passenger service and may be desirable at terminals where extreme climate conditions exist.

b. Second Level Boarding. The higher cost of construction associated with locating departure areas on the second level of the terminal with direct boarding of aircraft via loading bridges can seldom be justified at nonhub terminals. However, where forecasts indicate that such a terminal scheme will be feasible and desirable in some future phase of development, the terminal design should provide for vertical building expansions to avoid costly future building modifications.

c. Unusual Topographic Features. At most nonhub airports, the passenger terminal enplaning and deplaning functions and aircraft parking apron are at the same level. Airport and terminal sites are not always located on relatively flat terrain. When natural conditions cause the passenger terminal site to be located above or below the aircraft apron, careful study and innovative adaptation to the topographical features can often result in a planning benefit. The use of split-level or two-level

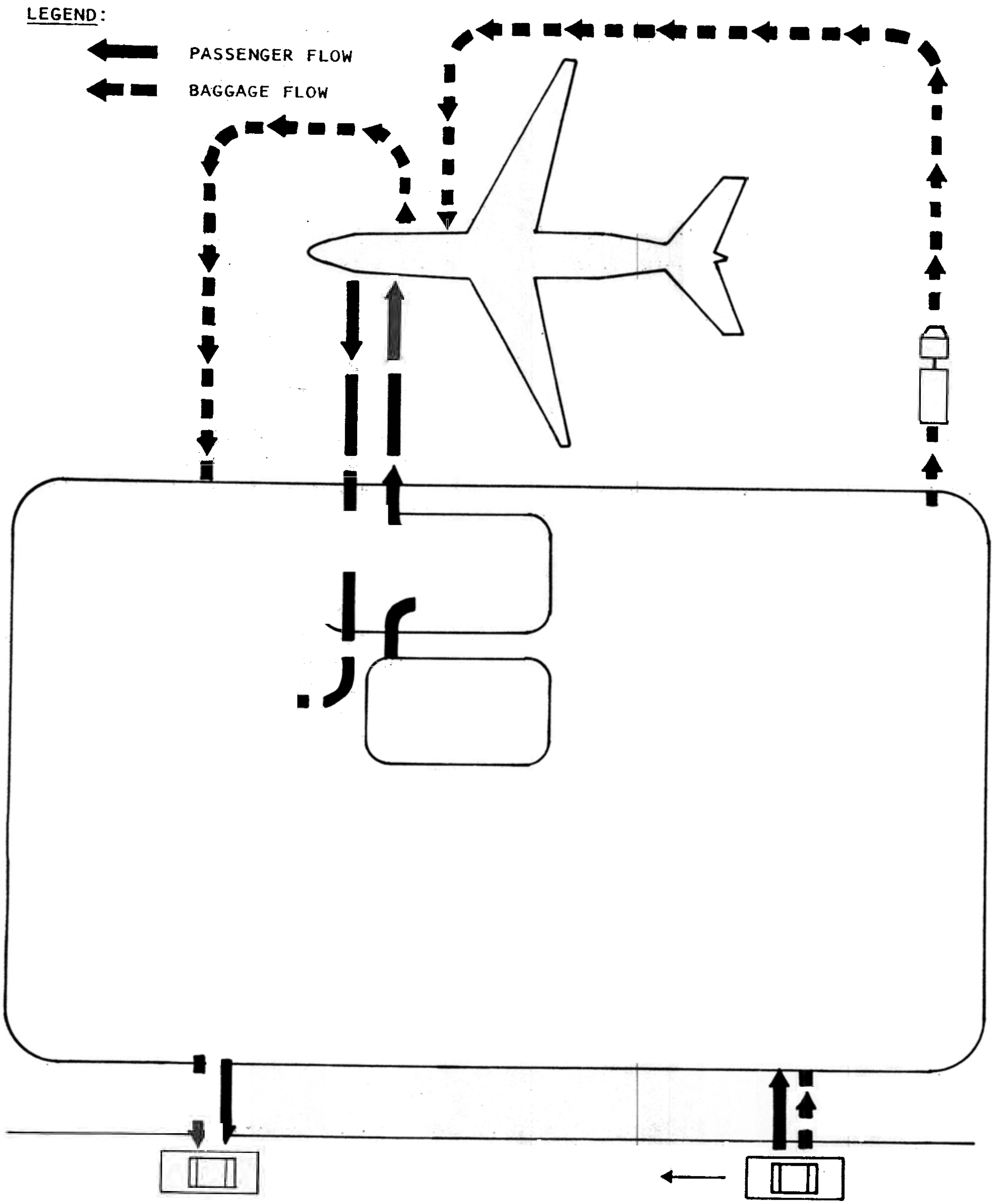
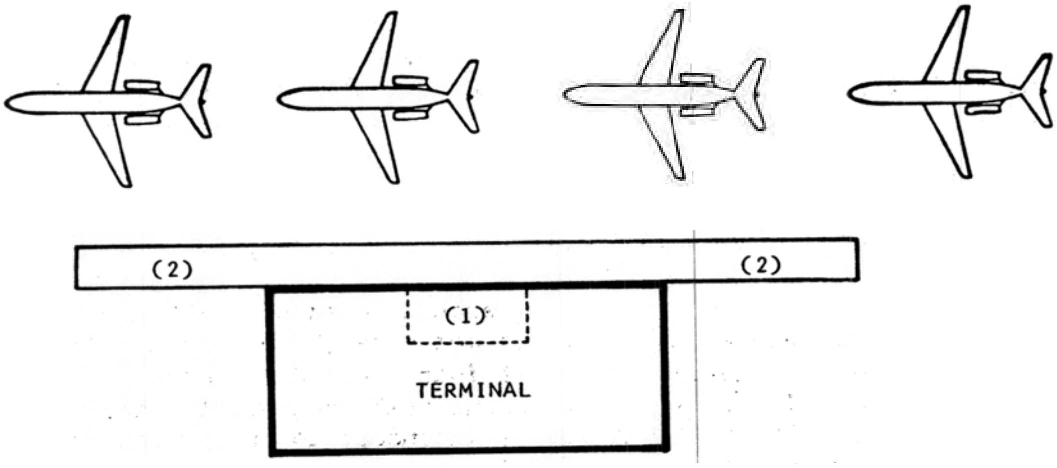


FIGURE 4-2. DIAGRAM OF PASSENGER TERMINAL CIRCULATION AND FUNCTIONAL RELATIONSHIPS

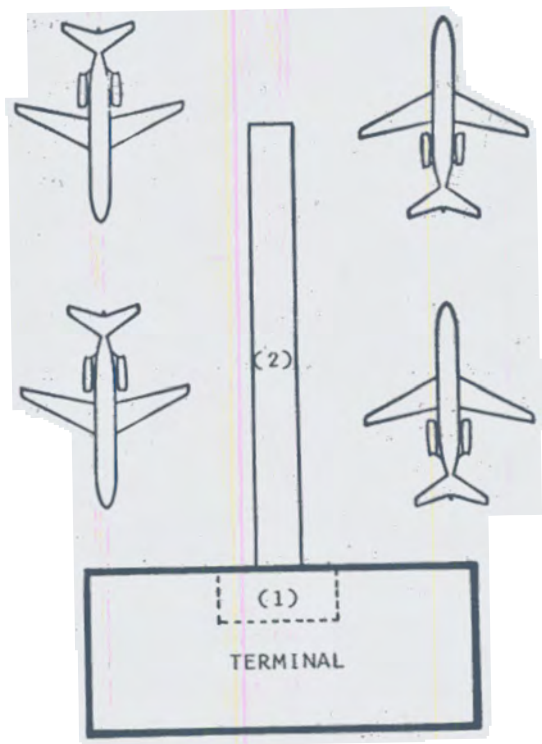


LINEAR SYSTEM

LEGEND:

(1) CENTRALLY LOCATED SECURE DEPARTURE AREA

(2) FENCED, COVERED, OR ENCLOSED WALKWAY



PIER SYSTEM

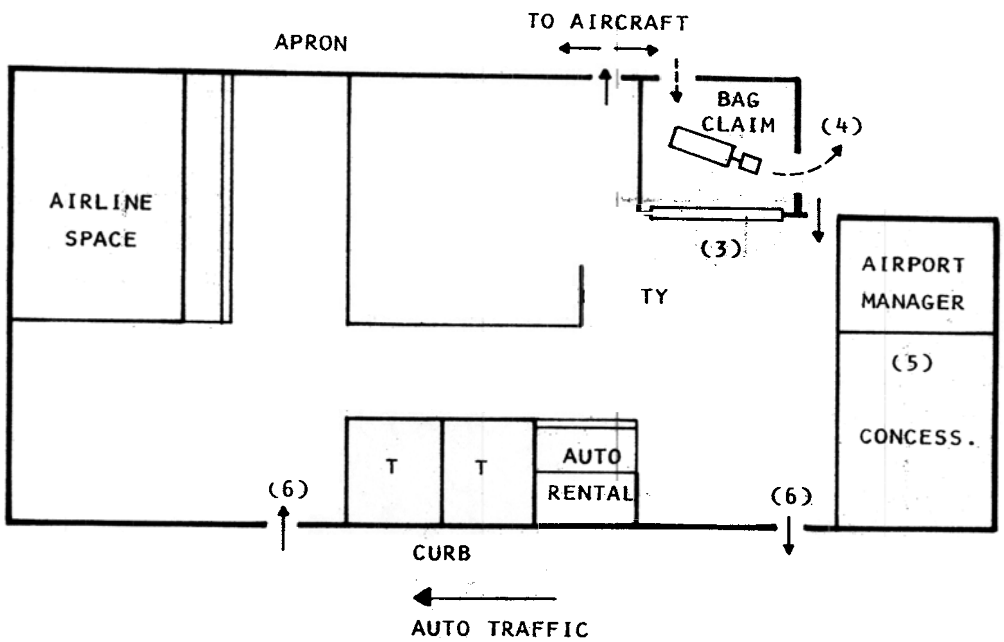
FIGURE 4-3. AIRCRAFT PARKING AND TERMINAL CONFIGURATIONS terminal concepts may become economically feasible and provide a more functional planning solution than might be possible on a level site. As in single-level buildings, provisions must be made for the handicapped (see paragraph 37).

23. FLEXIBILITY AND EXPANSIBILITY. The financial feasibility aspects of terminal planning and design, as discussed in Chapter 2, must be considered along with the flexibility and expansibility of the building.

a. Flexibility. A terminal building should be adaptable to permit alterations in interior layout and use to accommodate the ever-changing procedures and requirements. Flexibility built into a building encompasses all or portions of the following: using nonbearing walls and partitions; converting spaces to uses other than originally intended; locating various facilities so additions or enlargements will impose the least disruption to continued operation; selecting materials and methods of construction adaptable to remodeling; and installing mechanical and electrical systems that do not require substantial reworking for partition changes. All architectural, structural, and mechanical elements in design detail and specifications should reflect these considerations. Designers should be cautioned that the use of some materials can cause other problems. External metal walls, for example, can reflect electronic signals that can cause serious disruption of airport navigation equipment.

b. Expansibility. Growth of the aviation industry generates requirements for expanded facilities to accommodate the operational requirements of airport terminals. An airport terminal building should be planned to accept additions with a minimum of demolition or disruption of its functions. Provisions for expansion should be made primarily laterally and/or vertically. A structure of a simple rectangular configuration rather than of irregular or curved shape lends itself more readily to this type of expansion. End walls of the building should not be bearing walls. Elements such as vertical circulation, toilet accommodations, kitchen facilities, and other mechanical installations are best situated in the building so that relocation of these costly and vital installations will not be necessary when expansion occurs. Where vertical expansion or additions are likely, the original structural system should be designed to carry the future loads. The passenger service counter, waiting room, airline operational spaces, and baggage claim area may require periodic expansion. They should be planned so that enlargement will be a relatively simple and inexpensive operation. Typical errors often made in terminal plans that restrict expansion and compromise efficiency are depicted in Figure 4-4. For comparison, Figure 4-5 is illustrative of a more functional, expansible small passenger terminal.

24. AESTHETIC CONSIDERATIONS. The airport terminal is an important civic building. As the gateway to the community, it should reflect the character and aesthetic aspirations of its citizens. Artwork can be combined with the building design to give public spaces individuality and to present an image of the local culture and architectural heritage. Visual clues to the social and economic preoccupation of the region can be provided, and ethnic



(1) TICKET COUNTER EXPANSION REQUIRES REORIENTATION AND MAJOR RECONSTRUCTION

(2) QUEUES AT SECURITY CLEARANCE BLOCK CIRCULATION

(3) BAGGAGE CLAIM EXPANSION RESTRICTED

(4) CROSS TRAFFIC - BAG CARTS AND PEDESTRIANS

(5) OFFICE AND CONCESSIONS BLOCK LOGICAL BUILDING EXPANSION

(6) BUILDING FUNCTIONS IN WRONG SEQUENCE TO MATCH ARRIVING AND DEPARTING VEHICLES

FIGURE 4-4. EXAMPLE OF TERMINAL PLANNING DEFICIENCIES

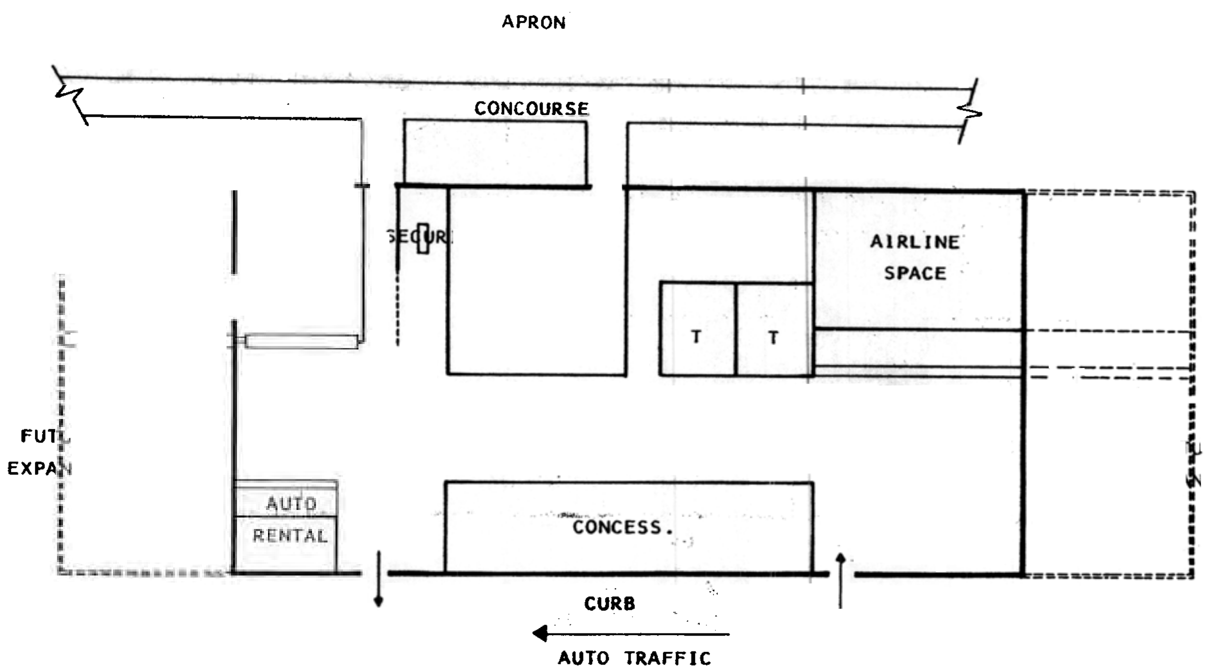


FIGURE 4-5. EXAMPLE OF A FUNCTIONAL TERMINAL LAYOUT

sensibilities and identification can be expressed. FAA programming criteria permit the use of ADAP grant-in-aid funds for incorporating expanded design arts concepts and principles in airport terminal building projects. However, Federal participation in airport terminal development does not mean that any particular style of architecture will be imposed on the planner. Each community is free to select the architectural style and treatment that expresses local wishes and needs. An investment in the design of airport terminals can produce humane and pleasant places, improve the travel environment, and benefit the community. Caution should be exercised, however, to avoid extravagant monumental buildings, as these are not consistent with the ever-changing requirements of the aviation industry. In addition, Federal funds may not be adequate or available for overly ambitious design concepts. Qualified professional architects/engineers working with agreed-upon budgets and work programs can design imaginative solutions that will be a source of civic pride while reflecting the functional parameters and flexibility necessary for a successful terminal. If there is question concerning ADAP eligibility of incorporating particular design arts concepts in the terminal building plan, FAA Airports District or Regional Offices should be consulted.

CHAPTER 5. PEAKING AND DEMAND FORECASTS

25. PASSENGER FORECASTS. Passenger forecasts are employed in determining future terminal quantitative requirements.

a. Use. Passenger forecast data are used in the development of terminal space requirements, number of aircraft parking positions, automobile parking needs, and peak airport vehicular traffic demands. Forecasts are customarily made for 5-, 10-, and 20-year periods. The forecast data are used in preparing a master plan of the full development of the terminal to accommodate orderly, incremental additions or expansion of facilities. The initial stage of construction of airport terminal facilities should be designed to accommodate, comfortably, the forecast demands 5 years from the proposed date for occupancy.

b. Sources. There are a number of sources for passenger forecasts that may be obtained for a specific airport. These include: a current airport master plan developed under the FAA-sponsored PGP; FAA's published Terminal Area Forecasts; forecasts developed by the Air Transport Association or the airlines serving the airport; airport management; local or regional planning agencies; state and metropolitan airport system plans; or early airport studies or reports.

c. Translating Forecasts to Peak Demands. Airport terminals and related vehicle access and parking are planned, sized, and designed to accommodate peak passenger demands of the forecast periods.

(1) Facilities should be provided to accommodate normal high levels of activity (peaks) that can be expected to occur during the forecast year. Planning for absolute peak demands; i.e., the greatest demands anticipated, will result in impractically oversized and under-utilized facilities except for rare occasions. Facility-sizing guidelines, presented in this circular, are based on forecasted: total peak hour passengers (enplaned and deplaned); peak hour enplaned passengers; peak hour deplaned passengers; and annual enplaned passengers. Chapter 6 covers the subject of facility sizing in detail.

(2) FAA's AC 150/5360-7, Planning and Design Considerations for Airport Building Development, current edition, describes a methodology for translating forecasted passenger activity into design peak hour demands. The procedure utilizes historic and projected passenger levels and aircraft movements to develop a hypothetical design day activity table from which passenger peaking activity can be analyzed. The circular also provides "average" peaking charts and rules-of-thumb for rough estimating of various peak hour demand activities.

(3) In lieu of developing a detailed design day activity analysis, a simple and accurate method of determining peak hour demands involves the use of current and most recent historical data or peak hour activities and facility usage at the airport under study. Current data can be obtained

from airline station records of hourly enplanements and deplanements (total passengers) for a minimum 2-week period. From an analysis of this data, a typical peak hour level of activity can be determined. As a guideline, this level of activity is one which is anticipated to occur at least 100 to 150 times a year (or, as an average, approximately two or three times weekly) during busy 60-minute periods. The current peak hour activity levels must be adjusted to account for the peak months of activity, if the data is obtained in other than a typically busy month of passenger activity. This can be done by comparing enplaned passenger counts in the month when the data was collected to enplaned passenger counts during the typical peak months of the preceding year and, if necessary, adjusting the peak level upward or downward proportionately. This calculated peak hour/peak month count is then divided by the total number of enplaned passengers for the most recent 12-month period to arrive at a peaking factor expressed as a percentage of annual enplaned passengers. This peaking factor will decrease gradually as total annual enplanements increase. (The rate of decrease in peaking factors varies from airport to airport. It is advisable to consult with airline facilities planners and FAA Airports District Office representatives for assistance on this matter.) The resultant factor when applied to forecasted passenger enplanements for the design year will yield the approximate total peak hour passengers anticipated for that year. Enplaning and deplaning design peak hour passenger levels can be determined separately by following a similar procedure or by assuming that both enplaning and deplaning peak hour passengers equal 60% to 70% of total peak hour passengers. This is a rule-of-thumb percentage that has proved to be quite accurate.

(4) The facility sizing graphs in Chapter 6 are designed to be utilized with design peaking levels obtained from either procedure discussed above.

26. PEAKING CHARACTERISTICS. Peaking characteristics vary from airport to airport and thus influence the planning, sizing, and design of passenger terminal facilities in different ways. The most commonly encountered peaking characteristics influencing passenger terminal planning are described below.

a. Aircraft Apron. Current peak use characteristics of the terminal apron can be determined from arrival and departure times listed in airline schedules. Off-schedule operations should be considered when scheduled flights are closely spaced, timewise--i.e., a delay in a departure would increase the peaks of aircraft parking. At nonhub airports, the airlines usually stagger their schedules of aircraft on the ground to minimize staffing of ground servicing personnel. This procedure tends to hold peak demand for aircraft parking positions to a minimum. Airports in locations with seasonal attractions, such as resorts, tend to have higher than normal peak demand for aircraft parking positions. Additional aircraft parking positions may also be required because of interline connecting schedules or other scheduling influences at locations where more than one airline serves a nonhub airport. Quantification of aircraft parking position requirements is dealt with in paragraph 28.

b. Passengers. Passenger peaking and airline aircraft peaking generally occur during the same periods. However, a late arrival or departure of a scheduled flight may result in more than the usual number of aircraft on the ground at the same time and, consequently, may result in a larger than normal number of passengers and visitors present in the terminal.

(1) Airline Schedules. Peaking of passenger activity at airports with only a few daily flights is a result of airline scheduling considerations rather than marketing forces. When the annual volume of passenger traffic is in the upper range of the nonhub category, passenger peaking characteristics are predominatly influenced by the character of the air travel market. At airports where the preponderance of the passengers are traveling for business purposes, peaking usually occurs in the early morning hours with the attendant aircraft peaking. Evening peaks for such business travelers are normally spread over longer periods than morning peaks.

(2) Seasonal or Special Event Traffic. Airports with seasonal passenger traffic characteristics or traffic generated by special events usually have passenger peaking characteristics spread over more hours of a day than airports with predominatly business travel. The spreading or sustaining of these peaks is attributable to the availability of aircraft, airline scheduling, and flexibility of the passengers' arrival or departure hour.

c. Nonpassengers. In addition to passengers, terminal occupants are usually in three categories--each there for different purposes and some contributing to peak occupancy.

(1) Meeters/Greeters. Persons accompanying an enplaning passenger into the terminal or meeting a deplaning passenger usually arrive coincidentally with the peaking of passengers. These people add to the demand for public spaces and facilities and for concessions. The greeter-per-passenger ratio varies with the nature of the passenger traffic. Generally, lower ratios, such as one-to-one, are found where business travel is predominant; and higher ratios, such as two-or-more-to-one, when vacation travel is predominant. This characteristic should be verified when planning a terminal. Special events, such as the arrival or departure of public figures, can impose heavy greeter loads on facilities. It is neither functionally nor financially sound to size facilities for such rare occasions.

(2) Visitors. The impact of visitors and sightseers is normally of minor importance in the sizing of nonhub airport passenger terminal facilities--an exception might be a popular restaurant which attracts the general public because of food quality, price, or some unique feature.

(3) Employees. Employees do not normally impact the sizing of passenger terminal facilities at the smaller passenger volume airports. They are usually occupied in processing of passengers and baggage and servicing aircraft during peaks; and thus have no significant demand on the public or concession facilities of the terminal during peak activity.

d. Vehicles. The peaking of automobiles affects the design of the on-airport roadway system, the passenger unloading/loading curbs at the terminal, and the parking lots.

(1) Personal Automobiles. The on-airport ingress and egress roadways at nonhub airports usually do not present problems at normal peak periods. Peak demands at the enplaning curb occur about one-half hour prior to flight departures and at the deplaning curb immediately following arrivals. Passenger dropoffs at the enplaning curb create peaks greater than pickups at the deplaning curb since deplaned baggage is most frequently hand carried to the parked car.

(2) Public Vehicles. At nonhub airports, taxis, limousines, buses, and courtesy vehicles are generally not significant factors in peak demand at the terminal curb. However, at resort areas and airports with unusual peaking characteristics involving public transportation vehicles, consideration should be given to providing designated unloading/loading areas.

(3) Employee and Service Vehicles. Terminal employees' vehicles precede or follow the passenger peaks, and thus their contribution to peak traffic is minimal at smaller airports. If a problem exists, service vehicles can be required to make deliveries or pickups during offpeak hours, thereby not compounding peak vehicular traffic problems.

(4) Parking Lots. Public parking lot usage usually generates three peaks at nonhub airports--a short period before departing flights, another short period prior to arriving flights, and a relatively longer period during the week. The latter is of the greatest significance because the quantity of parked automobiles at approximately midweek usually establishes parking lot size. This happens because of the buildup of departing air travelers' vehicles usually occurring from Sunday through Wednesday. However, at some airports, special situations may generate parking peaks on weekends. Peaking characteristics of rental car storage is usually the inverse of public parking demand. The peak number of rentals occurs typically on the airport over the weekends, with the inventory lowest during the midweek. The weekend accumulations of rental cars are usually parked in service areas. However, ready-and-return-car parking spaces are normally provided in proximity to the passenger terminal to accommodate the checkout peaks in the early part of a week and the return peaks later in the week.

CHAPTER 6. FACILITY REQUIREMENTS

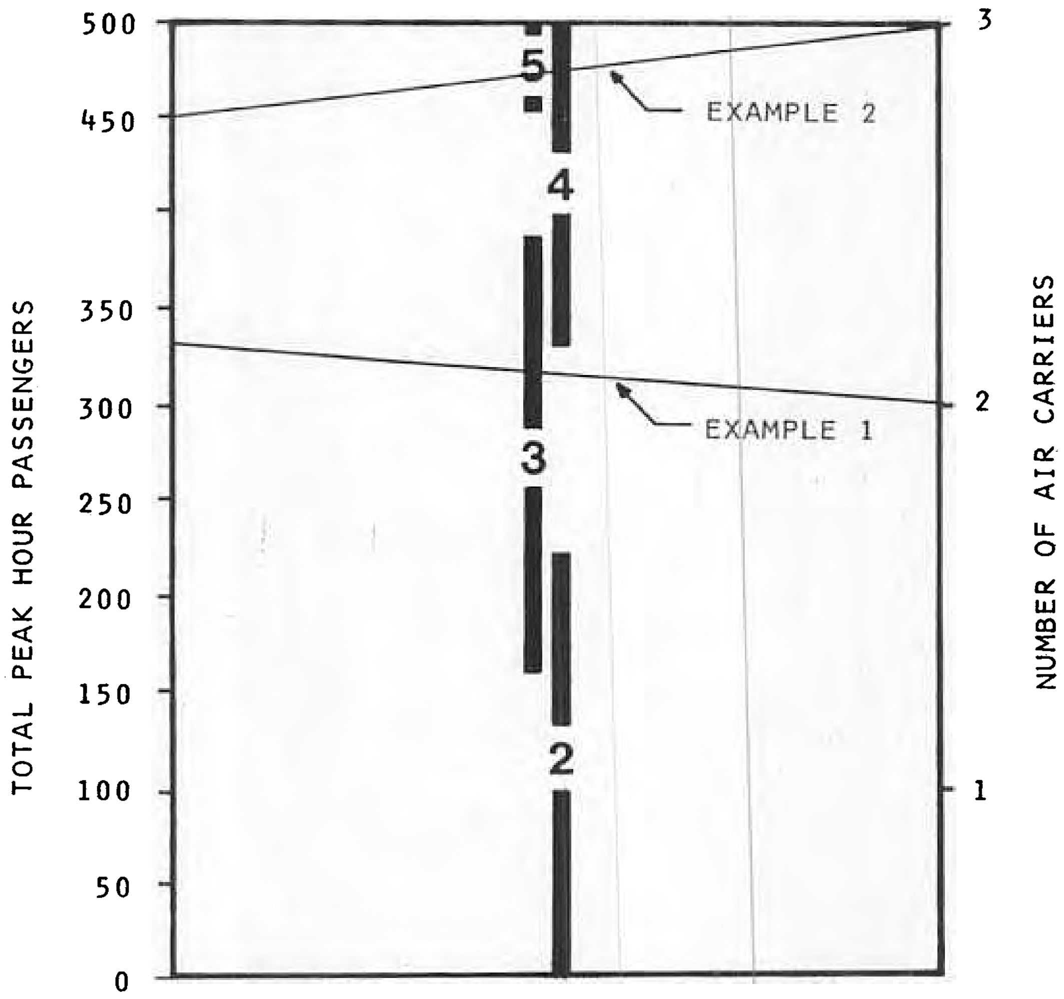
27. FACILITY REQUIREMENT GRAPHS. The facility sizing graphs herein are based on peak hour passenger activity with the exception of automobile parking, which is based on annual enplanements. The graphs have been designed for those specific facilities that are dependent on enplaning passenger peaks (e.g., airline ticket counters); deplaning passenger peaks (e.g., baggage claim facilities); or total passenger peaks (e.g., lobby/seating area).

28. AIRCRAFT PARKING. The principal factors of parking air carrier aircraft at the terminal relate to the number of positions, the method of parking, and the apron layout. Airline technical representatives can provide advice and assistance.

a. Number of Airline Aircraft Parking Positions. As a minimum, two parking positions are necessary for air carrier aircraft--one position for regularly scheduled flights and the other for the possibility of a delayed or off-schedule flight. Airlines sometimes request preferential parking positions. Additional parking positions may be required due to scheduling of simultaneous flights or when more than one airline serves the airport. To determine the required number of aircraft parking positions, it is necessary to use the forecast of total peak hour passenger activity for the planning periods and to account for the number of airlines serving the airport. In calculating peak hour passenger traffic, passengers carried by the intrastate carriers using similar equipment to that of certificated carriers should be included in the annual and monthly data. The graph shown in Figure 6-1 can be used as a guide in determining the number of airline aircraft parking positions for each of the forecast periods. Commuter airlines, air taxis, charters, and general aviation could add to the requirements for aircraft parking positions. The graph does not include these activities, and additional aircraft parking positions may be warranted. If commuter airline, air taxi, or general aviation parking positions are provided at the terminal, they should be carefully located to avoid interference with air carrier aircraft maneuvering and the effects of jet blast.

b. Methods of Aircraft Parking. At nonhub airports, aircraft are generally taxied in and out of parking positions with their own power. This is a cost effective operating procedure preferred by the airlines but requires adequate space between parked aircraft for maneuvering and clearance. In special situations where space is limited, aircraft parking positions can be spaced closer but must be pushed out by use of a tug. At most nonhub airports, however, the volume of passenger traffic will not justify the cost of the push-out operation or the equipment required. Before adopting such a solution, this should be reviewed with the airlines serving the airport.

c. Apron Design. Apron frontage of two taxi-in, taxi-out aircraft parking positions for most Group II size aircraft listed in AC 150/5335-1 may be based on a minimum spacing of 175 feet (53 m) center to center. In planning the aircraft parking apron, 25 feet (8 m) is considered a safe



Example 1:
Given: 330 forecasted average total peak hour passengers and 2 air carriers.

To find required number of air carrier aircraft parking positions at terminal - using a line connect the number (330) of total peak hour passengers with the number (2) of air carriers.
On the center bars read 3 aircraft parking positions.

Example 2:
Given: 450 forecasted total peak hour passengers and 3 air carriers.

To find required number of air carrier aircraft parking positions at terminal - using a line connect the number (450) of total peak hour passengers with the number (3) of air carriers.
On the center bars read 4 or 5 positions. Paragraph 28a. cites influences on aircraft parking position requirement variations to assist in a determination of a 4 or 5 position apron.

FIGURE 6-1. AIRLINE AIRCRAFT PARKING POSITIONS minimum clearance to other aircraft, buildings, or obstructions and for passenger circulation or service equipment. The depth of apron is dependent on aircraft size, parking angle to the building, and whether apron edge taxiing is planned. Guidance on aircraft parking aprons is contained in "The Airport Terminal Building Planning Report" (Report No. FAA-RD-75-191).

d. Jet Blast. In designing an apron-terminal complex, the effect of jet blast at the terminal, particularly on glass areas facing the apron, must be considered. AC 150/5325-6, Airport Design Standards--Effects and Treatment of Jet Blast, current edition, contains information on this subject. In addition, user airlines should be consulted to reflect their operating experience. General aviation parking areas on the terminal apron must be planned to give consideration to the effects of jet blast or propeller wash from maneuvering aircraft.

e. General Aviation Aircraft Parking. Security requirements will affect the locations of parking space for general aviation aircraft at the terminal. ADAP legislation requires that users of such aircraft must be provided access to the passenger enplaning and deplaning area of the airport and to and from the passenger terminal building. Since persons using these aircraft have not normally been screened for security, their movement in aircraft operational areas and their access to the terminal building must be controlled. For this reason, it is often necessary to designate separate areas apart from air carrier aircraft parking for general aviation aircraft. In addition, provisions must be made to permit unscreened individuals deplaning from general aviation aircraft to have access to terminal facilities without passing through "sterile" secure areas.

29. AUTO PARKING. Public parking facilities should be provided for in proximity to the passenger terminal for airline passengers, visitors, and other terminal users. While parking requirements and characteristics vary from airport to airport, Figure 6-2 provides a guide for the number of required public parking spaces based on annual enplaned passenger traffic. Data analyzed at many airports revealed that public automobile parking requirements are more accurately relatable to annual enplaned passengers than to peak hour passengers.

a. Total Public Parking Requirements. The quantities indicated by the curve are intended to be used as a guide. It is advisable to survey public parking lot usage to determine its adequacy or inadequacy during typical peak days. The data obtained on existing public parking related to current annual enplaned passengers can be plotted on the graph. If the data seems valid, it can be projected parallel to curves or adjusted to reflect special conditions. From this procedure, future need can be estimated.

b. Short- and Long-term Parking. Normally 15% to 25% of the total public spaces should be allotted to short-term parking (up to 3 hours' duration)--the balance provided for long-term parking. Short-term parking is usually provided nearer to the terminal for two basic reasons. The

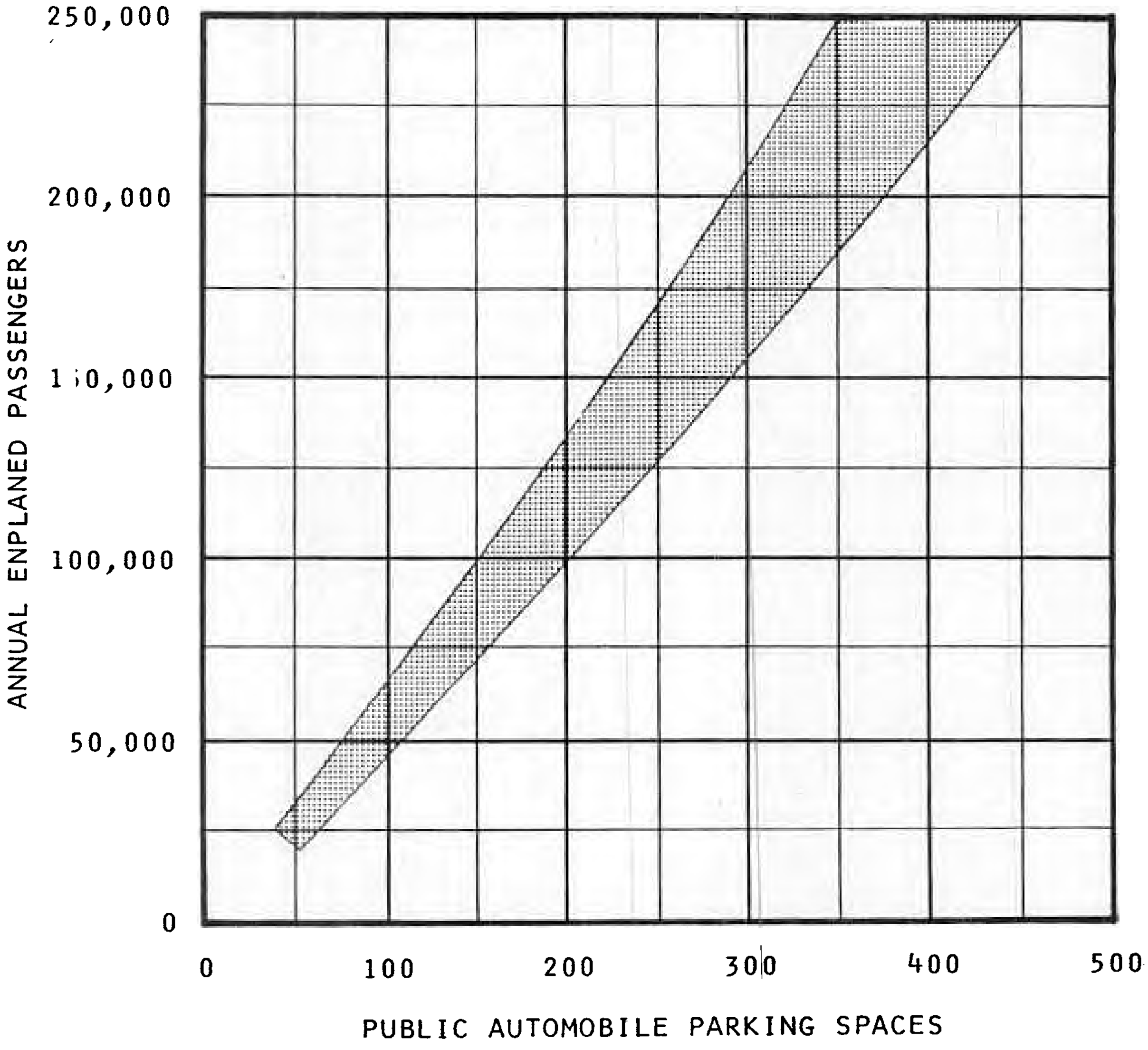


FIGURE 6-2. PUBLIC AUTOMOBILE PARKING

turnover is usually three or more times that in the long-term lots--thus it provides more spaces where needed. Parking fees for the short-term lot usually command a substantially higher rate per hour than the long-term lot.

c. Parking Lot Entrance and Exits. Points of entering and exiting the parking lots should be clearly identified and sufficiently separated to preclude confusion. A single exit is preferable where fees are charged. The exit should be situated to permit the parking patron to recirculate to the terminal curb for passenger and baggage pickup.

d. Employee Parking. Parking for terminal employees should be provided within a reasonable distance to the terminal. The number of terminal area employee parking spaces required can normally be determined by consulting with airport management, the terminal tenants, or by providing 10% to 20% of the projected public parking space requirements.

e. Rental Car Parking. At airports with low passenger volumes, a minimum of 10 parking spaces for each rental agency having a counter in the terminal should be provided in proximity to the terminal building--usually near the baggage claim area of the building. The number of spaces to provide is dependent on local agency requirements. Rental car wash, service, and storage facilities are normally situated away from the terminal building complex.

30. TERMINAL CURB. The passenger terminal curb provides for passenger and baggage dropoff and pickup. The length of curb at nonhub volume airports is usually a function of the length of the building which is generally adequate for the normal vehicular traffic. However, curb extensions beyond the ends of the building are advisable to accommodate peak demands and to correspond with future building extensions. The platform or sidewalk adjoining the curb should be of a width to allow for the swinging open of a car door plus a minimum of 8 feet (2.5 m) for circulation. A canopy extending over the curb, minimum height of 11 feet (3 m) (check local codes) to clear service trucks and buses, is a desirable feature for weather protection. The roadway at the terminal curb should be a minimum of three lanes--one for parking while unloading and loading, one for maneuvering into a parking position, and one for through traffic. In nonhub airports with special peaking problems, such as those in resort areas, professional traffic analysis and recommendation should be sought.

31. PUBLIC AREAS. The type, shape, and juxtaposition of the elements of a terminal plan affect the amount of public space in a terminal, as discussed in the following guidance material:

a. Lobby/Waiting Area. A lobby directly accessible from the curb with space for waiting and seating should be provided adjacent to the ticketing area. The lobby must be large enough to accommodate passengers who arrive early, passengers with delayed flights, and people who accompany passengers to the airport. It should be located with easy access to concessions, rest rooms, telephones, security check point(s), and the baggage claim area. It is the hub of the circulatory route through the terminal; and as such, the seating should not conflict with passengers' queuing at the ticket counters or with passenger traffic flow. The graph, Figure 6-3, can be used as a guide to the amount of area for a lobby or waiting area. Unusual peaks resulting from special events, resort areas, or colleges may require additional lobby/waiting space than indicated on the graph. The number of occurrences annually can influence judgment on providing additional space for such conditions. Ten to 15 percent for circulation space and allowance for visitors is accounted for in the curve. Lobby space for queuing in front of ticket counters is obtainable from Figure 6-4. The depth of queuing space should not be less than 20 feet (6 m). Queues should not obstruct entrances or impinge on the circulation space parallel to the line of ticket counters. Area for the circulation space is in addition to the areas obtained from Figure 6-4.

b. Circulation Space. As described in paragraph 20 and shown in Figure 4-2, circulation is a key element in a successful terminal plan. The amount of circulation space with respect to the gross terminal area varies from approximately 20% to as much as 30%, depending upon the layout, degree of centralization of facilities, and size. As an example, initial development may include a concourse to a departure lounge. Future construction phases may include an addition to the departure lounge and apron to accommodate an additional aircraft parking position and enlarged ticket counter, ticket lobby, and baggage claim areas. Thus, additional circulation space will not be required for these additions; and its percentage of the total space would be less than the initial percentage. Unless some factor portends unusual growth, 20% may be used for planning purposes. Adequate circulation space should be allowed in the planning to take into account future forecast requirements.

c. Passenger Security Screening. Air carriers using aircraft operated under FAR Part 121 are required by section 121.538 to screen all passengers prior to boarding the aircraft. Three types of preboard passenger screening stations are currently used in airport passenger terminals. They are sterile concourse, holding area, or boarding gate, in this order of preference from the standpoints of security and passenger facilitation. Careful attention should be afforded the type, location, and number of screening stations to simplify passenger flow through the terminal and to plan for a minimum security screening staff. This suggests a single screening station. Nonhub terminals, when the volume of traffic warrants, sometimes employ x-ray baggage inspection and/or electronic walk-through metal detection devices. A security screening station requires in the order of 100 to 150 square feet (10 to 15 m^2). In an existing passenger terminal when a single security station is not functionally feasible, provision must be made for multiple security screening facilities at boarding gates, departure lounges, or concourses as appropriate. Queuing space should be provided at the security inspection station to accommodate queues which can quickly develop when a person must be rescreened or physically searched or when baggage must be physically inspected. The security inspection stations should be planned to avoid queues extending into circulation elements. Additional security considerations are discussed in Chapter 7.

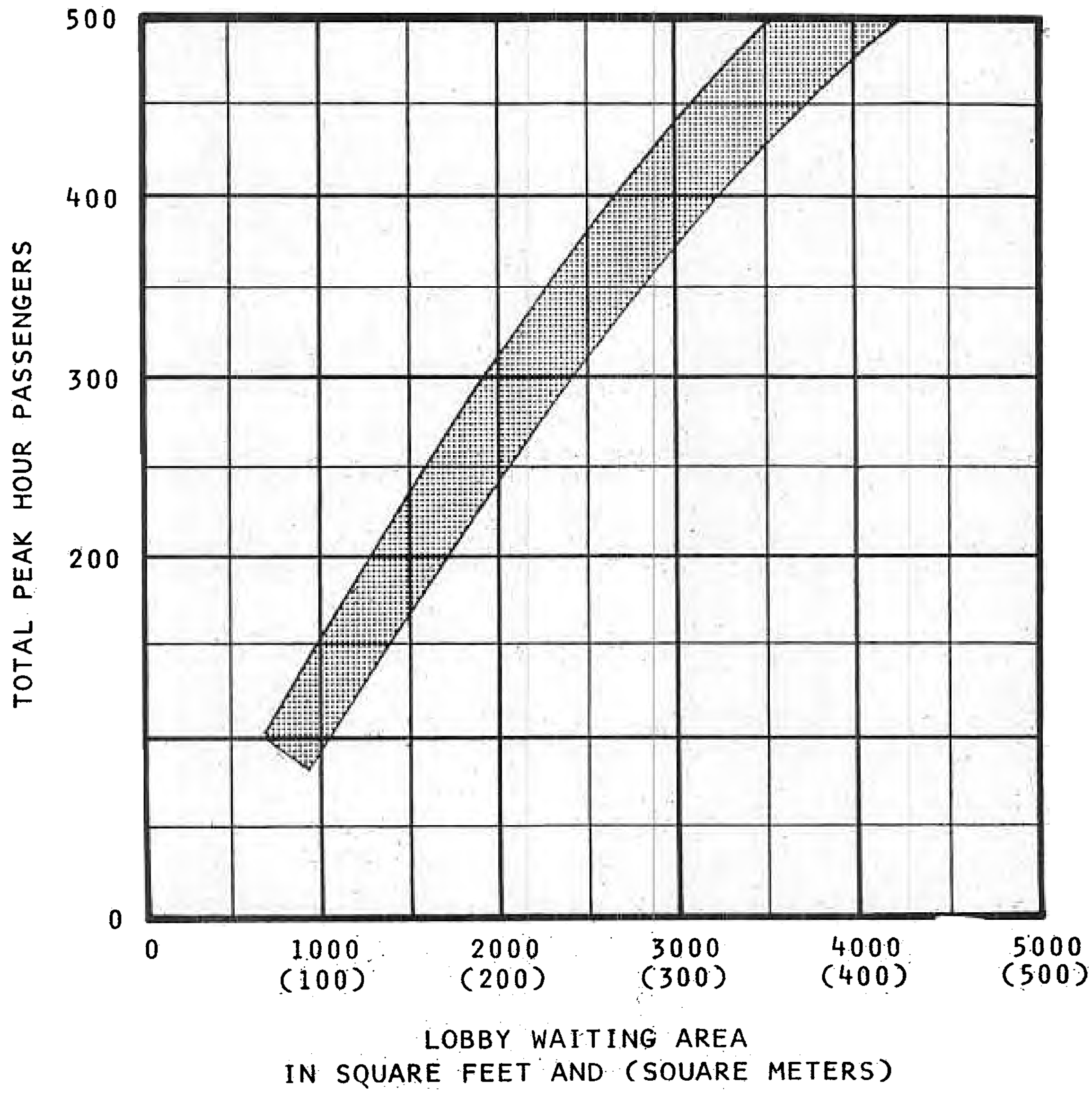


FIGURE 6-3. LOBBY AND WAITING AREA

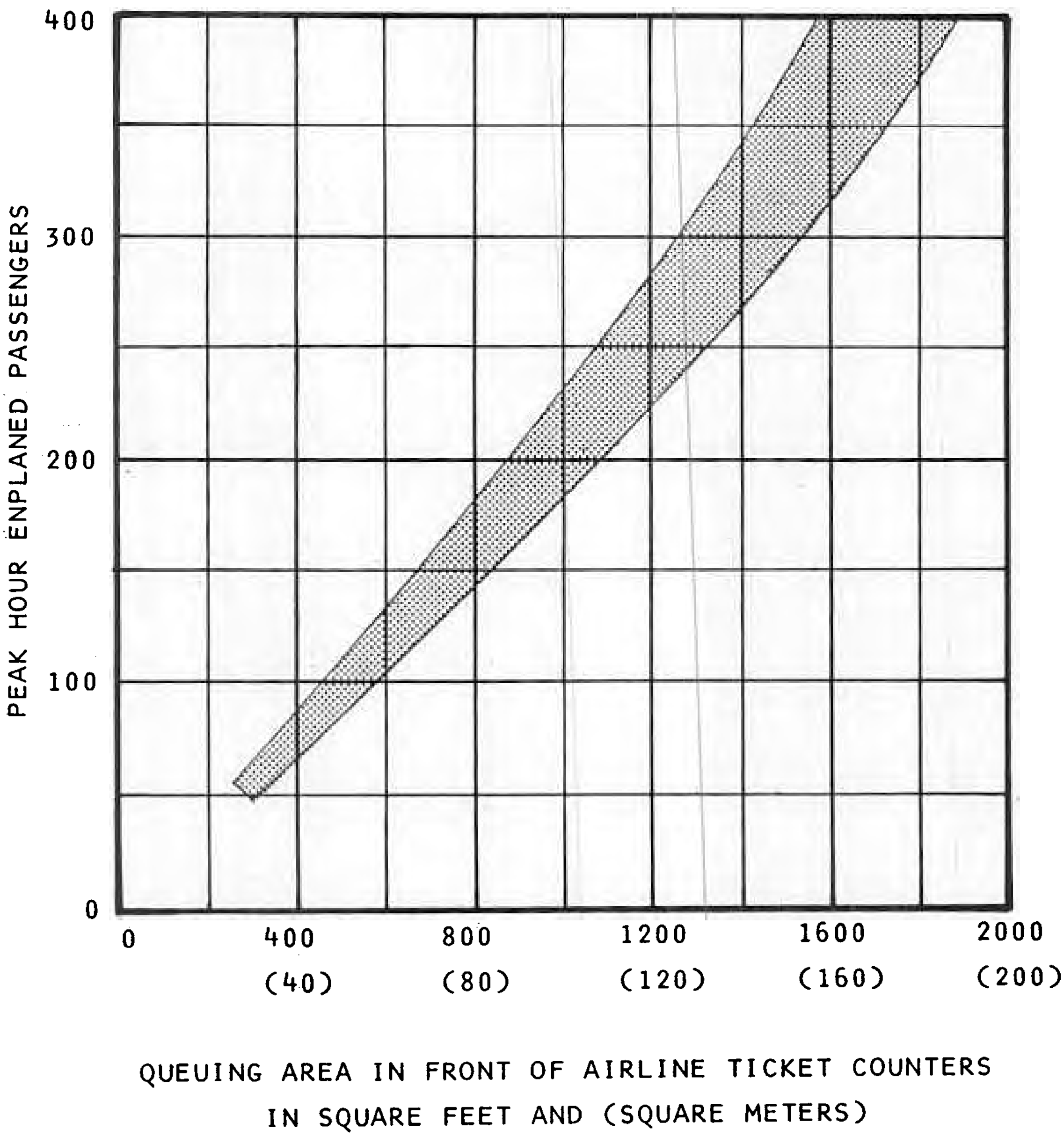


FIGURE 6-4. TICKET COUNTER QUEUING SPACE

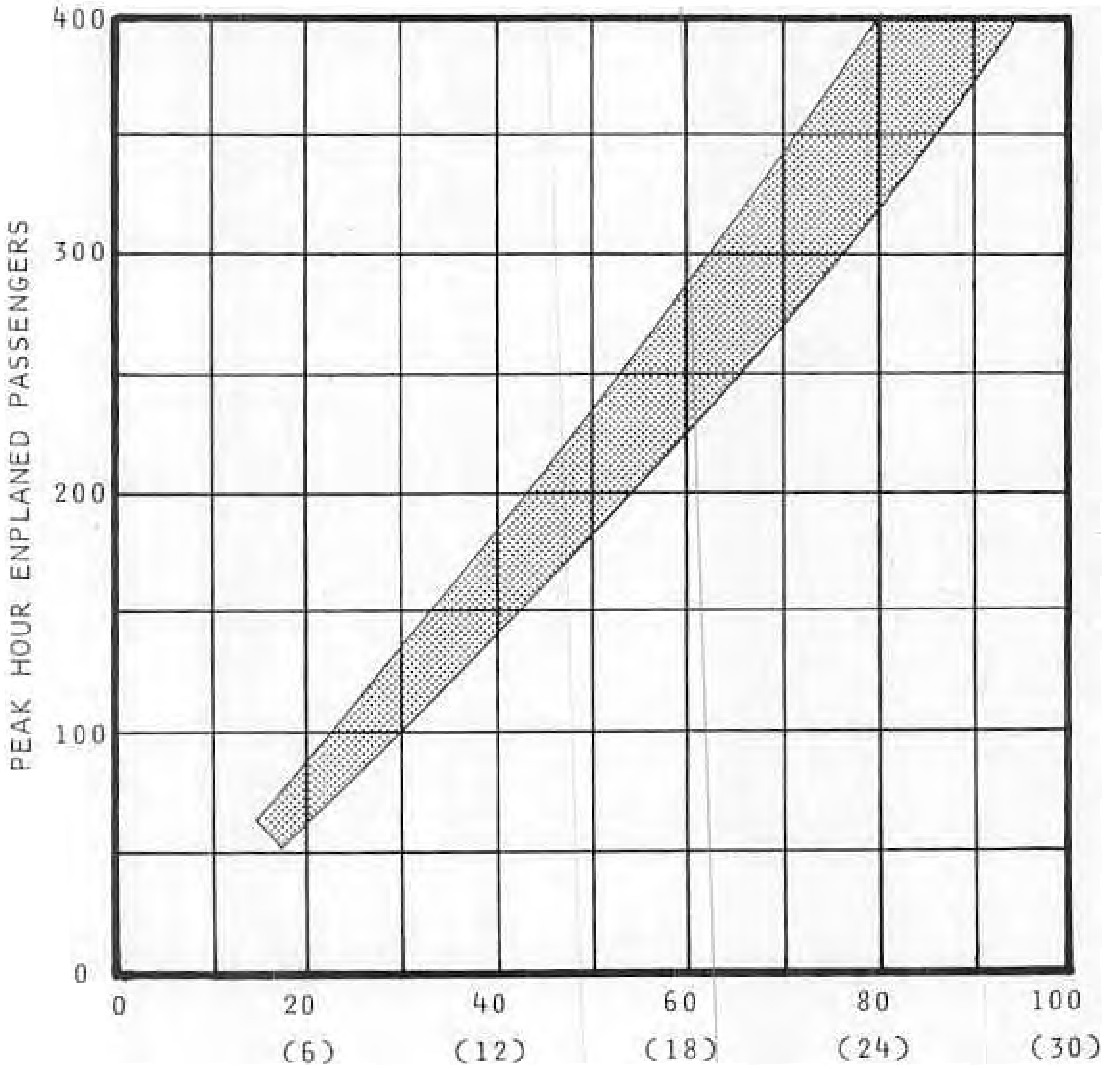
d. Departure Areas and Lounges. After passengers have been processed through security, they proceed to a departure area to wait until the boarding of aircraft commences. These areas must be designed to maintain security through monitored or controlled entrances, exits, or fire doors to preclude random egress or ingress between the aircraft apron or to nonsecure areas. Boarding passes are checked at the departure area or lounge door which opens to the aircraft parking apron. At nonhub volume airports, departure areas can range in size from 500 square feet (50 m^2) up to 1200 square feet (120 m^2), depending on the number of seats on the airplane(s) and boarding load factors. Seating in the departure areas can be approximated by providing one seat for each 20 square feet (2 m^2). Where feasible, a single common departure area or "hold room" may be space and cost effective for passengers processed through the security check. The tenant airlines can be helpful in furnishing square foot requirements for departure areas.

e. Rest Rooms. Public rest rooms should be at locations convenient to the ticket lobby, restaurant facilities, and baggage claim area. In most nonhub terminal buildings, rest room facilities can be grouped in one centralized location. Additional rest rooms might be provided in a secure area and/or in proximity to departure lounges. Private toilet facilities are sometimes provided in conjunction with operational and administrative facilities in nonpublic-use areas. Local building codes often specify the number of fixtures based on occupancy of a public building. Provision must be made for access and use of facilities by handicapped persons. (See Chapter 7.)

32. AIRLINE SPACE REQUIREMENTS. The guidance material presented on sizing of facilities for airline use can be utilized for preliminary planning. The user airline(s) should be consulted on facility requirements early in the planning stages.

a. Ticket Counter. Counters for the sale of tickets and check-in of baggage should be situated near the entrance, clearly visible and readily accessible from the terminal curb and the lobby areas. Curbside baggage check-in facilities are rarely provided at nonhub size terminals. Airline equipment at the counter often includes computer terminals that provide reservation data, seat assignment data, inventory control, and flight information. Tenant airlines will furnish specifics on communications and electrical requirements. Figure 6-5 provides a guide to ticket counter lengths for planning purposes. Individual airline counter requirements should be obtained from each tenant airline to verify or modify the data taken from the graph. Counters are normally placed in a continuous line with space provided for expansion. Approximately 8 feet (2.5 m) should be provided between the counter and the wall behind the counter for counter airline personnel and baggage conveyors.

b. Airline Office and Operational Spaces. The tenant airlines will furnish a tabulation of the spaces and space requirements for their individual needs in the airport terminal. Figure 6-6 is intended to provide an approximation of total office and operational spaces to be used for preliminary planning and sizing of airline terminal facilities.



AIRLINE TICKET COUNTER
IN LINEAR FEET AND (LINEAR METERS)

AIRLINE TICKET COUNTER LENGTH

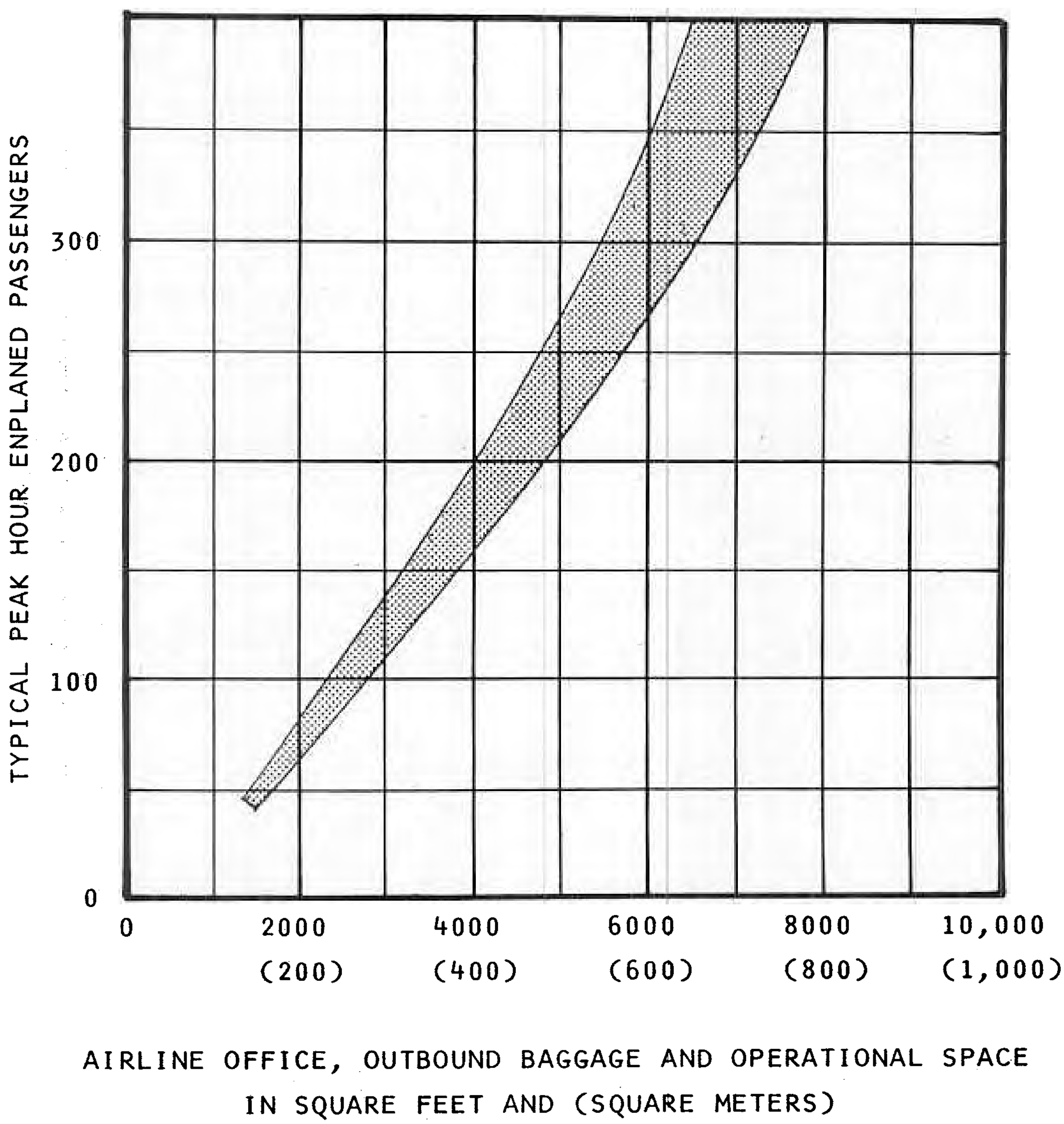


FIGURE 6-6. AIRLINE SPACE REQUIREMENTS

(1) Outgoing Baggage, Cargo, and Mail. After baggage is tagged at the ticket counter, it is conveyed to a baggage makeup area where it is sorted according to destination and loaded onto carts for movement to the parked aircraft. The security of the baggage makeup area is important not only for theft prevention reasons but also as a security measure to prevent the introduction of explosive devices into checked baggage. Outgoing baggage or baggage makeup areas at nonhub airport terminals should be located near, usually behind, the ticket counters and have direct access to the aircraft apron. Individual baggage makeup areas are generally provided for each airline and sized to baggage carts and handling requirements. At some locations, small package cargo is often moved by truck directly to or from the baggage room or to the aircraft. At locations where there is a substantial volume of cargo activity, a separate cargo building may be required. Mail transported by air is transferred at planeside to and from Postal Service vehicles. If the latter, it is sometimes processed in a secure section of the cargo area.

(2) Offices. Airline office space is usually provided behind the ticket counters. This office area should have access to the ticket counter and baggage makeup area. It is used primarily by the agents as a work space, and space is frequently needed for a lounge and training purposes. Sometimes a multipurpose room is used for all these functions. The airline manager's office may also be in this location.

(3) Operations and Maintenance. Each airline usually requires space in the terminal accessible to the crews for flight planning purposes. A crew lounge may also be included. Limited maintenance space and storage for aircraft supplies is usually required and can be located near the aircraft parking apron or, if not, as a part of the space behind the ticket counter.

c. Baggage Claim. The baggage claim facilities are normally shared by all airlines at nonhub airports. Actual counts have indicated that, on the average, an allowance of one checked bag per passenger is a reasonable planning criteria. This number varies and would be lower for locations of predominatly business travel and higher in resort or college areas.

(1) Facility and Location. The baggage claim facility consists of nonpublic circulation and unloading space for baggage carts, a claim counter on which baggage is displayed for claiming, and space for passengers awaiting baggage. An alternative to a fixed baggage claim counter is a moving display baggage conveyor. The claiming facility should be situated convenient to the deplaning passenger flow patterns and in proximity to the terminal curb. Car rental counter space should be provided adjacent to the claim area.

(2) Space Requirements. The total quantity of baggage claim space required--airline and public--is determined by the seating capacity of the arriving airplane (or airplanes for simultaneous arrivals) and the number of

deplaning passengers. The claiming facility is thus subject to surges of occupants as deplaning passengers leave the aircraft in a 10- to 20-minute timespan, frequently before bags are delivered to the claim facility. The graph of baggage space requirements in Figure 6-7 must be considered a preliminary planning guide, allowing for area adjustments as affected by current and forecast airline scheduling and aircraft types. Also, the number of bags per person is greater in resort areas than in other areas, and additional counter lengths may be required. Areas taken from the curve include the waiting space and space for the baggage claim counter or device(s).

(3) Counter Length. The graph in Figure 6-8 approximates lengths of baggage counters or lengths of a moving baggage display device in the public baggage claiming lobby. Figure 6-8 is based on a 2'6"- (0.75 m) wide counter. For moving displays, sufficient length for the unloading of a minimum of two baggage carts should be provided in the nonpublic airline workspace.

(4) Baggage Cart Unloading. The baggage handling area in the nonpublic space for offloading baggage carts should be a minimum of 12 feet (4 m) wide plus an additional 10 feet (3 m) of width for cart maneuvering or passing. The length of the work area should be equal to the length of the claim room as a minimum.

33. CONCESSIONS. The type and size of concessions that are economically feasible in nonhub volume airports are primarily dependent on traffic volumes. Figure 6-9 provides the terminal planner a guide to an approximation of space requirements for food, beverage, and miscellaneous concessions. Final space requirements should be based on local conditions of possible patronage of the concessions planned.

a. Food Service. A minimum facility would consist of space provided for vending machines for the dispensing of hot and cold pre-prepared food and beverages. An area of 80 square feet (8 m^2) would be a minimum. If a vending machine-type service is planned for the initial stage of terminal construction, the terminal should be capable of accepting future additions that could include a snack and beverage bar. The latter might be considered when a determination is made that passenger volumes and other airport patron sources would support a minimum staffed facility of 400 to 600 square feet (40 to 60 m^2). In the higher volume nonhub airports, a coffee shop with some table seating and a separate kitchen may be warranted. Local conditions and potential patrons would be a determinate for this type of facility which could, in addition to patronage related to passenger volumes, provide meals to be served on airline aircraft, executive, or general aviation aircraft. The size of such a facility could range from 1,000 to 3,000 square feet (100 to 300 m^2).

b. Beverage Service. A beverage facility, bar or cocktail lounge, where alcoholic beverage laws permit, could be situated in conjunction with

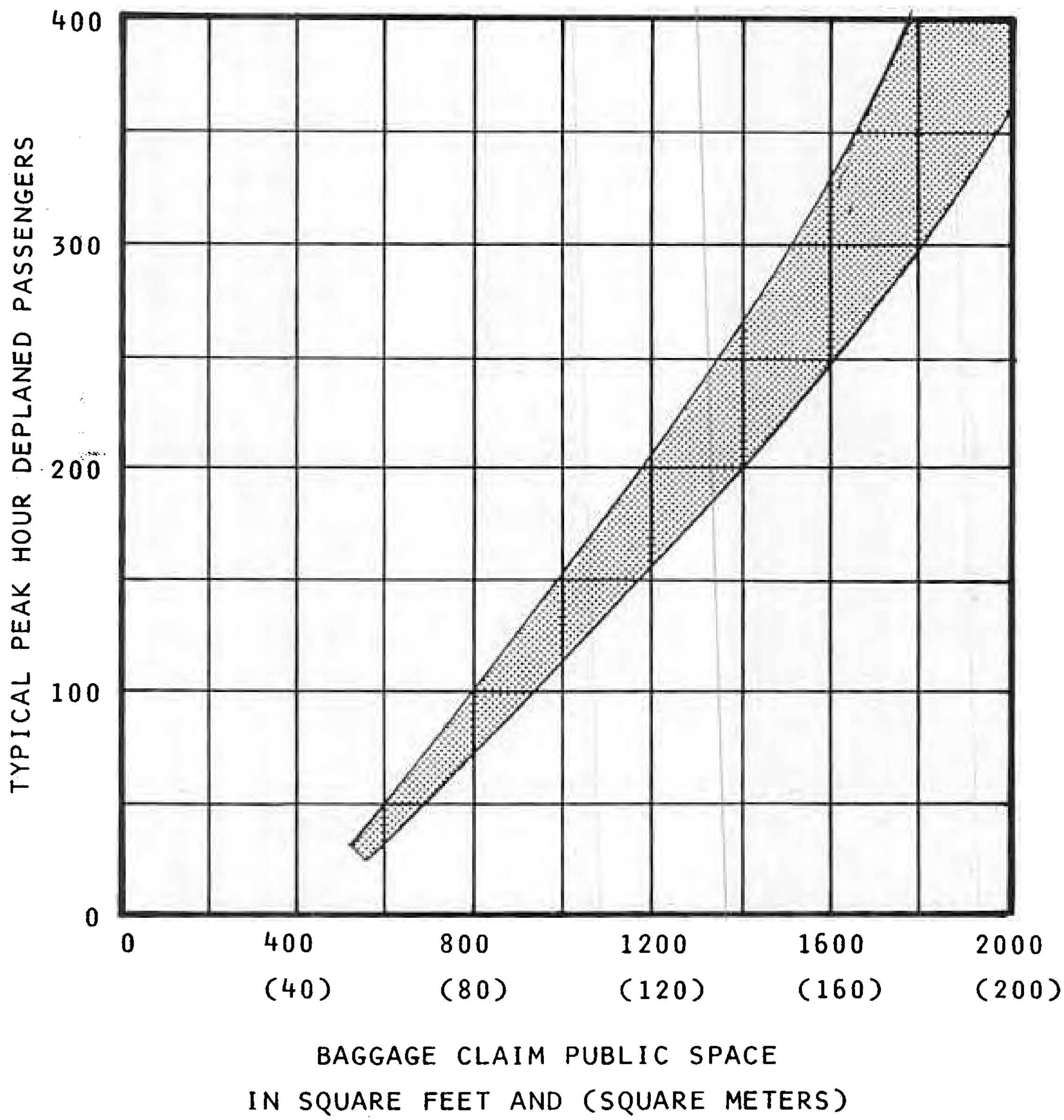


FIGURE 6-7. BAGGAGE CLAIM PUBLIC SPACE

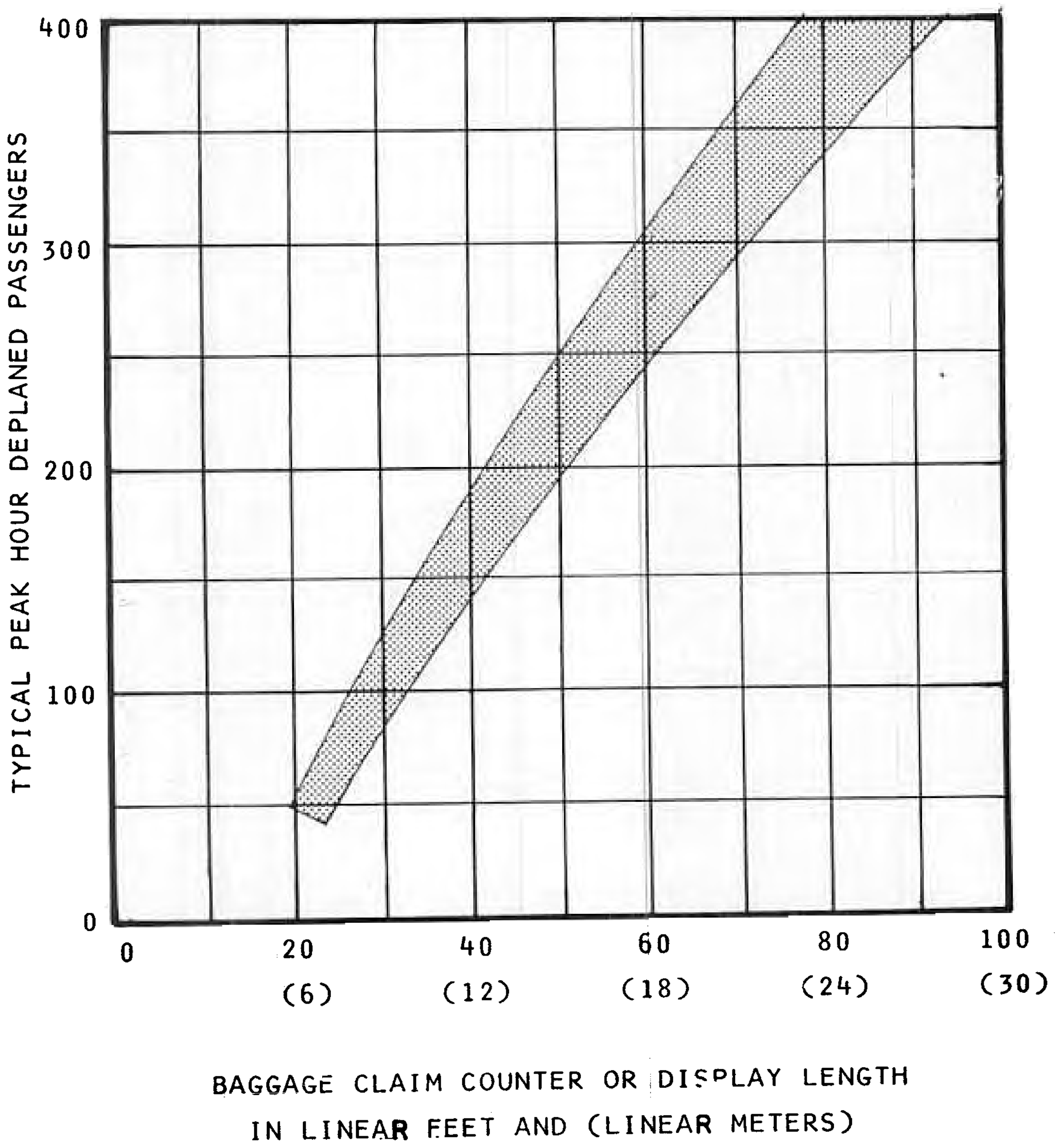
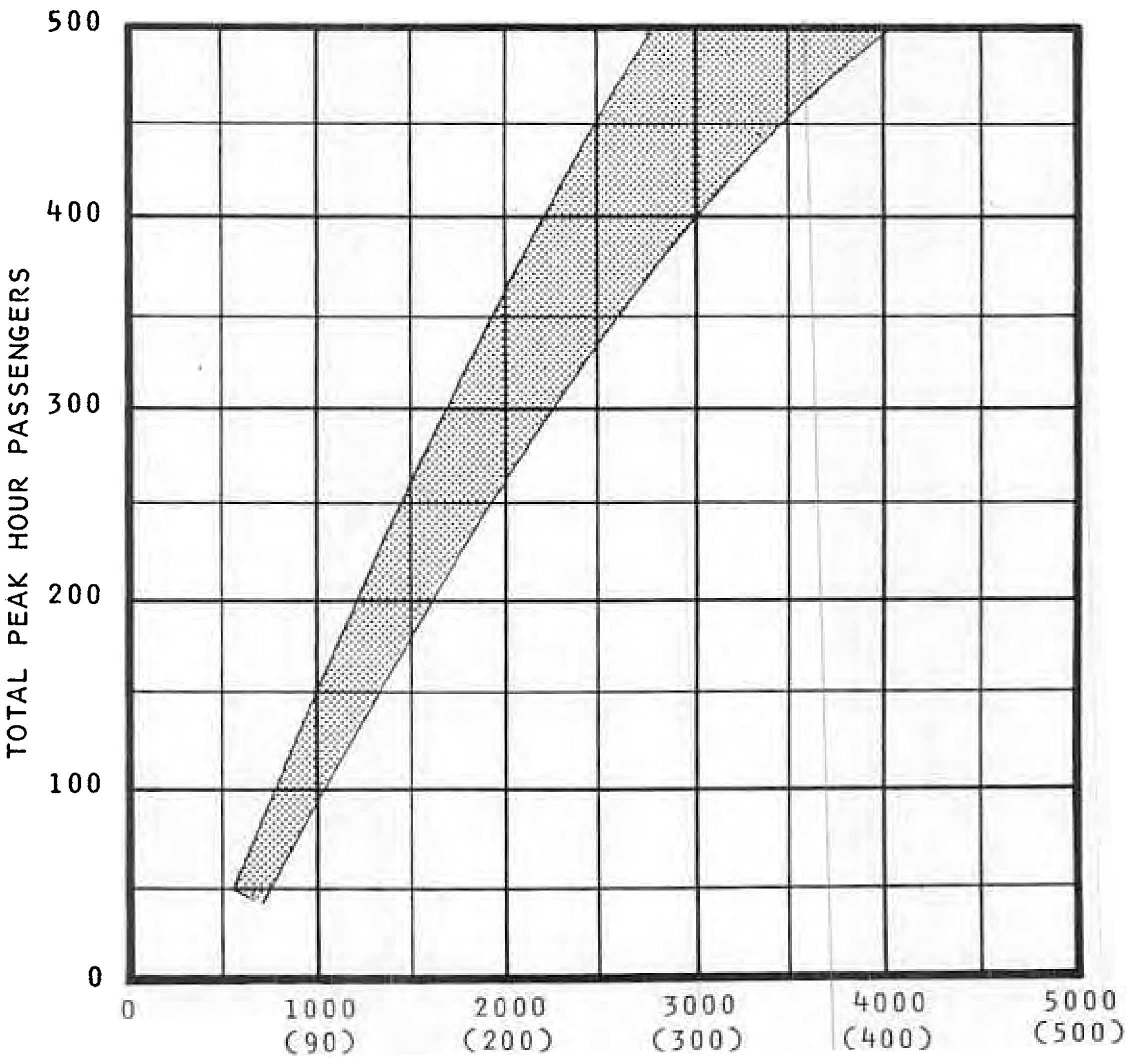


FIGURE 6-8. BAGGAGE CLAIM COUNTER LENGTHS



FOOD, BEVERAGE AND MISCELLANEOUS CONCESSIONS
IN SQUARE FEET AND (SQUARE METERS)

FIGURE 6-9. CONCESSION SPACE

the food facility or be a separate, independent facility. The size of such facilities is dependent on local conditions with 200 square feet (20 m^2) considered as a minimum.

c. Miscellaneous. A newsstand and a gift shop can usually be supported at many small to medium volume nonhub airports if they are combined with eating facilities. Additional concessions, such as drug and sundries shops, a branch bank, and flight insurance policy dispensers, may be included where sufficient traffic and patronage is anticipated.

d. Telephones. Public telephones should be in proximity to the ticket lobby, baggage claim area, and eating facilities. Additional telephones should be located in the secure boarding areas. Specialized telephones and displays are often provided in or near the baggage claim area for ground transportation and hotel/motel room reservations.

e. Car Rentals. One or two car rental companies will usually serve most small airport terminals. Counters for car rental transactions should be located in or near the baggage claim area public circulation space. This space within the terminal often includes a small amount of office space behind or reasonably close to the counter. They should also be located so as to have direct access to the car rental parking area. A minimum space of 8 feet (2.5 m) in depth and 6 feet (2 m) in width for each company should be provided. Allow a minimum of 10 feet (3 m) for queues in front of the counters and circulation areas. In some situations where car rental facilities are not on the airport and a staffed counter is not provided, a direct line telephone is used to make arrangements to have the car delivered to the airport terminal.

34. AIRPORT AND BUILDING SERVICES. The nonpublic elements discussed below should not inhibit future expansion possibilities of the building. Those fixed elements such as utility equipment rooms should be in basements, on roofs, or at "core" locations.

a. Airport Management. Offices for the airport manager and staff are generally based on the size of staff in the terminal building. The amount of space is a local determination. The airport offices should be accessible to the public but not necessarily in the flow pattern of terminal users.

b. Building Mechanical Systems. Spaces for heating, ventilating, air conditioning, electrical, and telephone equipment usually require approximately 15% of the total gross terminal area. Additional space is required for a building maintenance facility, for storage of building supplies, and for janitor closets. Utility systems should be planned for possible future terminal additions or expansion. Air intake systems should be located to avoid drawing jet or automobile engine exhaust fumes.

35. FEDERAL INSPECTION FACILITIES. Nonhub airports that are designated to serve arriving international traffic may require facilities for the Federal Inspection Services (FIS) (Immigration, Public Health, Customs, and Agriculture). Arriving international passengers, if not precleared at the point of embarkation, must be segregated from other passengers beginning at the arrival aircraft and through the FIS facilities. Information of FIS facility requirements is contained in the booklet entitled "Guidelines for Federal Inspection Services Facilities," which is available from the U.S. Customs Service. The booklet covers the functional, spatial, and sizing aspects of FIS facilities. AC 150/5360-4, Guidelines for Federal Inspection Service Facilities at International Airports of Entry and Landing Rights Airports, current edition, provides information on obtaining this publication and lists the addresses of U.S. Customs Service Regions. These regional offices should be contacted for guidance and coordination when designing areas to serve FIS.

36. MINIMUM-SIZE TERMINAL REQUIREMENTS. Approximately 10 to 12 acres (4 to 5 hectares) are needed to accommodate a minimum-size terminal, a roadway system, and aircraft and auto parking. Terminal facilities can be housed in approximately 6,000 to 8,000 square feet (600 to 800 m^2), exclusive of mechanical, utility, or building maintenance areas.

CHAPTER 7. SPECIAL CONSIDERATIONS

37. PROVISIONS FOR THE HANDICAPPED. There are a significant and increasing number of handicapped travelers that by law must be provided with adequate accommodations in the design and construction of transportation facilities in which Federal funds are utilized. The first legal requirements for accommodating the physically handicapped in building design occurred with the passage of the Architectural Barriers Act of 1968 (P.L. 90-480). This law required the establishment of Federal standards to insure that physically handicapped persons will have ready access to public buildings constructed or leased on behalf of the Federal Government and buildings subsidized under Federal programs which may be utilized for the employment or residence of physically handicapped persons. Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112) further expanded on this requirement by provided that "no otherwise qualified handicapped individual . . . shall solely by reason of his handicap be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." This same Act established within the Federal Government an Architectural and Transportation Barriers Compliance Board with the responsibility of insuring compliance with Federal standards pertaining to accommodating the physically handicapped, investigating complaints, examining alternative approaches, and reporting to Congress on its activities relating to transportation barriers and housing needs of handicapped individuals. In May 1979, the Department of Transportation (DOT) published in the Federal Register (Vol. 44, No. 106 dated 5/31/79) the final regulation specifying those requirements necessary to implement Section 504 of the Rehabilitation Act. This regulation requires that airport terminal facilities receiving Federal financial assistance be designed and constructed in accordance with the minimum standards specified by the American National Standards Institute. These standards are contained in document ANSI A117.1-1961 (R 1971) entitled "American National Standards Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped" and are currently being revised and updated. Copies of this document are available from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. The regulation also specifies additional measures required to facilitate the arrival and departure processes for handicapped persons, including matters relating to terminal circulation and flow, the use of the international accessibility symbol, design of ticketing systems, phones, teletypewriters, vehicular loading and unloading areas, parking areas, baggage check-in and retrieval, and walking areas. Existing airport terminals will be required to comply with the ANSI standards within 3 years of the regulation's effective date. AC 150/5200-11, Airport Terminals and the Physically Handicapped, current edition, is, as of the date of this circular, being revised to provide details on the regulation and its implementation. In the meantime, airport terminal planners, designers, and airport authorities should contact appropriate FAA Airports field offices for the latest information and details on the implementation of this regulation.

38. ENERGY CONSERVATION. The airport terminal requires higher energy consumption than most public buildings. This is due primarily to its generally unprotected location and exposure to weather extremes, to the heat loss or gain resulting from the movement of people and baggage through the building, and to its 24-hour-a-day operation. The architect/engineer should pay particular attention to energy conservation early in the planning of a terminal building in order to reduce dependence on irreplaceable and increasingly costly fossil fuels. If a terminal addition is being planned, existing mechanical systems should be analyzed for methods in which they could become more energy efficient. Solar architecture can be incorporated in new or existing buildings to replace or supplement conventional heating systems. Active and/or passive systems can utilize the sun's energy to considerably reduce energy usage in buildings for space heating. Active solar systems generally utilize special hardware to collect and store solar heat in order to replace or supplement conventional heating systems. The installation of an active solar system will result in a substantially higher initial construction cost, but will greatly reduce heating requirements. Passive solar systems simply use solar-oriented and energy-conserving architectural elements, such as maximum southern glazing, and selection of building materials on the basis of thermal properties, with little additional construction cost. This system simply allows solar penetration into the building during sunny winter days. Solid concrete block walls and thickened concrete floors reradiate the heat absorbed from the sun into the building's interior space at night. During the evening or on cold, cloudy days, glazed areas can be sealed with controlled movable insulating louvers. Combined with minimum window exposure on the north, east, and west walls, this passive solar heating system can offset the demand for conventional heating by as much as 50%. Earth berms used around perimeter walls can lower the building profile and further reduce heat gain or loss. The use of vestibules, automatic doors at baggage conveyors passing from exterior to interior spaces, wind-protected baggage unloading areas, and ample lighting control to avoid the necessity of full lighting loads when not required should be considered. In addition to the accommodation of specific terminal functions, resource conservative buildings designed to utilize materials, components, and construction techniques that place a low demand on natural resources should be an overall design objective.

39. NOISE ATTENUATION. Aircraft engines generate sound that is transferred to the terminal building and becomes a problem when it causes discomfort or intereferes with communication. Tolerance is affected by the frequency of the noise and length of exposure to it. The medium-to-high-frequency noise, often produced by jet aircraft, will cause a greater disruptive effect on speech and hearing than a low-frequency tone of the same intensity. Noise problems usually occur during the starting of the jet engines and the initial taxiing away from the terminal. While it is not practical to plan for costly noise control measures, terminal construction should be solid and of dense materials, and workmanship should be first class to avoid most problems. Construction materials should be of a type not to preclude their

removal for future additions or modifications. The acceptable noise level for the various specialized terminal building areas varies with respect to the function of each area. Operational and baggage-handling areas with higher degrees of noise acceptability will act as a noise barrier for more sensitive terminal areas if located on the field side of the building. Where possible, the shortest wall of rooms should face the noise source. Noise transmission is reduced by the use of dense building materials and the incorporation of airspace within walls. The use of materials with low transmission loss should be minimized. Transmission of sound through windows can be reduced by using fixed sash and double glazing. Doors, windows, and hardware should be of a heavy duty nature, adequate in quality to assure tight fitting with a minimum of maintenance. Residential construction or inexpensive commercial methods are inappropriate to airport terminals if noise is to be controlled. Building insulation should be specified that will have a high level of noise suppression as well as heat loss reducing qualities. Utilization of sound-absorbing surfaces within rooms and the careful selection of furnishings also contribute to the total room noise reduction.

40. MAINTENANCE CONSIDERATIONS. Nonhub airports usually are very limited from a budget and staffing standpoint. The architect/engineer, in planning an airport terminal facility, should be conscious of this in order to avoid design features that require costly and time-consuming building repair maintenance. For example, terminals with large expansions of glass may be pleasing aesthetically, but require frequent and costly cleaning and repairs. Use of carpeting can be both pleasing to the eye and safe and may be easier to maintain than a resilient tile flooring which requires frequent waxing. In the operational areas where impact damage to walls and columns from baggage carts and tugs is prevalant, building materials should be selected that will withstand the forces of impact, e.g., jacket columns, with steel plates or protect walls with curbs. These and similar considerations can, in the long run, be major factors in determining whether a building design is successful.

41. SYMBOL SIGNS. The American Institute of Graphic Arts in cooperation with the DOT, Office of Facilitation, has undertaken a study to inventory and evaluate symbol systems to be used for transportation-related facilities in the United States. As a result of this effort, in 1974 DOT published Report DOT-OS-40192, Symbol Signs, which recommended a set of 34 symbol signs. The report also contains guidelines for their legibility and presentation. It is anticipated that these symbol signs will eventually be adopted by DOT as standards for all federally funded transportation-related projects. Consequently, their use in new construction projects is highly recommended.

42. AIRPORT SECURITY CONSIDERATIONS. FAR, Part 107, Airport Security, prescribes aviation security rules governing the operators of airports regularly serving airlines to whom FAR's Part 121, Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft (section 121.538), and Part 129, Operations of Foreign Air

Carriers (section 129.25) apply. FAR Part 107 assigns the responsibility and places requirements on the airport operator for maintaining overall airport security. This regulation along with FAR section 121.538, which places a requirement on airlines to screen passengers prior to boarding the aircraft, has had a major effect on the design and layout of airport terminal buildings. The architect/engineer should contact airport management and the FAA for interpreting these regulations and establishing security planning requirements. In addition to the discussion of passenger security screening contained in paragraph 31c and security measures described in previous paragraphs of this circular, the following material points out other aspects of this important consideration.

a. Access to the Air Operations Area (AOA). FAR Part 107 (and section 121.538) includes requirements for securing the AOA to deter and prevent access by unauthorized persons and vehicles. The AOA is described as that portion of the airport designed and used for landing, taking off, or surface maneuvering of airplanes. Provisions must be made to prevent unauthorized access into the AOA, including access from a terminal building. This can be accomplished by installing security fencing, gates, or doors separating the secured AOA from the unsecured public area. Vehicles using service roads that provide access to the AOA must pass through controlled gates. Passengers are permitted access to the AOA only after undergoing passenger screening. Obviously, it is important in the design of the terminal building to limit the number and provide for the control of the doors, gates, passageways, conveyor belts, jetways, stairwells, etc., that provide direct or indirect access to the AOA. Doors leading to the AOA that are not under visual control of authorized personnel must be locked or equipped with alarms that will signal unauthorized use. Fire codes permit the locking of emergency exits provided they contain panic knockout devices.

b. Observation Decks. An effective barrier is needed on decks to deter and prevent unauthorized access from them to the aircraft parked on the apron and to deter persons from hurling dangerous objects at an airplane from the observation deck.

c. Coin-operated Locker Security. Lockers provide a valuable and desired service to the traveling public. Obviously, from a security view, the best location for coin-operated lockers is within a sterile concourse; however, this is not always possible. If lockers cannot be located within a secured area, the FAA recommends the location in those public areas where an explosion would cause the least amount of injuries and damage. Consideration should be given to their location in the building and the material used. The construction of blast-proof barriers for protection purposes may be advisable.

d. Curbside Check-in Facilities. Curbside check-in facilities are used infrequently at nonhub airports. However, if such procedures are employed, facilities for the safe and secure storage of baggage tags are required. This prevents the baggage tags from being stolen and utilized to introduce bombs or incendiary devices aboard aircraft.

e. Security Guidance Material. In addition to the FAR's previously cited, the FAA publishes AC 107-1, Aviation Security - Airports, current edition, which discusses in greater detail many aspects of airport security. Additional guidance is contained in the following AC's:

(1) AC 121-17, Aviation Security: Certain Air Carriers and Commercial Operators - Security Programs and Other Requirements, current edition.

(2) AC 135-4, Aviation Security: Air Taxi Commercial Operators (ATCO), current edition.

43. ENVIRONMENTAL IMPACT ANALYSIS. An environmental assessment may be required for a terminal building facility at a nonhub location. Guidance on this determination and subsequent requirements are discussed below.

a. Requirement for Environmental Assessment. If proposed terminal expansion or new construction involves the FAA through an ADAP grant application, it may be necessary to prepare an analysis of the environmental consequences of the project. Appendix 6 to FAA Order 1050.1, Policies and Procedures for Considering Environmental Impacts, current edition, requires the preparation of an environmental assessment for the following projects:

(1) Major new construction or expansion of passenger handling or parking facilities proposed to be accomplished with Federal funding. Major new construction or expansion is defined as "development on a hub airport that would provide for accommodation of part or whole of an aggregate increase of 25% (but not less than 100,000) in enplanements for the forecast period." For the most part, nonhub locations will not be dealing with this projected volume of enplanements; however, there may be cases in which a nonhub is proposing development to accommodate such future increases in enplanement level.

(2) Any terminal development that involves Federal funding and will have a significant impact on the environment or is highly controversial. Appendix 6 to FAA Order 1050.1 lists the types of significant impacts and controversy which generate the requirement for an environmental assessment.

(3) Any terminal development that involves Federal funding and involves one or more of the following:

(i) Use of any Department of Transportation Act Section 4(f) lands (i.e., publicly owned parks, recreation areas, wildlife and waterfowl refuges of local, state, or national significance and public or privately owned historic sites of local, state, or national significance).

(ii) An effect on property included in or eligible for inclusion in the National Register of Historic Places or other property of state or local historical, architectural, archeological, or cultural significance.

(iii) Wetlands, flood plains, or coastal zones.

(iv) Endangered or threatened species.

(4) Land acquisition associated with the above items plus any land acquisition which causes relocation of residential or business activities.

b. Environmental Factors to be Considered. For any of the above proposed projects, the airport sponsor must prepare and submit to the FAA an environmental assessment exploring potential environmental consequences. The environmental factors to be considered are detailed in Chapter 5, of Appendix 6, FAA Order 1050.1. Prior to the airport sponsor or the consultant initiating the preparation of an assessment, it is advisable to consult with the local FAA Airports District Office or regional office to define those issues which must be addressed. The holding of a public hearing may be advisable, particularly in a case of potential significant impacts or public controversy. The FAA will use the environmental assessment to determine whether to prepare an environmental impact statement or a finding of no significant impact. An environmental impact statement is required if the FAA believes the proposed project would have significant impacts or is highly controversial on environmental grounds.

c. Other Environmental Requirements. Many states and local governments now have environmental laws and regulations. It is especially advantageous to the airport sponsor or the consultant to spend the time early in the project development on coordination with local, state, and Federal officials concerned with environmental issues. This early coordination can help to clear up questions and issues, assist in the identification of impacts, trigger advance planning of mitigation measures, and inform interested parties of the proposed project. In accordance with the DOT's policy and the Council of Environmental Quality's regulations, it is intended that a single environmental document meet all Federal, state, and local requirements.

APPENDIX 1. Bibliography

1. The latest issuance of the following free advisory circulars may be obtained from the Department of Transportation, Publications Section, M-443.1, Washington, D.C. 20590. AC 00-2, updated triannually, contains the listing of all current issuances of these circulars and changes thereto.

a. AC 00-2, Advisory Circular Checklist. Transmits the revised checklist of current FAA advisory circulars.

b. AC 00-44, Status of the Federal Aviation Regulations. Lists FAR prices and provides ordering instructions for purchasing the regulations.

c. AC 150/5000-3, Address List of Regional Airports Divisions and Airports District/Field Offices.

d. AC 150/5200-11, Airport Terminals and the Physically Handicapped. Discusses the problems of the physically handicapped air traveler and suggests features that can be incorporated in modification or new construction of airport terminal buildings.

e. AC 150/5300-2, Airport Design Standards - Site Requirements for Terminal Navigational Facilities. Provides information regarding the relative location and siting requirements for the terminal navigation facilities located on or close to an airport.

f. AC 150/5300-4, Utility Airports - Air Access to National Transportation. Establishes design standards for utility airports which are constructed for and intended to be used in propeller-driven aircraft of 12,500 pounds (5670 kg) maximum gross weight or less.

g. AC 150/5300-6, Airport Design Standards, General Aviation Airports, Basic and General Transport. Provides recommended design criteria for the development of larger than general utility airports.

h. AC 150/5325-5, Aircraft Data. Presents a listing of aircraft affecting airport design for guidance in airport development.

i. AC 150/5325-6, Airport Design Standards - Effects and Treatment of Jet Blast. Presents criteria on the jet engine blast velocities associated with aircraft in common use in air carrier service, the effects of these blast velocities during ground operations, and suggested means to counteract or minimize these effects.

j. AC 150/5335-1, Airport Design Standards - Airports Served by Air Carriers - Taxiways. Provides criteria on taxiway design for airports served by certificated route air carriers with present airplanes and those anticipated in the near future.

k. AC 150/5335-4, Airport Design Standards - Airports Served by Air Carriers - Runway Geometrics. Provides criteria on runway geometric design for airports served by certificated route air carriers.

l. AC 150/5360-4, Announcement of Availability--Guidelines for Federal Inspection Services Facilities at International Airports of Entry and at Landing Rights Airports. Announces the availability of a booklet containing more current information on the requirements for Federal Inspection Services at airports of entry and at landing rights airports.

m. AC 150/5360-6, Airport Terminal Building Development with Federal Participation. Provides guidance pertaining to Federal participation in airport terminal building construction under the provisions of the Airport and Airway Development Act, as amended.

n. AC 150/5360-7, Planning and Design Consideration for Airport Terminal Building Development. Presents planning and design procedures to be considered in airport terminal building development funded under the Airport and Airway Development Act, as amended.

o. AC 150/5900-1, The Planning Grant Program for Airports. Offers guidance to the sponsors of airport system plans and airport master plans on how to participate in the FAA's Planning Grant Program. It describes the application process and the administrative procedures to be followed in performing planning projects.

p. AC 70/7460-1, Obstruction Marking and Lighting. Describes FAA standards on obstruction marking and lighting and establishes the methods, procedures, and equipment types for both aviation red and high intensity white obstruction lights.

q. AC 107-1, Aviation Security - Airports. Furnishes guidance to those individuals and organizations having responsibilities under Part 107 of the Federal Aviation Regulations. It also provides recommendations for establishing and improving security for restricted or critical facilities and areas the security of which is not dealt with in Part 107.

2. The following advisory circulars and Federal Aviation Regulations (FAR) may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Refer to AC 00-2 and AC 00-44 for pricing and additional ordering information.

a. AC 150/5070-6, Airport Master Plans. Provides guidance for the preparation of individual airport master plans as provided for under the Airport and Airway Development Act of 1970.

b. FAR Part 77, Objects Affecting Navigable Airspace. Provides criteria and standards for determining obstructions in navigable airspace and their determination of effects on the safe and efficient use of airspace.

c. FAR Part 107, Airport Security. Prescribes aviation security rules and requirements for operators of airports serving scheduled certificated air carriers and commercial operators of large aircraft engaged in intrastate common carriage.

d. FAR Part 121, Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft. Prescribes certification and operational requirements for air carriers and commercial operators of large aircraft.

e. FAR Part 129, Operations of Foreign Air Carriers. Prescribes rules governing the operation of foreign air carrier aircraft within the United States.

f. FAR Part 152, Airport Aid Program. Prescribes the policies and procedures for administering the Airport Aid Program for airport development and planning grant projects under the Airport and Airway Development Act of 1970, as amended.

3. The following Government reports are for sale and may be obtained from the National Technical Information Service (NTIS), Springfield, Virginia 22151. The number in brackets following the report title represents the NTIS ordering number.

a. FAA-RD-73-82, The Apron-Terminal Complex, Analysis of Concepts for Evaluation of Terminal Buildings (AD-771 186).

b. FAA-RD-75-191, The Apron and Terminal Building Planning Report (AD-A018 120).

c. FAA-AP-77-1, Environmental Assessment of Airport Development Actions (AD-A039 274).

d. DOT-OS-40192, Symbol Signs (PB-239 352).

4. The following Federal Aviation Administration order may be obtained on request at any FAA Regional Office or Airports District Office.

a. Order 1050.1C, Policies and Procedures for Considering Environmental Impacts.

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