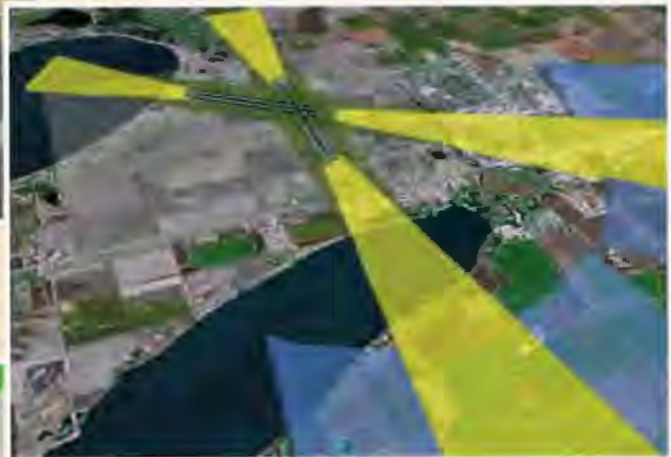




# California Airport Land Use Planning Handbook



State of California  
Department of Transportation

Division of Aeronautics



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## INTRODUCTION





# Introduction to the California Airport Land Use Planning Handbook

## **i-1 ENABLING LEGISLATION**

The purpose of the California State Aeronautics Act (SSA) pursuant to Public Utilities Code (PUC), Section 21001 et seq., “is to protect the public interest in aeronautics and aeronautical progress.” The California Department of Transportation, Division of Aeronautics, administers much of this statute. The purpose of the California Airport Land Use Planning Handbook (*Handbook*) is to provide guidance for conducting airport land use compatibility planning as required by Article 3.5, Airport Land Use Commissions, PUC Sections 21670 – 21679.5. Article 3.5 outlines the statutory requirements for Airport Land Use Commissions (ALUCs) including the preparation of an Airport Land Use Compatibility Plan (ALUCP). Article 3.5 mandates that the Division of Aeronautics create a *Handbook* that contains the identification of essential elements for the preparation of an Airport Land Use Compatibility Plan (PUC Sections 21674.5 and 21674.7). This *Handbook* is intended to (1) provide information to ALUCs, their staffs, airport proprietors, cities, counties, consultants, and the public, (2) to identify the requirements and procedures for preparing effective compatibility planning documents, and (3) define exemptions where applicable.

## **i-2 APPLICABILITY**

This *Handbook* applies to ALUCs established under the SAA, who are charged with providing for compatible land use planning in the vicinity of each existing and new public use airport within their jurisdiction. Most notably, it provides guidance for the preparation, adoption, and amendment of an ALUCP. Several PUC sections identify the *Handbook* as a resource for airport land use compatibility planning, including Sections 21674.5 and 21674.7.

### **i-2.1 Scope of the Handbook Update**

This volume represents the fourth edition of the *Handbook*. While this *Handbook* will present some additional information on the California Environmental Quality Act (CEQA) and present new information on the topic of Next Generation Air Transportation System (NextGen), the

primary purpose of this edition is to update and clarify concepts and processes that were described in the 2002 *Handbook*. Some of the more general discussions have been condensed or removed in order to prevent confusion about what must be done and what might be done. Throughout the text, anytime the term “shall” is used it indicates that there is a statutory requirement to be followed and a legal code reference will be given. The term “may” indicates that the action is statutorily permitted but not required. And lastly, the terms “should” or “could” indicate that the action is simply a best practice recommendation. Any reference to the “Department” means the Department of Transportation, or Caltrans, unless otherwise stated. The “Division” shall mean the Division of Aeronautics.

The 2011 *Handbook* provides guidance for meeting the baseline safety and compatibility requirements; however, ALUCs may choose to be more restrictive than the State’s guidance when their local conditions warrant doing so. With respect to how land is used and regulated by local governments, the Division does not have the authority to adopt land use development standards. Conversely, ALUCs are statutorily permitted (i.e. they have the option and authority) to include building standards, height restrictions and land uses in their Airport Land Use Compatibility Plans (PUC Section 21675(a)). When an ALUC chooses to establish development standards in an ALUCP to prevent airport noise and safety hazards, they are indirectly setting development standards for local government because local government general and specific plans (and therefore their implementing standards) must be consistent with the ALUCP (Section 21670.1(c)(2)(D) and Government Code Section 65302.3(a)), unless the conclusion of the overrule process allows otherwise.

It is not the intent of the preparers of this edition to fully replicate the extensive research that was performed in support of the previous *Handbook* editions. The intent was to analyze and determine if the data and conclusions that were reached in the 2002 *Handbook* are still valid today. As discussed in Appendix E, recent accident data does not support changes to the safety zones (presented in Chapter 3). Similarly, while tools for estimating and monitoring aircraft noise continue to improve, the basic compatibility standards for aircraft noise have not changed at the federal or state level.

## **i-2.2 Handbook Organization**

The *Handbook* is organized to assist a variety of participants with the airport land use compatibility planning process. The *Handbook* is composed of an Introduction and six chapters that follow a logical progression. The Introduction gives the statutory authority, purpose and applicability of the *Handbook* and presents the basic concepts behind airport land use compatibility planning. Chapter 1 describes the ALUC formation options, the basic functions of an ALUC, and an overview of the airport land use compatibility planning process. Chapter 2 describes the ALUCP, its contents, and its relationship with other planning documents. The Introduction, Chapter 1 and Chapter 2 provide the guiding principles for the remainder of the *Handbook*. The information in Chapters 3 through 6, and the appendices, provide ALUC staff and consultants with “how to” advice for preparing and using an ALUCP and for other related ALUC duties. Chapter 3 describes the development of compatibility planning policies while Chapter 4 addresses the development of compatibility criteria. Chapter 5 explains the role of local agencies (cities and counties) in the implementation phase of compatibility planning and

their responsibilities in the airport land use planning process. Chapter 6 discusses the ALUC's role in reviewing local actions.

The appendices contain technical information, including some of the information that was in the main body of the 2002 *Handbook*. They also include check lists and sample implementation documents (Appendix H, I and J) to assist the ALUC as they conduct airport compatibility planning.

### **i-2.3 Transition Between the 2002 and 2011 Handbooks**

The transition between a new edition of the *Handbook* is understandably a concern for those ALUCs who are in the process of updating their ALUCPs. The 2011 *Handbook* update supersedes the 2002 *Handbook*. For an ALUCP update that is in process, but not yet adopted, the ALUC will need to consider how far along they are in the planning process, how expansive the update is, and to what extent the revisions and additions in the 2011 *Handbook* apply to a particular airport.

The publication of the 2011 *Handbook* does not trigger the need to update a previously adopted ALUCP. However, ALUCs are well served to consider the adequacy of their adopted ALUCPs with regards to: statutory changes since the last ALUCP update, changes in current or forecasted operations at the airport(s) covered by the ALUCP, and changes in development patterns or land use plans in the vicinity of the airport(s) covered by the ALUCP.

If, as a result of legislative action, there is a conflict between the *Handbook* and the State Aeronautics Act, or any other California statute, the adopted statute shall govern.

The Divisions legal approach to interpreting regulations and the PUC is prescriptive, rather than permissive. When a prescriptive statute is silent and does not address an issue or subject, its language is mandatory and limited to what is explicitly stated in the statute.

## **i-3 BACKGROUND**

A brief description of aviation in California today will help the reader to understand the context in which airport land use compatibility planning exists and the importance of preserving airport facilities.

### **i-3.1 Airports in California**

California has a diverse variety of airport types, ranging from large hub commercial airports to small, privately owned airstrips. Additionally, California supports a large number of facilities in a wide range of categories. Although commercial service airports handle most of the public's air travel needs, the most common type of airport in California is the general aviation airport. General aviation airports offer a wide variety of services, ranging from flight instruction and recreation, to air cargo, emergency medical transportation, law enforcement, and firefighting operations. Each ALUCP must be customized to reflect the individual conditions of each airport.

### **i-3.2 Economic Importance of Airports in California**

Aviation is a vital link in the local, national, and global transportation system. Air cargo, consisting mainly of high-value, time-sensitive documents and goods, plays a significant role in the vitality of the state's economy. In today's international and technology-oriented economy, businesses use the speed and reliability of air service to achieve operating efficiency. California's airports are critical for providing services such as business travel, tourism, emergency response, fire suppression, and law enforcement. Airports, airlines, and businesses that support airports provide direct and indirect jobs and income throughout the State.

The vital role that airports play in economic development and as a means of passenger and cargo transportation cannot be understated. In 2009, 163.9 million passengers (enplaned and deplaned) traveled through California's commercial service airports; making up 11.6 percent of the national enplanement total. Furthermore, 3.5 million tons of air cargo moved through 24 of California's commercial and general aviation airports in 2009.

### **i-3.3 Reciprocal Impacts: Airports and the Surrounding Community**

It is important to understand the ways in which an airport interacts with the land uses around it. Despite the mutually beneficial economic relationship that airports can have with the communities around them, the reality is that airports also create certain unwanted impacts. Airports can create impacts such as noise, vibration, odors, and risk of accidents. Likewise many land uses can cause direct or indirect impacts on the way airports grow and the safety of their operations. Development around an airport, particularly in the approach and departure paths, can create obstructions in the airspace traversed by an approaching or departing aircraft. Additionally, certain land uses have the potential to attract wildlife or to create hazards to aircraft such as a distracting glint or glare, smoke, steam, or invisible heat plumes.

## **i-4 THE GOAL OF AIRPORT LAND USE COMPATIBILITY**

Airport land use compatibility is the reconciliation of how land development and airports function together. The concept of compatibility has been defined as: "Airport compatible land uses are defined as those uses that can coexist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people living or working nearby to unacceptable levels of noise or (safety) hazards. Compatibility concerns include any airport impact that adversely affects the livability of surrounding communities, as well as any community characteristic that can adversely affect the viability of an airport (PAS 2010, p. 39)".

Incompatible development near an airport can lead to a politically contentious relationship between an airport and the communities around it, resulting in complaints and demands for restrictions on airport operations, ultimately threatening the airport's ability to operate efficiently and serve its function in the local economy.

## **i-5 BASIC ELEMENTS OF AIRPORT - LAND USE COMPATIBILITY**

### **i-5.1 Compatibility Planning Goals**

The desired outcome or result of airport land use compatibility planning is to “minimize the public’s exposure to excessive noise and safety hazards” while providing for the “orderly expansion of airports” (Section 21670 (a)(2)). This planning effort is applied to “the area surrounding these airports” (Section 21670 (a)).

### **i-5.2 Noise and Overflight**

Noise is sometimes perceived to be the most significant concern generated by aircraft operations, and it can be audible for miles from an airport. The challenge of determining appropriate land use compatibility policies regarding aircraft noise is that not everyone responds to noise the same way. A sound that is an annoyance to one person may be barely perceived by another. Furthermore, one community may deem a land use acceptable within a certain noise level, while another does not (e.g. urban environments may have less restrictive residential noise standards than suburban or rural ones).

With regard to noise and overflight, the goal of airport compatibility planning is to reduce annoyance and to minimize the number of people exposed to excessive levels of aircraft noise.

### **i-5.3 Safety and Airspace Protection**

The concept of safety is more difficult to define than the concept of noise. Safety issues are considered for both those living and working near an airport as well as those using the airport.

The issue of safety compatibility is one of evaluating “risk”, and determining the locations around an airport that are at the greatest risk of experiencing an aircraft accident. Research was performed during the preparation of this *Handbook* update to identify any potential changes in aircraft accident patterns. Nothing substantial has changed with respect to where the highest number of aircraft accidents are occurring. Typically accidents occur along the extended runway centerline. Proper safety and airspace protection minimizes the number of people on and off of the airport that are exposed to the risks associated with potential aircraft accidents and avoids flight hazards that interfere with aircraft navigation.





# CHAPTER 1

## AIRPORT LAND USE COMMISSIONS





# Airport Land Use Commissions

## 1.1 PURPOSE AND AUTHORITY OF AIRPORT LAND USE COMMISSIONS

The purpose of an Airport Land Use Commission (ALUC) is to conduct airport land use compatibility planning. ALUCs protect public health, safety, and welfare by ensuring the orderly expansion of airports and the adoption of land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses. The statutes governing ALUCs are set forth in Division 9, Part 1, Chapter 4, Article 3.5, Sections 21670 – 21679.5 of the California Public Utilities Code (PUC).

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*The statutorily defined responsibilities of ALUCs have not changed since publication of the January 2002 edition of the Caltrans Handbook*

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An ALUC has the following powers and duties, per PUC Section 21674:

- ◆ To assist local agencies in ensuring compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that the land in the vicinity of those airports is not already devoted to incompatible uses.
- ◆ To coordinate planning at the state, regional, and local levels so as to provide for the orderly development of air transportation, while at the same time protecting the public health, safety, and welfare.
- ◆ To prepare and adopt an airport land use compatibility plan pursuant to Section 21675.
- ◆ To review the plans, regulations, and other actions of local agencies and airport operators pursuant to Section 21676.
- ◆ The powers of the commission shall in no way be construed to give the commission jurisdiction over the operation of any airport.
- ◆ In order to carry out its responsibilities, the commission may adopt rules and regulations consistent with this article.

**This chapter focuses on:**

- **The purpose of ALUCs**
- **ALUC formation choices**
- **ALUC compatibility planning process**
- **Statutory requirements and options**
- **Intergovernmental roles**

## 1.2 ALUC FORMATION CHOICES

The state law governing creation of airport land use commissions applies to every county in California having an airport “operated for the benefit of the general public” (PUC Section 21670(b)). Each county subject to Article 3.5 of the State Aeronautics Act (SAA) must choose the means by which they will accomplish proper airport land use compatibility planning. This section does not apply to the City and County of San Francisco because it does not have a public use airport. Thus, there are 57 counties in California that fall into one of the following six types of ALUCs: an ALUC, an Exempt County, a Designated Body, a Designated Agency, an Exception County, and an Intercounty ALUC. The six types and their statutory authorization are shown in Table 1A below.

**Table 1A: ALUC FORMATION CHOICES BY STATUTE**

DESCRIPTION	PUC SECTION
ALUC	21670(b)
Self-declared Exempt	21670(b)
Designated Body	21670.1(a)
Designated Agency	21670.1(c)
<i>Statutory Exceptions</i>	
Los Angeles County	21670.2
San Diego County	21670.3
Kern County	21670.1(d)
Santa Cruz County	21670.1(e)
Intercounty ALUC	21670.4

### 1.2.1 ALUC

The basic procedure established by Article 3.5 of the SAA is the creation of a single-purpose (or stand-alone) ALUC comprised of seven members. The county board of supervisors, a city selection committee, and a public airports selection committee each select two members, with the seventh commissioner appointed by the other six commissioners to represent the general public (PUC Section 21670(b)). The selection process is described in Section 1.4.1, below.

While the ALUC uses county staff, the commission’s autonomous decision-making authority is separate from other actions of the County and the board of supervisors. The terms and duties of the commissioners are further discussed in Section 1.4.2.

### 1.2.2 Self-Declared Exemption

The PUC contains provisions for a self-declared exemption from the SAA (PUC Section 21670 (b)). A county declaring itself exempt from the requirements to form an ALUC is required to consult with airport operators and affected cities, hold a public hearing, and adopt a resolution stating that there are no noise, safety or land use issues affecting any airport in the county. A copy of the resolution must be transmitted to the Division of Aeronautics.

The procedures for conducting this action are found in Section 21760(b) and read in part:

“The Board of Supervisors of the county may, after consultation with the appropriate airport operators and affected local entities and after a public hearing, adopt a resolution finding that there are no noise, public safety, or land use issues affecting any airport in the county which require the formation of a commission and declaring the county exempt from that requirement. The board shall, in this event, transmit a copy of the resolution to the Director of Transportation” (Section 21670 (b)).

For matters of practicality, the Board may transmit their resolution of exemption directly to the Division of Aeronautics who will advise the Director of receipt of the resolution. Counties that may qualify for this exemption, or want to verify their exemption status, are encouraged to contact the Division’s land use planner assigned to their geographic area.

### 1.2.3 Designated Body

If the board of supervisors and the mayors’ committee in a county each determine that another body can accomplish airport land use compatibility planning, then such a body can be designated to assume the planning responsibilities of the airport land use commission and a separate commission need not be established (Section 21670.1(a)). The designated body must have at least two members with aviation expertise or, when serving as the ALUC, be augmented to have two members thus qualified (Section 21670.1(b)). In most of these instances, a regional planning agency (a Regional Transportation Planning Agency or Metropolitan Planning Organization) serves as the ALUC. Other options include the board of supervisors, the county planning commission, or the county airport commission.

A designated body has the same responsibilities as an ALUC County as defined in Section 21670, including the preparation and adoption of an airport land use compatibility plan (ALUCP).

### 1.2.4 Designated Agency

In lieu of an ALUC or designated body, the county and each affected city may incorporate airport compatibility concerns into their land use planning and permitting processes per PUC Section 21670.1(c). Subject to Division review and approval, the county and each affected city determine the processes to accomplish proper land use planning and determine the agency responsible for preparation of each ALUCP. This format of compatibility planning has the same responsibilities as an ALUC county, including general and specific plan consistency with the ALUCP(s).

The designated agency, identified as the “alternative process” in the 2002 edition of the *Handbook*, was created in 1994 to provide a potentially lower cost option for compliance with the SAA. The processes of a designated agency are described in PUC Sections 21670.1(c). One of the distinguishing features of this option is that the ALUC functions within the County may be carried out by more than one agency, unlike the single-purpose ALUC or designated body. Counties who have chosen this compatibility planning method incorporate various planning tools to carry out their responsibilities. While the Division has the authority to review and approve the proposed processes,

its main concern is with the ability of the county and affected cities to meet the objectives of the SAA, and not with the individual methods employed.

### **1.2.5 Statutory Exceptions**

Statutory exceptions were created by legislation for counties who requested relief from some of the provisions in Article 3.5. Exceptions were granted based on the unique conditions in these counties. None of the statutory exception counties are required to form an ALUC. The PUC includes four counties as statutory exceptions, namely Kern (Section 21670.1(d)), Santa Cruz (Section 21670.1 (e)), Los Angeles (Section 21670.2(a)), and San Diego (Section 21670.3(a)). Additionally, Santa Cruz County has been identified as being a “no procedures county.” The organizational structure and processes of a statutory exception county can resemble either a designated body or a designated agency. The applicable Article 3.5 provisions are slightly different in these counties.

#### ***Kern County***

Section 21670.1(d) provides a conditional waiver from the requirement to form an ALUC for a county that contracts with the Division to prepare ALUCPs. This exception requires that the County and the affected cities (1) “agree to adopt and implement” an ALUCP(s) and (2) to incorporate applicable federal regulations and *Handbook* compatibility criteria into their general and specific plans. Kern County is the only county currently with this arrangement.

#### ***Santa Cruz County***

Santa Cruz County uses exception (Section 21670.1(e)) as they are a County which “has only one public use airport that is owned by a (single) city.” The City of Watsonville is identified as owning the airport. The City of Watsonville is required to include all applicable federal regulations and the *Handbook*’s compatibility criteria noted in PUC Section 21670.1(d)(2) as part of its general and specific plans. The original statutory exception did not specify the preparation of an ALUCP, however, the City of Watsonville must submit its general and specific plans to the Division of Aeronautics (21670.1(e)(1)(B)(ii)) for review.

#### ***Los Angeles County***

Los Angeles County formed their ALUC type pursuant to PUC Section 21670.2(a), which identifies a specific governmental entity, in this case Los Angeles County Regional Planning Commission, to be responsible for airport compatibility planning. The Regional Planning Commission is required to prepare and adopt the necessary ALUCP(s) (PUC Section 21670.2(b)). If there is a conflict between the affected cities and the County’s Regional Planning Commission regarding airport land use compatibility, there is an appeal process that triggers a city’s ability to overrule the Regional Planning Commission by a four-fifths vote of its governing body.

#### ***San Diego County***

San Diego County is exempt from the requirement to form an ALUC pursuant to PUC Section 21670 and to name a designated body pursuant to PUC Section 21670.1. PUC Section 21670.3 requires the San Diego County Regional Airport Authority to conduct a collaborative planning process when preparing, adopting or amending the ALUCP(s).

## 1.2.6 Intercounty ALUCs

In the case where any airport is bisected by a county line through its runways, runway protection zones, inner safety zones, inner turning zones, outer safety zones, or sideline safety zones, that county is provided the option to form an intercounty ALUC pursuant to Section 21670.4. Intercounty ALUCs may take one of two forms: (a) a new airport land use commission as authorized under Section 21670.4(c)(1), or (b) an existing appropriate entity designated by the two counties, as authorized under Section 21670.4(c)(2). Alternatively, each affected ALUC may adopt provisions for its portion of the airport impacts in their individual compatibility plans.

## 1.2.7 Reported Formation Choices

The Division conducted a survey in 2010 that asked all ALUCs to describe which of the six ALUC types they formed themselves as. The results are shown in Table 1B, below. The counties noted with a plus sign (+) participate in an intercounty ALUC, in addition to their respective county ALUCs. The two ‘unknown’ counties had incomplete data by the time of printing.

**Table 1B: ALUC FORMATION SURVEY**

	COUNTY	ALUC FORMATION	ADMINISTRATIVE AGENCY
1	Alameda	ALUC	County
2	Alpine	Self-declared exempt	None
3	Amador	ALUC	County
4	Butte	ALUC	County
5	Calaveras	ALUC	County
6	Colusa	Designated Body	County Airport Advisory Committee
7	Contra Costa	ALUC	County Planning Department.
8	Del Norte	Unknown	Unknown
9	El Dorado	Designated Body	RTPA-EDTC
10	Fresno	Designated Body	MPO-FresnoCOG
11	Glenn	ALUC	County
12	Humboldt	ALUC	County
13	Imperial	ALUC	County
14	Inyo	ALUC	County
15	Kern	Statutory exception	County and Cities
16	Kings	Designated Body	RTPA-KCRPA
17	Lake	ALUC	County
18	Lassen	Unknown	Unknown
19	Los Angeles	Statutory Exception	County Regional Planning Commission
20	Madera	ALUC	County
21	Marin	Designated Body	County Planning Commission
22	Mariposa	ALUC	County Public Works Department.
23	Mendocino	ALUC	County
24	Merced	ALUC	County
25	Modoc	Self-declared exempt	None
26	Mono	ALUC	County
27	Monterey	ALUC	County

**Table 1B: ALUC FORMATION SURVEY**

	<b>COUNTY</b>	<b>ALUC FORMATION</b>	<b>ADMINISTRATIVE AGENCY</b>
28	Napa	ALUC	County
29	Nevada	Designated Body+	RTPA-NCTC
	Nevada/Placer	Intercounty ALUC	RTPAs-NCTC & PCTPA
30	Orange	ALUC	County
31	Placer	Designated Body+	RTPA-PCTPA
32	Plumas	ALUC	County
33	Riverside	ALUC	County
34	Sacramento	Designated Body	MPO-SACOG
35	San Benito	Designated Body	MPO-SBtCOG
36	San Bernardino	Designated Agency	County and Cities
37	San Diego	Statutory exception	San Diego County Regional Airport Authority
38	San Francisco	No Airport – ALUC requirement not applicable	None
39	San Joaquin	Designated Body	MPO-SJCOG
40	San Luis Obispo	ALUC	County
41	San Mateo	Designated Body	MPO-C/CAG
42	Santa Barbara	Designated Body	MPO-SBCAG
43	Santa Clara	ALUC	County
44	Santa Cruz	Statutory Exception	Santa Cruz County & City of Watsonville
45	Shasta	Designated Body	County Planning Commission
46	Sierra	Self-declared exempt	None
47	Siskiyou	ALUC	County
48	Solano	ALUC	County
49	Sonoma	ALUC	County
50	Stanislaus	ALUC	County
51	Sutter	Designated Body	MPO-SACOG
52	Tehama	ALUC	County
53	Trinity	ALUC	County Planning Department
54	Tulare	Designated Body	County Planning Commission
55	Tuolumne	ALUC	County
56	Ventura	Designated Body	RTPA-VCTC
57	Yolo	Designated Body	MPO-SACOG
58	Yuba	Designated Body	MPO-SACOG

**Table 1C: ALUC FORMATION SURVEY TOTALS**

ALUC	29
Designated Body	18
Designated Agency (formerly “alternative process”)	1
Self-declared Exempt	3
Statutory Exception	4
Intercounty ALUC (in addition to the 57 required counties)	1
Unknown	2
<b>TOTAL</b>	<b>58</b>



## 1.3 ALUC COMPATIBILITY PLANNING PROCESS OVERVIEW

### 1.3.1 Background

The ALUC is a statutorily created, quasi-legislative, public administrative agency that is responsible for conducting airport land use compatibility planning and preventing the creation of new noise and safety problems in the vicinity of public use airports. Pursuant to PUC Sections 21670 (a) and (b), an airport land use commission shall be established for the purposes of ensuring the orderly expansion of airports and the adoption of appropriate land use measures. California's airport land use compatibility planning is unique because the legislature has created ALUCs, which are separate from both the airport operators and the local agencies (cities and counties) in which those airports are located.

ALUCs have been granted the statutory authority to prepare an ALUCP and to review local government general and specific plans for consistency against the ALUCP. ALUCs oversee the consistency between local plans and the ALUCP. In some cases, they also review the compatibility of individual land use projects with the ALUCP. When an airport layout plan (ALP) or airport master plan (AMP) is amended, the ALUC must review their ALUCP for any changes that may be needed as a result of the airport updating its plan(s). An ALUC's consistency determination should be given substantial consideration by their local agency, as their determinations stand on their own. As discussed below, when review by the ALUC is required under the PUC, the determination of the ALUC is binding unless overruled by the local agency.

### 1.3.2 Airport Land Use Compatibility Plans

One of the primary responsibilities of an ALUC is the preparation and adoption of an ALUCP (PUC Sections 21674(c) and 21675). As further described in Chapter 2, the ALUCP is the basis for compatible planning within the vicinity of a public airport. The ALUCP may include land use measures specifying land use, height restrictions, and building standards (PUC Section 21675(a)). The planning boundary of the ALUCP is the "airport influence area," and is established by the ALUC after a hearing and consultation with the involved agencies (PUC Section 21675 (c)). Involved agencies are primarily the cities and the county, but also include special districts, school districts, and community college districts (PUC Section 21670(f)). An ALUCP must also address any military airport within the jurisdiction of the ALUC (PUC Section 21675(b)).

### 1.3.3 Plan Consistency

Government Code (Gov. Code) Section 65302.3 (a) states that a county's or city's general plan, as well as any applicable specific plans, "shall be consistent" with an ALUCP and that every affected county or city must amend its general and specific plans as necessary to keep them consistent with the ALUCP. The ALUC reviews the general plan (and applicable specific plans) and makes a consistency determination (PUC Section 21676(a)). If the ALUC determines the local plan to be inconsistent with the ALUCP, the local agency shall reconsider its plan, or overrule the ALUC's decision. The overrule is accomplished by a two-thirds vote of the local agency's governing body, accompanied by specific findings that its action meets the intent of

Article 3.5 of the SAA (PUC Section 21676(a)) and other published case law. Any local agency seeking to amend its general plan, a specific plan, or adopt zoning ordinance or building regulation within the airport influence area must first refer its proposed amendments to the ALUC for a determination if the proposed action is consistent with the airport land use compatibility plan. If the ALUC determines that the amendment is not consistent, the local agency may not enact the plan or regulation unless a two-thirds of the local agency's governing body votes to overrule the ALUC's inconsistency determination and the local government makes specific findings that its proposed action is consistent with the purposes of the Article 3.5 of the SAA (PUC Section 21676 (b)) and other published case law. The significance of this is that even if a local agency invokes the overrule provision, the local agency's actions must be in compliance with SAA.

### 1.3.4 ALUC Review

The ALUC's other main tool for compatibility planning, besides the preparation of the ALUCP, is the review of plans, regulations, and other actions of local agencies. Review of local agency actions occurs as follows:

- ◆ Prior to the adoption of an ALUCP, the ALUC shall review all local agency actions, regulations, or permits within the vicinity of a public airport. (PUC Section 21676(b)). "Vicinity" is the proposed planning boundary, or in the absence of a planning boundary, within two miles of the airport boundary.
- ◆ Upon the adoption of an ALUCP, the ALUC shall review the general plan and any applicable specific for consistency with the ALUCP (PUC Section 21676(a)).
- ◆ Prior to the amendment of a general plan or specific plan, or the adoption of a zoning ordinance or building regulation within the ALUCP planning boundary, the ALUC shall review the plan, ordinance, or regulation for consistency with the ALUCP (PUC Section 21676(b)).
- ◆ If a local agency has neither revised its general plan or applicable specific plans, nor overruled the ALUC by a two-thirds vote of its governing body (with required findings), the ALUC may require that all local agency actions, regulations, and permits be submitted for review to determine consistency with the ALUCP (PUC Section 21676.5(a)).
- ◆ Prior to the modification of an AMP<sup>1</sup> (by a public agency owning the airport), the ALUC shall review the proposed action (PUC Section 21676(c)).
- ◆ The ALUC reviews plans for the construction of new airports (PUC Section 21661.5) and the expansion of existing airports within its jurisdiction (PUC Section 21664.5).
- ◆ The local agency and ALUC may mutually agree that certain individual projects shall be reviewed by the ALUC (PUC Section 21676.5(b)).

A complete discussion of the recommended procedures and considerations for ALUC review is found in Chapter 6 of this *Handbook*.

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<sup>1</sup> Note that the AMP includes the ALP.

### 1.3.5 The Override Process

ALUC consistency determinations for local agency plans and projects (described in Section 1.3.4, above), are subject to override by the local agency. The override process preserves local government's constitutional land use authority and local government's ability to implement its plans and projects. When a plan or project is found inconsistent by the ALUC, the local agency has a choice to stop or amend the plan or project, and thereby accept the ALUC's inconsistency determination, or to override the ALUC with a two-thirds "supermajority" vote of the local agency's governing body.<sup>2</sup>

The override process, described in PUC Sections 21675.1(d), 21676, and 21676.5 requires the local agency's governing body to make specific findings that show the project is consistent with the purpose of Article 3.5 of the SAA. When a public agency overrides an ALUC's action or recommendation, pursuant to PUC Sections 21676, 21676.5 and 21677, a non-public operator of a publicly owned airport shall be immune from liability from damages resulting directly or indirectly from the override decision.

At least 45 days prior to the decision to override the ALUC, the local agency shall provide the ALUC and the Division a copy of the proposed override decision and accompanying findings. The ALUC and the Division may provide comments to the local agency's governing body within 30 days of receiving the proposed decision and findings. While the ALUC and Division comments are advisory, they must be included in the public record of any decision to override the ALUC.

## 1.4 ALUC STATUTORY REQUIREMENTS AND OPTIONS

This section states the basic requirements of the ALUC under Article 3.5 and identifies where actions and procedures are mandatory, and where they are optional. The complete ALUC statute, in addition to other pertinent statutes, can be found in Appendix A.

### 1.4.1 ALUC Membership and Selection

Per PUC Section 21670(b), each ALUC shall consist of seven members to be selected as follows:

- ◆ Two representing the cities in the county, appointed by a selection committee comprised of the mayors of all the cities within that county. If there are any cities contiguous or adjacent to the qualifying airport, at least one city representative shall be appointed from there. If there are no cities within a county, the number of representatives selected by the county and the airport managers shall be increased by one each (as of this *Handbook* edition, only the counties of Alpine, Mariposa and Trinity have no incorporated cities).
- ◆ Two representing the county, appointed by the board of supervisors.
- ◆ Two having expertise in aviation, appointed by a selection committee comprised of the managers of all of the public airports within the county.

<sup>2</sup> An exception to this rule is found in PUC Section 21677, which allows local agencies in the County of Marin to override the ALUC with a simple majority.

- ◆ One representing the general public, appointed by the other six members of the commission.

A person “having expertise in aviation,” as used above, means a person who, by way of education, training, business, experience, vocation, or avocation has acquired and possesses particular knowledge of, and familiarity with the function, operation and role of airports, or is an elected official of a local agency which owns or operates an airport (PUC Section 21670(e)). While this person is often a pilot, that is not required by law.

A person who already holds an elected or appointed public office, may be appointed and serve as a member of the commission during their term of public office (PUC Section 21670(c)).

Each member of the ALUC shall appoint one proxy to represent him or her in commission affairs and to vote on all matters when the member is not in attendance. The proxy must be made in writing and kept on file with the ALUC. The proxy serves at the pleasure of the member who appointed him or her. A vacant proxy position shall be promptly filled (PUC Section 21670(d)).

### ***Designated Body***

The membership of a designated body is governed by the rules of that body (for example, a regional transportation planning agency). However, if the designated body does not include among its membership at least two members having expertise in aviation (as defined above), it shall augment its membership with at least two members having that expertise when acting in the capacity of an ALUC (PUC Section 21670.1(b)).

## **1.4.2 Duties of Members**

### ***Term of Office***

The term of office is four years (PUC Section 21671.5(a)). All terms are to end on the first Monday in May. The terms of membership are staggered so that no more than two commissioner terms expire in the same year (see PUC Section 21671.5(a) for the exact procedure). Members serve at the pleasure of the body which appointed them (see the discussion under Section 1.4.1, above) and may be removed at any time without cause. Vacancies will be filled by the body that originally appointed that commissioner.

### ***Compensation, Staffing, and Fees***

Compensation for commissioners, if any, is determined by the board of supervisors of the county (PUC Section 21671.5(b)).

Staff assistance, including the mailing of notices, keeping of minutes, and the keeping of equipment and supplies, is provided by the county. The necessary operating expenses of the ALUC shall be a county charge (PUC Section 21671.5(c)). The ALUC shall not employ any personnel either as employees or independent contractors without the prior approval of the board of supervisors (PUC Section 21671.5(d)).

The ALUC may establish a schedule of reasonable fees necessary to carry out their statutory responsibilities (PUC Section 21671.5(f)). Those fees shall be charged to the proponents of actions, regulations, or permits. Per state law (Gov. Code Section 66016), the fee shall not exceed the estimated reasonable cost of providing the service, and may be levied only after a public hearing. Please refer to Appendix H for information on how some ALUCs have structured their fee schedules. Generally, an ALUC cannot charge a fee until it has adopted an ALUCP (see PUC Sections 21671.5(f) and (g)).

### ***Meetings and Conflict of Interest***

The ALUC shall meet at the call of the commission chairperson or at the request of the majority of the commission members. A majority of the commissioners shall constitute a quorum for conducting business. No action shall be taken by the ALUC except by the recorded vote of a majority of the full membership (PUC Section 21671.5(e)). In practice, most ALUCs have a regular schedule for meetings. ALUC meetings are subject to normal open meeting requirements (the Brown Act, Gov. Code Section 54950 et seq.).

Each ALUC shall adopt rules with respect to the temporary disqualification of its members from participating in the review or adoption of a proposal because of conflict of interest (PUC Section 21672). The SAA does not provide guidance on what constitutes a conflict of interest; the ALUC should seek guidance from their legal counsel as to the appropriate state requirements.



## CHAPTER 2

# AIRPORT LAND USE COMPATIBILITY PLANS







# Airport-Land Use Compatibility Plans

## 2.1 PURPOSE OF AIRPORT LAND USE COMPATIBILITY PLANS

### 2.1.1 Introduction

Public Utilities Code (PUC), Section 21675(a) requires preparation of an airport land use compatibility plan (ALUCP) for each public use airport in the state. This requirement applies regardless of whether a county chooses to establish and maintain an airport land use commission (ALUC) or to utilize one of the other authorized formation types for airport land use compatibility planning.

The ALUCP is designed to encourage compatible land uses in the vicinity surrounding an airport. It provides for the “orderly growth of each public airport and the area surrounding the airport” while safeguarding “the general welfare of the inhabitants within the vicinity of the airport and the public in general (PUC Section 21675(a)).” The ALUCP contains criteria for making consistency determinations, including building standards and height and land use restrictions.

ALUCPs are the fundamental tool used by ALUCs in fulfilling their purpose of promoting airport land use compatibility.

**This chapter addresses:**

- The purpose of ALUCPs
- Scope of an ALUCP
- ALUCP Contents
- Adoption Process
- Consistency Review

### 2.1.2 Responsibility for ALUCP Preparation

The ALUC (or the body designated to carry out the responsibilities of a commission) is responsible for preparing, adopting and amending the ALUCP. As a practical matter, responsibility for the preparation is typically assigned to staff and/or consultants working under the direction of the ALUC.

### 2.1.3 Information Resources

A variety of information resources are available to assist ALUCs and their staffs with the process of preparing compatibility plans. Among the most important of these are the following:

- ◆ *California Airport Land Use Planning Handbook* – The *Handbook* serves as a source of information regarding compatibility plans and policies. It also identifies many of the problems and issues faced by ALUCs when preparing, using, and updating their plans.

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**A** 1994 addition to the *State Aeronautics Act* requires that ALUCs “shall be guided by” information in the *Handbook* when formulating airport land use compatibility plans.

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- ◆ Division of Aeronautics—Division staff is available to respond to inquiries regarding state law, compatibility criteria, review procedures, and any other matters involving airport land use commissions.
- ◆ Other ALUCs—The experience of other ALUCs is another valuable information resource. Copies of adopted plans can generally be obtained from individual commissions. Also, commission members and their staffs are usually willing to discuss particular issues that they have faced. The Division maintains a list of contact persons and phone numbers for each of the airport land use commissions in the state.
- ◆ Consultants—Airport and land use planning consultants often provide services to ALUCs, including review of airport layout (ALPs) and drafting of ALUCPs.
- ◆ Seminars and Workshops—ALUC seminars and workshops are held periodically by the Division and other organizations. These gatherings of airport land use commission members, staffs, and others involved in airport land use planning facilitate the exchange of information about airport land use compatibility planning issues.
- ◆ Transportation Research Board's Airport Cooperative Research Program—The ACRP carries out applied research on problems that are shared by airport operating agencies and other interested stakeholders. A number of studies have been published by the ACRP regarding land use compatibility issues, noise and safety concerns, and other topics of interest.

### 2.1.4 Funding for ALUCP Preparation

Obtaining funds with which to prepare and/or update ALUCPs is an on-going problem for the majority of ALUCs. Potential funding sources include the following:

- ◆ State Funding—The Division of Aeronautics has provided grants to local agencies for the preparation of many ALUCPs. This funding has primarily come from the California Aid to Airport Program (CAAP) Acquisition and Development (A&D) grant, which covers up to 90% of the cost for plan preparation. The availability of A&D grant funds varies from year to year depending upon funding levels provided by the legislature and on prioritization guidelines established for airport-related projects by the California Transportation Commission. In addition to the A&D grant program, the state also provides a \$10,000 annual grant to each public-use general aviation airport in the state (except those designated as air carrier reliever airports).
- ◆ Department of Defense Funding—Funding for ALUCPs that cover areas around military airports is potentially available through the Defense Department's Office of Economic Adjustment.

- ◆ **ALUC Fees**—A portion of the fees that ALUCs are permitted to collect for the purpose of conducting compatibility reviews can be allocated to amending or updating an airport land use compatibility plan. ALUCs are not authorized to collect fees if they have not previously adopted an ALUCP (PUC Section 21671.5(f)).
- ◆ **Other Local Funds**—Preparation of an ALUCP can include funds from the local government’s general fund or airport-derived revenues (particularly at larger airports). For designated bodies who are also a MPO or RTPA, local transportation planning funds could be used for the ALUCP.

## 2.2 BASIC SCOPE OF ALUCPs

### 2.2.1 Overview

When preparing or updating an ALUCP, several decisions must be made regarding the scope and funding of the plan. Issues to be considered include:

- ◆ Each public use and military airport must be included in the ALUCP(s) (PUC Section 21675(a) and (b));
- ◆ The types of impacts to be addressed;
- ◆ The airport influence area (AIA);
- ◆ The availability of FAA approved ALPs or airport master plans (AMPs);
- ◆ Types of projects to be reviewed for ALUCP consistency determinations; and
- ◆ Procedures for the review of plans, ordinances, and other local agency actions.

### 2.2.2 Airports

Perhaps the most basic scoping issue is to determine which types of airports the ALUCP should address.

- ◆ **Public-Use Airports**—An ALUCP must be formulated for “each public airport” (that is, each airport served by a scheduled airline or operated for the benefit of the general public) within the jurisdiction of the ALUC (Section 21675(a)). In addition to existing public-use airports, ALUCs have, on occasion, also developed ALUCPs for proposed public airports even though it is not required.
- ◆ **Military Airports**—Commissions shall include the area surrounding any federal military airport in their ALUCP. The ALUCP shall be consistent with the safety and noise standards in the military’s Air Installation Compatible Use Zone (AICUZ) plan (PUC Section 21675(b)). (See also *Muzzy Ranch Co. v. Solano County ALUC* (2008) 164 Cal.App.4th 1 [finding that compatibility plan could be more restrictive than the AICUZ and still be consistent with the AICUZ].)
- ◆ **Airports Impacting Adjacent Counties**—Although often overlooked, when an airport impacts multiple counties, each ALUC should adopt compatibility policies for any

airport that impacts the area within its jurisdiction; even if the airport itself is located in an adjacent county. Typically, the county in which the airport is situated will take the lead in development of an ALUCP and then request concurrence or adoption by other affected jurisdictions. Another option is for both counties to jointly establish a separate ALUC for these “intercounty” airports. That commission would then be responsible for preparation of a compatibility plan for all of the airport’s influence area.

### 2.2.3 Airport Impacts

Noise and safety are the two primary airport impact concerns that have the potential to affect the health, safety and welfare of people within the vicinity of an airport. The related issues of overflight (noise) and airspace protection (safety) should also be considered when preparing the ALUCP.

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*Approaches to addressing these concerns are outlined in Chapters 3 and 4. The Appendices contain additional background discussion of noise and safety compatibility concepts and issues.*

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People’s reaction to aircraft noise varies widely with some people reacting vigorously to very low levels of aircraft noise, while other people have no reaction to very high levels of aircraft noise. The objective of compatible land use planning is to prevent people from being exposed to the most intensive and disruptive cumulative aircraft noise exposure levels. Aircraft noise exposure is depicted with cumulative noise exposure contours—measured in California in terms of community noise equivalent level (CNEL). CNEL contour maps are typically prepared for airports. However, aircraft noise exposure in areas beyond the outermost CNEL contours can also be annoying to some people and may be regarded as locally significant. These levels of aircraft noise exposure are generally described under the heading of overflight impacts.

Safety impacts from aircraft accidents near airports are typically handled by specifying the types of land uses and thus limiting the number of people who would be exposed to the risk of an accident. The other major safety concern is related to land uses that can create hazards to flight. Airspace protection primarily involves limitations on the height of objects on the ground near airports. Additional flight hazards to be considered are activities that can cause electronic or visual impairment to navigation or attract large numbers of birds.

### 2.2.4 Airport Influence Area

The geographic boundary of the ALUCP is known as the airport influence area (AIA). ALUCs establish the AIA after a hearing and in consultation with the involved agencies, as required by Section 21675(c). ALUCs sometimes describe the AIA as the referral area (as it is the area within which projects are potentially referred to the ALUC).

The ALUC usually establishes the AIA boundary based on:

- ◆ The location and configuration of the airport(s) included in the plan; and
- ◆ The extent of the noise and safety impacts associated with the airport(s).

The geographic area for noise impacts is typically described by CNEL contours and overflight areas, while safety impacts are mapped according to airport safety zones and the airspace surfaces. These areas are discussed in Chapter 3.

### 2.2.5 Document Format: Separate versus Countywide ALUCPs

ALUCP documents can be formatted to include only one airport or to cover all of the airports located within the county. Each of these two approaches has its advantages and disadvantages.

- ◆ Individual Airport Plans—Some ALUCs have separate ALUCP documents for each airport within their jurisdiction. This approach allows the plan to focus on the specific issues relevant to the individual airport, its surrounding land uses, and affected local jurisdictions.
- ◆ Countywide Plan—Other ALUCs have prepared a single ALUCP document that includes all of the airports. This format promotes consistency among the policies for all of the airports within the commission’s jurisdiction. A disadvantage is that, especially for counties with many airports, the ALUCP can become unwieldy in size and much of it will be irrelevant to jurisdictions affected by only one airport. A variation on the countywide plan is to prepare one document containing introductory information, policies, and other material that apply countywide, and separate sections that include maps and background data for each individual airport.

### 2.2.6 Airport Master Plans and Airport Layout Plans

#### ***Planning Requirements***

Section 21675(a) requires that each ALUCP “shall include and be based either on a long range master plan or an airport layout plan, as determined by the Division of Aeronautics of the California Department of Transportation, that reflects the anticipated growth of the airport during at least the next 20 years.”

#### ***The Airport Master Plan***

An AMP is an airport-sponsored, comprehensive planning study that usually describes existing conditions as well as interim and long-term development plans for the airport that will enable it to meet future aviation demand. An AMP contains an FAA-approved activity forecast and an ALP.

“An airport master plan is a comprehensive study of an airport and usually describes the short-, medium-, and long-term development plans to meet future aviation demand . . . The elements of a master planning process will vary in complexity and level of detail, depending on the size, function, issues, and problems of the individual airport (FAA 2007, p. 1).” The FAA reviews all elements of the AMP to ensure that sound planning techniques have been applied. However, the FAA only approves the following two elements of the AMP: 1) the 20-year forecast of demand and 2) the ALP.

The AMP functions as a long range, comprehensive study of the airports facilities and property needs. Even though an AMP may be “suggestive” of property outside of its boundaries, this document cannot dictate changes beyond the airport boundary (unless owned by the airport).

Thus an ALUCP and an AMP have fundamentally distinct and separate functions. The ALUCP focuses on the area outside of the airport property that is within its AIA, while the AMP focuses on airport operations and the area under the control of the airport. AMPs therefore cannot be used to achieve both purposes, i.e. AMPs cannot be a substitute for an ALUCP. Simply incorporating an ALUCP chapter into the AMP does not constitute an adequate ALUCP.

### ***The Airport Layout Plan***

An ALP is a scaled drawing of existing and proposed airport facilities including airport property lines and the information required to demonstrate conformance with applicable FAA regulations. A current FAA-approved ALP is required for airports identified in the National Plan of Integrated Airport Systems (NPIAS) that receive Federal assistance. ALPs remain current for a five-year period or until major changes are made or are planned to be made at the airport. The ALP is one of the components of an AMP.

All airport development at Federally-obligated airports, i.e. those airports who receive federal funds, must be done in accordance with an FAA approved ALP. An approved ALP indicates that the existing facilities and proposed development shown on the ALP conforms to the FAA airport design standards in effect at the time of approval, and it indicates that the FAA finds the proposed development to be safe and efficient (FAA 2005, pg. 8).

### ***Non-NPIAS Airports***

Since the eligibility for federal FAA assistance does not extend to non-NPIAS public use airports, the Division will accept a signed ALP drawing in lieu of an FAA-approved ALP as the basis of an ALUCP update, provided the drawing is prepared consistent with the California Code of Regulations, Title 21, Section 3534. The ALP drawing must reflect existing conditions and proposed changes, i.e. anticipated growth over a 20 year period. Only non-NPIAS airports that do not already receive state funds under the California Aid to Airports Program (CAAP) will be eligible for this exception (to the requirement of an AMP/ALP). Non-NPIAS airports and ALUCs are eligible to apply directly for A&D state funds to update their ALPs and ALUCPs respectively. A funding request for an ALP update as part of an ALUCP update can be made or the ALP update can be a separate funding request.

## **2.3 ALUCP CONTENTS**

State law provides only limited guidance regarding the specific components of the ALUCP. One of the most important parts of an ALUCP is a clear statement of the ALUC's compatibility review criteria upon which their decisions are made. Table 2A provides a checklist of typical ALUCP contents.

**TABLE 2A: CHECKLIST OF ALUCP CONTENTS**

<p>■ <b>Scope of the Plan</b>—In a preface or introductory chapter, provide a clear statement describing the scope and function of the plan. Specifically:</p> <ul style="list-style-type: none"> <li>• Purpose and Authority: Refer to PUC statute that requires the formation of ALUCs and requires preparation of an ALUCP. Include the resolution that formed the ALUC and the resolution that adopts this ALUCP. The plan's purpose should be defined as a vehicle for conducting airport land use compatibility planning.</li> <li>• Airport Identification: List the airport(s) addressed by the plan and the city or unincorporated county in which they are located.</li> <li>• Airport Influence Area: Provide a general description and map of the area that comprises the jurisdiction of the ALUC. Also include a map covering the planning boundary of the ALUCP if it varies from the AIA boundary.</li> <li>• Jurisdictions Affected: Identify all local jurisdictions and any military facilities that are affected by the ALUCP. Listing the general and specific plans of local jurisdictions also may be valuable.</li> <li>• Limitations of the Plan: Note the limitations on ALUC jurisdiction over existing land uses; state, federal and tribal land; and airport operations as stated in the law and how they are applied by the individual ALUC.</li> </ul>
<p>■ <b>Airport Information</b>—Include essential information about the airport(s) that shows the ALUCP has been based upon an FAA-adopted AMP or ALP.</p> <ul style="list-style-type: none"> <li>• Planning Status: Indicate the FAA approval date of the current ALP and activity forecasts (see below). Indicate local government or airport adoption date for the AMP.</li> <li>• ALP: Include a copy of the FAA-approved ALP.</li> <li>• Airport Activity: Document existing and projected airport operational levels. Include data indicating the known or estimated distribution of operations by type of aircraft, time of day, and runway used. As necessary, extend the 20 year forecasts included in adopted AMPs to ensure that the ALUCP reflects the anticipated growth of airport activity over a 20 year period.</li> </ul>
<p>■ <b>Compatibility Policies and Criteria</b>—State all policies and criteria as clearly, precisely, and completely as possible, in a separate chapter from background information. As appropriate, use tables to present primary criteria. Address each of the following compatibility concerns:</p> <ul style="list-style-type: none"> <li>• Noise: Indicate maximum normally acceptable exterior noise levels for new residential and other noise-sensitive land uses. Note interior noise level standards.</li> <li>• Overflight: Indicate how aircraft overflight noise concerns are addressed.</li> <li>• Safety: Indicate maximum acceptable land use densities and intensities and the manner in which they are to be measured. List any uses explicitly prohibited from certain zones.</li> <li>• Airspace Protection: Note reliance upon FAR Part 77 and Terminal Instrument Procedures (TERPS) if relevant. If applicable, indicate policies addressing objects where ground level exceeds FAR Part 77 criteria. List criteria regarding hazards to flight such as bird strikes, solar panels, wind turbines, stationary smoke plumes and electronic interferences with flight operations.</li> </ul>
<p>■ <b>Compatibility Zone Maps</b>—For each airport, provide either a composite compatibility zone map or individual compatibility zone maps. On base map, identify roads, water courses, section lines, and other major natural and man-made features. Showing the local government zoning as a background layer is also helpful.</p> <ul style="list-style-type: none"> <li>• Noise Contours: Show CNEL contours to be used for planning purposes.</li> <li>• Compatibility Policies: If compatibility policies are based on separate assessment of compatibility concerns, indicate boundaries and dimensions of safety zones. When basing zones on guidelines in Chapter 3 of this Handbook, make adjustments as appropriate to reflect traffic pattern locations and other factors particular to each individual airport.</li> <li>• FAA Airspace Protection Surfaces: Include map derived from FAR Part 77 standards indicating allowable heights of objects relative to the airport elevation. Indicate locations where ground exceeds these limits. Base map should show topography.</li> <li>• Composite Compatibility Zones: When using compatibility criteria representing a composite of the above individual compatibility concerns (noise, overflight, safety, and airspace protection) provide a map showing the boundaries of each zone. Indicate distances of boundaries from the airport runways.</li> <li>• Airport Influence Area: Clearly identify the AIA boundary on a map and with a written description.</li> </ul>
<p>■ <b>Review Policies</b>—Describe the process and list the steps that the ALUC will use in reviewing local government plans and projects.</p> <ul style="list-style-type: none"> <li>• Types of Actions for ALUC Review: List the types of local government plans or projects that are to be submitted to the ALUC. Distinguish between mandatory and voluntary submittals.</li> <li>• Project Information: List the types of information to be included when a project or plan is submitted for an ALUC consistency decision.</li> </ul>

TABLE 2A: CHECKLIST OF ALUCP CONTENTS

<ul style="list-style-type: none"><li>• Timing: Define when ALUC reviews are to be conducted and the time limits within which the ALUC must respond.</li><li>• ALUC Staff Responsibilities: Define staff duties in the ALUC compatibility review process.</li></ul>
<ul style="list-style-type: none"><li>▪ <b>Preliminary Review of Plans and Projects for Consistency determinations</b>—If applicable, describe the steps involved when an affected local jurisdiction requests the ALUC to provide a preliminary assessment of the general plans, specific plans, and relevant land use ordinances and regulations prior to their official submission for an ALUC determination. The ALUC should make a reasonable effort to identify any direct conflicts needing to be resolved as well as criteria and procedures that need to be defined in order for the local plans to be considered consistent with the ALUCP.</li></ul>
<ul style="list-style-type: none"><li>▪ <b>Land Use Information</b>—Include maps such as the following:<ul style="list-style-type: none"><li>• Existing Land Use Development: Show locations in the airport vicinity where development exists by using current, high-altitude aerial photographs and/or GIS data.</li><li>• Planned Land Uses: Show locations in the airport vicinity where development is planned by including current general plan and zoning maps.</li></ul></li></ul>
<ul style="list-style-type: none"><li>▪ <b>Discussion of Compatibility Issues</b>—Discuss the basic concepts and rationale behind the compatibility policies and criteria.</li></ul>
<ul style="list-style-type: none"><li>▪ <b>Local Government Implementation</b>—Discuss the general plan and specific plan ALUCP consistency requirement. Refer Local jurisdictions to the Handbook appendices for sample implementation documents such as, Methods for Calculating Usage Intensities, Buyer Awareness Measures, and an Airport Overlay Zone Ordinance.</li></ul>
<ul style="list-style-type: none"><li>▪ <b>Supporting Materials</b>—For quick reference, include:<ul style="list-style-type: none"><li>• State Aeronautics Act: Provide a copy of the current state laws pertaining to airport land use commissions (PUC Sections 21670-21679.5). Indicate the date of the most current legislative amendment.</li><li>• Federal Aviation Regulations Part 77: Provide a copy of regulations governing objects affecting navigable airspace.</li><li>• Glossary: Prepare a glossary of common aviation terms, particularly those associated with airport land use compatibility planning topics.</li><li>• A website link to the Caltrans Division of Aeronautics</li></ul></li></ul>

2.4 ALUCP ADOPTION PROCESS

2.4.1 Involvement of Local Agencies

Information and input from local agencies is essential to the preparation of airport land use compatibility plans. Adoption and, ultimately, successful implementation of compatibility plans requires that cooperation between ALUCs and affected local governments be continued beyond the plan development stage.

*Informal Consultation*

In many cases, the majority of issues that arise during the review of a draft ALUCP result more from lack of clarity in proposed policies than from fundamental disagreement over the policy objectives. Informal negotiations between the affected jurisdictions and the ALUC frequently can resolve many of these issues. Initially these negotiations can take place at the staff level, then involve elected county and city officials and commission members at a later date.

*Formal Consultation Requirements*

PUC Section 21675(c) requires formal consultation between ALUCs and affected local jurisdictions when an AIA is established. Although the statute does not distinguish between



establishing and amending an AIA, consultation is strongly recommended when the AIA is amended.

## 2.4.2 ALUCP Amendments

PUC Section 21675(a) limits amendment of all ALUCPs to no more than once per calendar year. A comprehensive review and update is recommended at least every five years.

The review and amendment process should follow essentially the same steps as the original adoption process which includes preparation of a draft ALUCP and environmental document, circulation for review and comment among affected agencies and the public, a noticed public meeting, incorporation of comments, and adoption by resolution of the ALUCP and its CEQA document. Coordination with local jurisdictions is important, particularly if the changes affect general and specific plan consistency with the ALUCP.

When an ALUCP is amended, as with its initial adoption, local government again has 180 days within which to amend its general and specific plans to be consistent with the ALUCP or to approve findings and overrule the ALUC.

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*It is recommended that ALUCs differentiate between major and minor amendments. A major amendment, which can occur only once per year, involves revising the policies in a manner that would change their applicability to a public agency, add new policies, or revise maps. A minor amendment, by contrast, addresses grammatical, typographical, or minor technical errors that do not affect policies or the manner in which those policies are applied to consistency and compatibility reviews.*

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## 2.5 ALUCP CONSISTENCY REVIEWS

### 2.5.1 Types of Local Government Actions Reviewed by ALUCs

Review of local government plans and projects pertaining to airport land use compatibility is one of the fundamental responsibilities of ALUCs. These local government actions fall into two broad groups: (1) Land use related, including general and specific plans, zoning ordinances, building regulation, or individual development projects; and (2) airport related, including the modification of an AMP or plans for the construction or expansion of an airport.

ALUCP policies should clearly specify the types of local government plans or projects that are to be submitted to the ALUC for a review that will result in a compatibility determination. The ALUC determines whether the plan or project is consistent with the ALUCP and therefore compatible with airport operations or it is determined to be inconsistent and incompatible. The ALUCP should also provide guidance on which plans or projects require mandatory review and which are subject to voluntary review.

### 2.5.2 Consistency Review Procedures

The procedures that the ALUC will use in reviewing local plans and projects should be defined in the ALUCP. Among the procedural matters that should be addressed are:

- ◆ The types of plan or project information that needs to be submitted;
- ◆ At one point in the local land use process that a plan or project should be submitted to the ALUC;
- ◆ ALUC staff responsibilities, if any, for certain ALUCP consistency reviews; and
- ◆ Notification procedures.

Some ALUCs append to their determinations various local government documents that memorialize necessary changes to a proposed project. The use of such documents is permissible, provided the determination from the ALUC is either “consistent” or “inconsistent” with the ALUCP.

# CHAPTER 3

## BUILDING AN AIRPORT LAND USE COMPATIBILITY PLAN





# Building an Airport Land Use Compatibility Plan

## 3.1 OVERVIEW

While compatibility policies, including both criteria and maps, comprise the substantive body of any airport land use compatibility plan (ALUCP), the compatibility concerns behind them (i.e., noise, safety, airspace protection, and overflight) provide the underlying context. The purpose of this chapter is to provide the foundation for developing an effective ALUCP. As such, the following sections introduce the basis and methods of measuring the four compatibility concerns. Furthermore, this chapter also covers common issues that arise when preparing an ALUCP and formulating the policies contained therein. Specific policy guidance regarding noise and safety compatibility concerns is provided in Chapter 4.

## 3.2 TYPES OF COMPATIBILITY CONCERNS

As indicated in the preceding chapters, the land use compatibility concerns of airport land use commissions (ALUCs) fall under two broad headings identified in state law: noise and safety. However, for purposes of formulating compatibility policies and criteria, further dividing these basic concerns into four functional categories is more practical. These categories are:

- ◆ *Noise*: As defined by the exposure to noise attributable to aircraft operations.
- ◆ *Overflight* : As defined by the annoyance and other general concerns arising from routine aircraft flight over a community.
- ◆ *Safety* : As defined by the protection of people on the ground and in the air from accidents.
- ◆ *Airspace Protection*: As defined by the protection of airspace from hazards to flight.

Chapter 4 provides strategies for formulating policies that will help achieve these objectives. Before that discussion can occur, however, an understanding of the regulatory and conceptual basis for these policies, and the scale at which attainment of these objectives can be measured, must be understood in order to develop effective land use compatibility criteria.

**Topics addressed in chapter include:**

- **Types of compatibility concerns;**
- **Noise contours;**
- **Overflight and notification;**
- **Safety zones;**
- **Airspace protection;**
- **Options in presenting compatibility criteria;**
- **Compatibility planning for different types of airports;**
- **Existing land uses; and**
- **Limits on ALUC land use controls.**

### **3.2.1 Noise**

Noise is one of the most basic airport land use compatibility concerns. Moreover, at major air carrier airports, many busy general aviation airports, and most military airfields, noise is usually the most geographically extensive form of airport-related impact.

#### ***Noise Policy Foundations***

Federal and state statutes and regulations establish the basis for local development of airport plans, analyses of airport impacts, and enactment of compatibility policies. Brief descriptions of selected statutes, regulations, and policies having particular significance to noise issues are provided in the following paragraphs.

#### ***Federal Statutes and Regulations***

While there are a number of federal statutes and regulations addressing the issue of aircraft noise, the following are perhaps the most influential from a land use compatibility standpoint.

##### **Statutes**

Aviation Safety and Noise Abatement Act of 1979 (ASNA)—Among the stated purposes of this act is “to provide assistance to airport operators to prepare and carry out noise compatibility programs.” The law establishes eligibility requirements for noise compatibility planning funding. The law does not require airports to develop noise compatibility programs—the decision to do so is within the discretion of each individual airport proprietor. Regulations implementing the act are set forth in Part 150 of the Federal Aviation Regulations (FAR).

##### **FAA Regulations and Policies**

FAR Part 150 Airport Noise Compatibility Planning—As a means of implementing ASNA, the FAA adopted these regulations, which establish a voluntary program that airports can utilize to conduct airport noise compatibility planning. “This part prescribes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving these programs.” FAR Part 150 also prescribes a system for measuring airport noise impacts and presents guidelines for identifying incompatible land uses. Airports that undertake a FAR Part 150 study are eligible for federal funding both for the study itself and for implementation of approved components of the local program.

FAR Part 150 noise exposure maps are depicted in terms of the average annual Day-Night Average Sound Level (DNL) contours around the airport. FAR Part 150 considers all land uses with noise levels less than 65 DNL to be compatible with aircraft operations. At higher noise exposures, selected land uses are also deemed acceptable, depending upon the nature of the use and the degree of structural noise attenuation provided.

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*The FAA allows use of Community Noise Equivalent Level (CNEL) contours for airports in California.*

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In setting the various compatibility guidelines, however, the regulations state that the designations :

“...do not constitute a Federal determination that any use of land covered by the [noise compatibility] program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.”

### **Military Airfields**

**Air Installations Compatible Use Zones (AICUZ ) Program**—The AICUZ program was established by the U.S. Department of Defense in 1973 in order to protect the federal government’s investment in military airfields. The current noise compatibility criteria (as set forth in the Code of Federal Regulations, Title 32, Part 256) are basically the same as those indicated in the Federal Interagency Committee on Urban Noise (FICUN) report and the FAA’s FAR Part 150 program; as a result, AICUZ compatibility standards for residential use suggest consideration of acoustical treatments above 65 dB DNL. AICUZ plans prepared for individual airfields are primarily intended as recommendations to local communities regarding the importance of maintaining land uses that are compatible with the noise and safety impacts of military aircraft operations.

### ***State of California Laws, Regulations, and Guidelines***

**State Aeronautics Act —Public Utilities Code (PUC) Section 21669** requires Caltrans to adopt—to the extent not prohibited by federal law—noise standards applicable to all airports operating under a state permit.

**California Airport Noise Regulations** —The airport noise standards promulgated in accordance with PUC Section 21669 are set forth in Section 5000 et seq. of the California Code of Regulations (Title 21, Division 2.5, Chapter 6). The current version of the regulations became effective in March 1990.

In Section 5006, the regulations state that:

“The level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a community noise equivalent level (CNEL) value of 65 dB for purposes of these regulations. This criterion level has been chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep and community reaction.”

In accordance with procedures listed in Section 5020, the county board of supervisors can declare an airport to have a “noise problem.” As specified in Section 5012, no such airport shall operate “with a noise impact area based on the standard of 65 dB CNEL unless the operator has applied for or received a variance as prescribed in...” the regulations.

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*The compatibility criterion (i.e., 65 dB CNEL) identified in the Airport Noise Regulations only is mandated for a few airports (less than a dozen) that are declared to have a “noise problem.” The regulations do not establish a mandatory criterion for evaluating the compatibility of proposed land use development around other airports. Section 5004 of the regulations specifically notes: “It is not the intent of these regulations to preempt the field of aircraft noise limitation in the state. The noise limits specified herein are not intended to prevent any local government, to the extent not prohibited by federal law, or any airport proprietor from setting more stringent standards.” As discussed later in this chapter, setting the threshold for land use compatibility lower than 65 CNEL is appropriate at many airports.*

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For designated “noise problem” airports, the “noise impact area” is the area within the airport’s 65 CNEL contour that is composed of *incompatible* land uses. Four types of land uses are defined as incompatible:

- Residences of all types;
- Public and private schools;
- Hospitals and convalescent homes; and
- Churches, synagogues, temples, and other places of worship.

However, these uses are not deemed incompatible if certain mitigation actions have been taken, as spelled out in Section 5014. Among these measures is airport acquisition of an aviation easement for aircraft noise and, except for some residential uses, acoustical insulation adequate to ensure that the interior CNEL due to aircraft noise is 45 dB or less in all habitable rooms.

California Building Code (California Code of Regulations, Title 24)—The California Building Code contains standards for allowable interior noise levels associated with exterior noise sources (California Building Code, 2007 edition, Part 2, Volume 1, Chapter 12, Section 1207.11). The standards apply to new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family residences.

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*Although the building code does not apply the 45 CNEL interior noise level standard to detached single-family residences, the Division of Aeronautics encourages communities to adopt this standard (or lower) for these uses. Many communities have done so as part of their general plan noise element policies.*

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The standards state that:

“Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the Day-Night Average Sound Level ( $L_{dn}$ ) or the Community Noise Equivalent Level (CNEL), consistent with the noise element of the local general plan. Worst-case noise levels, either existing or future, shall be used as the basis for determining compliance with [these standards]. Future noise levels shall be predicted for a period of at least 10 years from the time of a building permit application.”

With regard to airport noise sources, the code goes on to indicate that:

- ◆ “Residential structures to be located where the annual  $L_{dn}$  or CNEL exceeds 60 dB shall require an acoustical analysis showing that the proposed design will achieve the prescribed



allowable interior level. For public use airports or heliports, the  $L_{dn}$  or CNEL shall be determined from the airport land use plan prepared by the county wherein the airport is located. For military bases, the  $L_{dn}$  shall be determined from the facility Air Installation Compatible Use Zone (AICUZ) plan. For all other airports or heliports, or public use airports or heliports for which a land use plan has not been developed, the  $L_{dn}$  or CNEL shall be determined from the noise element of the general plan of the local jurisdiction.”

- ◆ “When aircraft noise is not the only significant source, noise levels from all sources shall be added to determine the composite site noise level.”

General Plan Guidelines—Section 65302(f) of the Government Code requires that a noise element be included as part of local general plans. Airports and heliports are among the noise sources to be analyzed. To the extent practical, both current and future noise contours (expressed in terms of either CNEL or DNL) are to be included. The noise contours are to be “used as a guide for establishing a pattern of land uses...that minimizes the exposure of community residents to excessive noise.”

Guidance on the preparation and content of general plan noise elements is provided by the Office of Planning and Research in its General Plan Guidelines publication (last revised in 2003). This guidance represents an updated version of guidelines originally published by the State Department of Health Services in 1976. Included in the document is a table indicating noise compatibility criteria for a variety of land use categories. Another table outlines a set of adjustment or “normalization” factors that “may be used in order to arrive at noise acceptability standards which reflect the noise control goals of the community, the particular community’s sensitivity to noise..., and their assessment of the relative importance of noise pollution.”

### ***Noise Contours for Compatibility Planning***

Although supplemental metrics may be useful for certain purposes, cumulative noise exposure metrics and the noise contours associated with these metrics continue to represent the best available tools for the purpose of airport land use compatibility planning. The following discussion focuses on issues to consider when projecting future noise impacts and selecting contours for compatibility planning purposes.

### ***Noise Analysis Time Frame***

PUC Section 21675 (a) requires that ALUCPs be based on an airport development plan “that reflects the anticipated growth of the airport during at least the next 20 years.” Forecasts having the required 20-year time horizon are normally included in airport master plans. The FAA, Caltrans, and some regional planning agencies also prepare individual airport forecasts, some of which extend to 20 years.

For compatibility planning, however, 20 years may be shortsighted. For most airports, a lifespan of more than 20 years can reasonably be presumed. Moreover, the need to avoid incompatible land use development will exist for as long as an airport exists. Once development occurs near an airport, it is virtually impossible—or, at the very least, costly and time consuming—to modify the land uses to ones that are more compatible with airport activities.

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*The “at least” phrase in the statute warrants emphasis. The 20-year time frame should be considered a minimum for compatibility plans. Noise impacts (as well as other compatibility concerns) should be viewed from the longest practical time perspective.*

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Past improvements in aircraft noise reduction technology—or, more to the point, the elimination of older, noisier aircraft from the fleet—have caused noise contours at some airports to shrink. One result of shrinking contour sizes during the late 1990s and early 2000s was pressure to allow residential and other noise-sensitive development closer to airports. The decrease in contour size due to the elimination of aircraft reached its pinnacle at most airports in the mid 2000s and contours began to increase again due to increased operations. Barring vast new improvements in aircraft noise reduction technology, the growth in aircraft operations expected at most airports will continue to result in larger noise contours.

In conducting noise analyses for ALUCPs, the long-range time frame is almost always of greatest significance. A possible exception to this is that, at some airports, planned changes in runway configuration or approach procedures could reduce noise exposure in some portions of the airport environs, or change the shape of the contour to include new areas. In these instances, a combination of current and future noise contours may be the appropriate basis for compatibility planning. This would allow for compatible land use planning until the changes are implemented.

#### ***Other Factors in Noise Contour Selection***

In addition to time frame and forecasting issues, several other factors warrant consideration in selection of noise contours for compatibility planning functions.

#### **Lowest Noise Contour Level**

Calculating at least one 5 dB CNEL contour interval below the threshold level can provide valuable supplemental information for land use planning. Aircraft noise does not become suddenly unnoticeable just beyond the CNEL contour that delineates the threshold for determining compatible versus incompatible land uses. The additional contour(s) can show where noise levels are below the level at which residential and certain other noise-sensitive land uses may need to be prohibited or substantially restricted, yet still may be noticeable and may warrant some form of land use compatibility measure. When applying this concept, it is important to recognize that CNEL contours become less precise the further they are from the airport.

#### **Supplemental Forecast Scenarios**

At some airports, the distribution of activity throughout the year or among aircraft types is such that an annual average forecast is insufficient for full assessment of noise impacts. For instance, an airport may have distinct seasonal or even daily variations in its activity. Such circumstances may warrant examination of noise contours reflecting these shorter periods in addition to the annual average impacts. These variations are particularly interesting when activity by the noisiest aircraft is concentrated into one part of the year. The predominantly summertime operations of fire attack aircraft is one common example.

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*As long as the assumptions used in supplemental forecast scenarios are consistent with the defined role of the airport, it is within reason for ALUCs to consider them.*

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Another situation in which supplemental forecast scenarios may be needed is when there is substantial uncertainty regarding a major component of airport activity. Examples include: possible changes in airline aircraft fleet mix and/or volume of operations; potential addition or elimination of particularly noisy aircraft; and/or, uncertainties in activity levels by aircraft that follow unique flight tracks (such as helicopters or agricultural applicator aircraft).

### **Special Noise Sources**

As noted in Appendix D, most noise contour calculations only take into account the noise from approaches/landings, takeoffs/departures, and closed traffic pattern (touch-and-go) activity. In some circumstances, other sources of aircraft noise may also need to be considered. These include:

- ◆ Helicopters —Because helicopters have distinct noise characteristics and usually follow different flight tracks than those used by airplanes, their noise can be particularly noticeable. Inclusion of helicopter noise in computation of airport noise contours is desirable, especially at airports having moderate or high levels of helicopter activity.

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*Including helicopter operations in noise contour calculations generally will not have much effect on the size or shape of noise contours unless the traffic volumes are quite high. In these instances, the location of common helicopter flight tracks and the single-event noise levels of helicopter overflights may be appropriate to consider in compatibility planning.*

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- ◆ Agricultural Aircraft—Another group of aircraft with unique noise characteristics is agricultural “crop duster” aircraft. For example, unless numerous flight tracks are modeled, the calculated contours tend to maintain a constant width along the flight tracks and never reach an end point.
- ◆ Ground Operations—For most airports, aircraft ground operations are not a significant source of noise. Noise from engine run-ups can be included in integrated noise model (INM) calculations, however. At airports where such activity is a noise factor, the INM calculations should account for the aircraft ground operations. If included, some reference to the fact should be noted in the description of the contours.

### **Sources of Noise Contours**

Potential sources of noise contours can be summarized as follows:

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*The preceding discussion focuses on issues concerning the development of noise contours suitable for compatibility planning. However, it may not be necessary for ALUCs to develop the contours. Noise contours are available from a variety of sources. Some of these are potentially useful for compatibility planning purposes, others are of limited value.*

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- ◆ Airport Master Plans—As indicated above, an adopted airport master plan is one of the preferred sources for airport activity forecasts and noise contours. Even when the forecasts and contours in a master plan do not extend at least 20 years into the future, information

contained about the intended role and future physical characteristics of the airport is needed for compatibility planning.

- ◆ **Noise Elements of Community General Plans**—The status of noise contours depicted in general plans is similar to that of noise contours from airport master plans in that they represent adopted local policy. As for their usefulness in compatibility planning, planners need to be sure the contours are up to date. More often than not, noise contours included in general plans are copies of ones from the most recent airport master plan.
- ◆ **Environmental Documents**—Environmental analysis prepared for major airport development, pursuant to the California Environmental Quality Act (CEQA) and/or National Environmental Policy Act (NEPA), normally contains newly prepared noise contours with a 20-year horizon. Depending upon the timing of the project, these contours may be more recent than ones in an airport master plan.
- ◆ **FAR Part 150 Studies**—Most of the air carrier and busier general aviation airports in the state have conducted FAR Part 150 noise compatibility studies. These studies contain current and five-year projected noise contours. At airports where noise impacts are expected to decrease in the future, the FAR Part 150 noise exposure maps are appropriate for land use compatibility planning purposes. If the noise exposure is expected to expand beyond the five-year time frame, then the noise contours will not provide a sufficiently long time horizon and generally should not be used.
- ◆ **AICUZ Studies**—AICUZ studies conducted by the U.S. Department of Defense are often times the primary source for noise contours associated with military installations. Because aircraft activity levels at most military facilities are highly dependent upon international events, the contours usually represent current conditions and long-range projections are seldom done. When preparing forecasted noise contours for a military installation, ALUC staff should work with military personnel to determine an appropriate mission expansion scenario that would reflect realistic increases in military operations for the foreseeable future.

#### 3.2.2 Overflight

As discussed in Appendix D, experience at many airports has shown that noise -related concerns do not stop at the boundary of the outermost mapped CNEL contour. Instead, many people are sensitive to the frequent presence of aircraft overhead even at low noise levels. These reactions can mostly be expressed in the form of *annoyance*.

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*As the term is applied herein, an overflight means any distinctly visible and audible passage of an aircraft, but not necessarily one which is directly overhead.*

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At many airports, particularly air carrier airports, complaints often come from locations beyond any of the defined noise contours. Indeed, heavily used flight corridors to and from metropolitan areas are known to generate noise complaints 50 miles or more from the associated airport. The basis for such complaints may be a desire and expectation that outside noise sources not be intrusive—or, in some circumstances, not even distinctly audible—above the quiet, natural background noise level. Elsewhere, especially in locations beneath the traffic patterns of general aviation airports, a fear factor also contributes to some individuals' sensitivity to overflight.

While these impacts may be important community concerns, the question of importance here is whether any land use planning actions can be taken to avoid or mitigate the impact/concern. Commonly, when overflight impacts are discussed in a community, the focus is on the modification of flight routes. Indeed, some might argue that overflight should be addressed solely through the aviation side of the equation—not only flight route changes, but other modifications to where, when, and how aircraft are operated. ALUCs are particularly limited in their ability to deal with overflight, as they have no influence over how an airport operates, nor do their policies affect existing land uses. These limitations notwithstanding, there are steps that ALUCs can and should take to help minimize overflight issues.

### ***Overflight Policy Foundations***

Very little guidance exists for limiting people's exposure to overflight. As is often the case, the basis for setting criteria is primarily the experience and knowledge that airport proprietors and ALUCs have about the noise sensitivity of the specific communities. Airport proprietors, specifically, possess not only a unique understanding of the land uses and neighborhoods around their airports, but also how typical airport operations may affect noise-sensitive land uses and communities.

The primary overflight strategy is the buyer awareness measure, which, rather than applying direct restrictions on the types of land uses, seeks to inform the public of potential annoyances associated with overflight.

Business and Professions Code Sections 11010(a) and (b)(13) require that:

"(a)... [A]ny person who intends to offer subdivided lands within this state for sale or lease shall file with the Department of Real Estate an application for a public report consisting of a notice of intention and a completed questionnaire on a form prepared by the department.

(b) The notice of intention shall contain the following information about the subdivided lands and the proposed offering:

...

(13)(A) The location of all existing airports, and of all proposed airports shown on the general plan of any city or county, located within two statute miles of the subdivision. If the property is located within an airport influence area, the following statement shall be included in the notice of intention:

#### **NOTICE OF AIRPORT**

This property is presently located in the vicinity of an airport, within what is known as an airport influence area. For that reason, the property may be subject to some of the annoyances or inconveniences associated with proximity to airport operations (for example: noise, vibration, or odors). Individual sensitivities to those annoyances can vary from person to person. You may wish to consider what airport annoyances, if any, are associated with the property before you complete your purchase and determine whether they are acceptable to you.

(B) For purposes of this section, an "airport influence area," also known as an "airport referral area," is the area in which current or future airport-related noise, overflight, safety, or airspace protection factors may significantly affect land uses or necessitate restrictions on those uses as determined by an airport land use commission."

(See also Civil Code, Sections 1102.6, 1103.4, and 1353.)

California real estate law also requires that sellers of real property disclose "any fact materially affecting the value and desirability of the property" (Civil Code, Section 1102.1(a)). While this general requirement leaves to the property seller the decision as to whether airport-related information constitutes a fact warranting disclosure, other sections of state disclosure law specifically mention airports. Specifically, Civil Code Section 1102.17 states: "The seller of residential real property subject to this article who has actual knowledge that the property is affected by or zoned to allow industrial use described in Section 731a of the Code of Civil Procedure shall give written notice of that knowledge as soon as practicable before transfer of title." Section 731a of the Code of Civil Procedure specifies:

"Whenever any city, city and county, or county shall have established zones or districts under authority of law wherein certain manufacturing or commercial or *airport* uses are expressly permitted, except in an action to abate a public nuisance brought in the name of the people of the State of California, no person or persons, firm or corporation shall be enjoined or restrained by the injunctive process from reasonable and necessary operation in any such industrial or commercial zone or *airport* of any use expressly permitted therein, nor shall such use be deemed a nuisance without evidence of the employment of unnecessary and injurious methods of operation...." [*emphasis added*]

It is interpreted that these sections of law establish a requirement for disclosure of information regarding the effects of airports on nearby property provided that the seller has "actual knowledge" of such effects. ALUCs have particular expertise in defining where airports have effects on surrounding lands. ALUCs thus can give authority to this disclosure requirement by establishing a policy indicating the geographic boundaries of the lands deemed to be affected by airport activity. In most cases, this boundary will coincide with the ALUC's planning boundary for an airport. Furthermore, ALUCs and local jurisdictions should disseminate information regarding their disclosure policy and its significance by formally mailing copies to local real estate brokers and title companies. Having received this information, the brokers would be obligated to tell sellers that the facts should be disclosed to prospective buyers.

#### ***Overflight Zones for Compatibility Planning***

Overflight boundaries often are established by an amalgamation of various data inputs, including noise contours, flight tracks, and even noise complaint patterns. This is because overflight boundaries extend beyond the well-defined CNEL contours. As CNEL contours are not very precise at low noise levels, especially where aircraft flight tracks are widely divergent, perhaps the most useful tool for determining the location of overflight boundaries are flight tracks. Flight track data depicts not only where aircraft typically operate, but also at what altitudes.

Flight track data, however, is not always available—especially for smaller general aviation airports. In these cases, understanding the standard operating procedures of the airport will assist in the establishment of overflight boundaries. For general aviation airports, such locations include areas beneath the standard airport traffic patterns, the portions of the pattern entry and departure routes flown at normal traffic pattern altitude, and perhaps additional places which experience a high concentration of overflight. Also, at all types of airports, common instrument flight rules (IFR ) arrival and departure routes can identify overflight areas of concern, sometimes many miles from the airport.

### 3.2.3 Safety

Compared to noise, safety is in many respects a more difficult concern to address in compatibility policies. A major reason for this difficulty is that safety policies address uncertain events that *may occur* with *occasional* aircraft operations, whereas noise policies deal with known, more or less predictable events that *do occur* with *every* aircraft operation. Because aircraft accidents happen infrequently and the time, place, and consequences of their occurrence cannot be predicted, the concept of *risk* is central to the assessment of safety compatibility. From the standpoint of land use planning, two variables determine the degree of risk posed by potential aircraft accidents:

- ◆ *Accident Frequency:* Where and when aircraft accidents occur in the vicinity of an airport; and
- ◆ *Accident Consequences:* Land uses and land use characteristics that affect the severity of an accident when one occurs.

### Safety Policy Foundations

In order for ALUCs and local land use jurisdictions to address the preceding compatibility concerns, an assessment of safety standards and guidelines set by federal and state agencies is essential. Unlike the case with noise, though, few federal and state laws, regulations, or policies address the issue of safety-related land use compatibility around airports. Only the guidelines prepared by the U.S. Department of Defense for military air bases are comprehensive in their approach. This section summarizes significant criteria which federal and state agencies have developed.

#### FAA

Land use safety compatibility guidance from the FAA is limited to the immediate vicinity of the runway, the runway protection zones at each end of the runway, and the protection of navigable airspace. The absence of FAA land use compatibility criteria for other portions of the airport environment is often cited by land use development sponsors as an argument that further controls on land use are unnecessary. What must be remembered, however, is that the FAA criteria apply only to property controlled by the airport proprietor. The FAA has no authority over off-airport land uses—its role is with regard to the safety of aircraft operations. The FAA’s only leverage for promoting compatible land use planning is through the grant assurances that airport proprietors must adhere to in order to obtain federal funding for airport improvements. State and local agencies are free to set more stringent land use compatibility policies.

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*Property acquisition for approach protection purposes is eligible for FAA grant funding.*

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#### **Runway Vicinity**

The emphasis in FAA safety criteria is on the runway surface and the areas immediately adjoining it. Standards are established that specify ground surface gradients for areas adjacent to runways and the acceptable location and height of aeronautical equipment placed nearby. These areas normally are encompassed within airport boundaries.

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*These standards are set forth in an FAA Advisory Circular entitled Airport Design (AC 150/5300-13).*

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#### **Runway Protection Zones**

Runway protection zones (RPZs) are trapezoidal-shaped areas located at ground level beyond each end of a runway. The dimensions of RPZs vary depending upon:

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*Runway protection zones (previously called clear zones) date from a recommendation in the 1952 Report of the President's Airport Commission. See Appendix E for additional information.*

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- ◆ The type of landing approach available at the airport (visual, non-precision, or precision); and
- ◆ Characteristics of the critical aircraft operating at the airport (weight and approach speed).

Ideally, each runway protection zone should be entirely clear of all objects. The FAA's *Airport Design* advisory circular strongly recommends that airports own this property outright or, when this is impractical, to obtain easements sufficient to control the land use. Acquisition of this property is eligible for FAA grants (except at some small airports that are not part of the national airport system). Even on portions of the RPZs not under airport control, the FAA recommends that churches, schools, hospitals, office buildings, shopping centers, and other places of public assembly, as well as fuel storage facilities, be prohibited. Automobile parking is considered acceptable only on the outer edges of RPZs (outside the extended object free area).

Beyond the runway protection zones, the FAA has no specific safety -related land use guidance other than airspace protection. However, additional property can also potentially be acquired with federal grants if necessary to restrict the use of the land to activities and purposes compatible with normal airport operations. In general, this property must be situated in the approach zones within a distance of 5,000 feet from the runway primary surface. Exposure to high levels of noise can also be the basis for FAA funding of property acquisition.

#### **U.S. Department of Defense**

Safety compatibility criteria for military air bases are set forth through the AICUZ program (DOD-1977). The objective of this program is to encourage compatible uses of public and



private lands in the vicinity of military airfields through the local communities' comprehensive planning process.

With respect to safety, AICUZ standards establish three accident potential zones (APZs) beyond each end of a military airfield runway. The innermost zone—the clear zone—is either trapezoidal in shape (at Navy bases) or rectangular (at Air Force bases). Two additional zones—designated APZ I and APZ II—lie beyond the clear zone. The alignment of these zones may be altered to follow the primary flight tracks. The clear zone length is typically 3,000 feet. Other dimensions vary depending upon the type of aircraft and/or number of aircraft operations on the runway. For most military runways, though, the APZs are 3,000 feet wide and have lengths of 5,000 feet for APZ I and 7,000 feet for APZ II, for a total of 15,000 feet from the runway end.

Within each zone, the compatibility or incompatibility of possible land uses is specified. For example, residential uses are considered incompatible in the clear zone and APZ I and compatible only at low densities in APZ II. Retail land uses are unacceptable in the clear zone and may or may not be compatible in APZ I and II depending upon on the intensity of use.

**As noted in Appendix E, these dimensions were developed based on a study of where military aircraft accidents have occurred in the past.**

## State of California

### Statutes

Few State-level laws and regulations exist that provide guidance with respect to airport land use compatibility. The guidance that is available is found in two primary locations:

- ◆ **State Aeronautics Act** —The State Aeronautics Act (PUC Section 21001 et seq.) provides for the right of flight over private property, unless conducted in a dangerous manner or at altitudes below those prescribed by federal authority (Section 21403(a)). No use shall be made of the airspace above a property that would interfere with the right of flight, including established approaches to a runway (Section 21402). The Act also authorizes Caltrans and local governments to protect the airspace defined in FAR Part 77. The SAA further prohibits any person from constructing any structure or permitting any natural growth of a height that would constitute a hazard to air navigation as defined in FAR Part 77 unless Caltrans issues a permit (PUC Section 21659). The permit is not required if the FAA has determined that the structure or growth does not constitute a hazard to air navigation or would not create an unsafe condition for air navigation. Typically this has been interpreted to mean that no penetrations of the FAR Part 77 surfaces is permitted without a finding by the FAA that the object would not constitute a hazard to air navigation.

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*Note that other parts of state law—the Government Code and Public Resources Code, in particular—establish various requirements for compatibility planning and the review of development near airports, but do not set specific compatibility criteria.*

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- ◆ **State Education Code** —Education Code Section 17215 requires that, before acquiring title to or leasing property for a new school site situated within two miles of an airport runway, a school district must notify the Department of Education. The Department of Education then notifies Caltrans, which is required to investigate the site and prepare a written report. If Caltrans does not favor acquisition of the site for a school, no state or local funds can be used for site acquisition or building construction on that site. Education Code Section 81033 establishes similar requirements for community college sites. Finally, PUC Section 21655

also prescribes similar requirements for any proposed property acquisition or construction by a state agency within two miles of an airport runway.

#### **Caltrans Guidelines**

In 1994, a section was added to the SAA to require that: “An airport land use commission that formulates, adopts or amends a comprehensive airport land use plan shall be guided by ... the Airport Land Use Planning Handbook published by the Division of Aeronautics of the Department of Transportation” (PUC Section 21674.7 ).

The addition of this statute changed the role of this *Handbook* from a useful reference document to one that must be used as guidance in the development of ALUC policies. This is particularly important in the development of safety compatibility policies because very little guidance is otherwise available for civilian airports.

#### ***Creating Safety Compatibility Zones***

There are two components to safety compatibility policies: identification of the locations where safety—that is, the risk of aircraft accidents—is a concern; and definition of appropriate land use measures addressing those risks. This section focuses on the first of these two components.

Creation of safety compatibility zones is an exercise predominantly driven by aeronautical considerations. That is, the geography of risk is determined by the runway configuration, approach and departure procedures, and other factors that determine where aircraft fly and where accidents occur. Except where features on the ground influence where aircraft actually fly—high terrain or a noise abatement route, for instance—safety zones should be defined independent of existing and future land uses and other geographic features. At most, these features should be considered only in fine tuning of the boundaries.

The first step in creating safety compatibility zones is to identify historical accident location patterns. In-depth data on this topic is provided in Appendix E and is further analyzed below. This data and analysis has been used to define a set of generic safety zones as described later in this section. For most airports, these generic zones will serve as the starting place for the zone delineation process. The essential remaining action is to adjust the zones to fit the circumstances of the particular airport and each runway end. Guidance on this step is offered here as well.

#### ***Identifying Accident Location Patterns***

A primary element in the establishment of safety compatibility policies is knowing *where* aircraft accidents pose risks to land uses near airports. Of course, the fact that accidents have historically occurred in certain locations is no guarantee that they will happen in precisely those places in the future, especially at any one airport (where the limited amount of data is not likely to be statistically significant). Furthermore, inevitable advances in aeronautics technology like Next Generation (Next Gen) may affect where aircraft accidents occur in the future, potentially requiring further analysis of accident location patterns (see Appendix C for a discussion of Next Gen). Nevertheless, it is reasonable to predict that the broad areas within which significant numbers of accidents have taken place in the past will be where most accidents will also occur in the foreseeable future.

A glance at the aircraft accident distribution patterns presented in Appendix E gives a good indication of where accidents are most likely to occur in relationship to a runway. In the form presented, however, the accident patterns are not easily usable for defining appropriate land use safety compatibility criteria. Doing so would be equivalent to attempting to set noise compatibility policies by using noise data for a series of discrete geographic points. An essential first step thus is to aggregate the accident location data into a more functional format. This process is described in Appendix F.

### ***Delineation of Geometric Zones***

While accident distribution contours are helpful as a means of portraying the geographic pattern of aircraft accident risks near an airport, they are not very satisfactory as the basis for defining safety compatibility policies. Their irregular shape is one drawback— although, in that respect, they are no different from noise contours. More important is the lack of precision that results from the modest size of the database, especially as associated with the contours for the individual runway-length groups.

Historically, regular geometric shapes have been used to define safety zones around airports. The 1952 *Report of the President's Airport Commission* first used accident location data to define the size and shape of clear zones (now called runway protection zones) intended to be created at the end of each runway. Prior to the 2002 *Handbook*, ALUCs mostly used regular geometric shapes when adopting airport safety compatibility zones. Many times, the geometric airspace surfaces defined by FAR Part 77 have been used at least as a starting point for establishment of safety zones.

RPZs and FAR Part 77 surfaces, however, both have shortcomings for purposes of land use safety compatibility objectives. Runway protection zones encompass only the most highly concentrated areas of accident locations near runways. As the data in Appendix E clearly indicates, a significant percentage of near-airport aircraft accidents occur in locations beyond the runway protection zones. And while FAR Part 77 surfaces cover a much greater geographic area, they were established for the purposes of airspace protection, not safety compatibility for people and land uses on the ground. As such, FAR Part 77 surfaces, especially the transitional surfaces, have rather minimal correlation to where aircraft accidents occur around airports.

A detailed analysis of aircraft accident location patterns, together with consideration for where aircraft fly and how they are being operated during takeoff departures and landing approaches, provides the best basis for determining optimum safety zone shapes and sizes. An ideal set of safety zones should have four characteristics:

- ◆ The zones should have easily definable geometric shapes;
- ◆ The number of zones should be limited to a realistic number (five or six should be adequate in most cases);
- ◆ The set of zones should have a distinct progression in the degree of risk represented (that is, the distribution of accidents within each zone should be relatively uniform, but less concentrated than in the zones closer to the runway ends); and

- ◆ Each zone should be as compact as possible.

#### **Generic Safety Zones**

Converting the above concepts into a set of safety zones for a specific airport is, unfortunately, not a simple task. There is no computer model akin to those for creating noise contours into which airport data can be inserted and a set of safety zones are produced as the output. While accident location data provides a solid foundation for delineation of safety zones, considerable judgment is required when creating zones for a particular airport.

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*This edition of the Handbook does not change the safety zone guidance provided in the 2002 edition. As described above, evidence from analysis of the limited new data gathered for this edition was insufficient to conclude that the geographic distribution of accidents has significantly changed during the past decade compared to the pattern from the 1983-1992 period that served as the basis for the previously suggested zones (see Appendix E).*

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**The dimensions of Zone 1 should reflect the runway protection zone as identified on an airport layout plan, and described in FAA Advisory Circular 150/5300-13: Airport Design.**

To assist ALUCs in delineation of safety zones for a given airport, this *Handbook* provides sets of generic zones intended to serve as a starting place for the exercise. A total of seven examples of different safety zone configurations are delineated in a series of diagrams shown in the figures on the following pages. Figure 3A includes safety zone examples for five different types of general aviation runways. Figure 3B presents examples for runways at a large air carrier and military airports. The diagrams divide the airport vicinity into as many as six safety zones in addition to the immediate runway environs (defined by the FAR Part 77 primary surface):

- ◆ *Zone 1:* Runway protection zone and within runway object free area adjacent to the runway;
- ◆ *Zone 2:* Inner approach/departure zone;
- ◆ *Zone 3:* Inner turning zone;
- ◆ *Zone 4:* Outer approach/departure zone;
- ◆ *Zone 5:* Sideline zone; and
- ◆ *Zone 6:* Traffic pattern zone (not applicable to large air carrier airports).

The intent of the set of zones depicted for each example is that risk levels be relatively uniform across each zone, but distinct from the other zones. For the most part, the shapes and sizes of the zones were established based upon mathematical analyses of the accident location data presented in this and Appendix E. Not clearly stated in past editions, though, was that another factor also played a part in the zone delineation and is important to acknowledge here: flight parameters. More specifically, as an aircraft approaches for landing or climbs out after takeoff, how is it being operated? Where is it normally flying relative to the runway, and at what altitude? Is it flying straight and level or turning and climbing or descending? What actions pose the greatest stress on the aircraft and greatest potential for loss of control or fewest options for recovery if the unexpected occurs? Where are conflicts between aircraft in flight most likely to happen and potentially create risks for the land uses below?

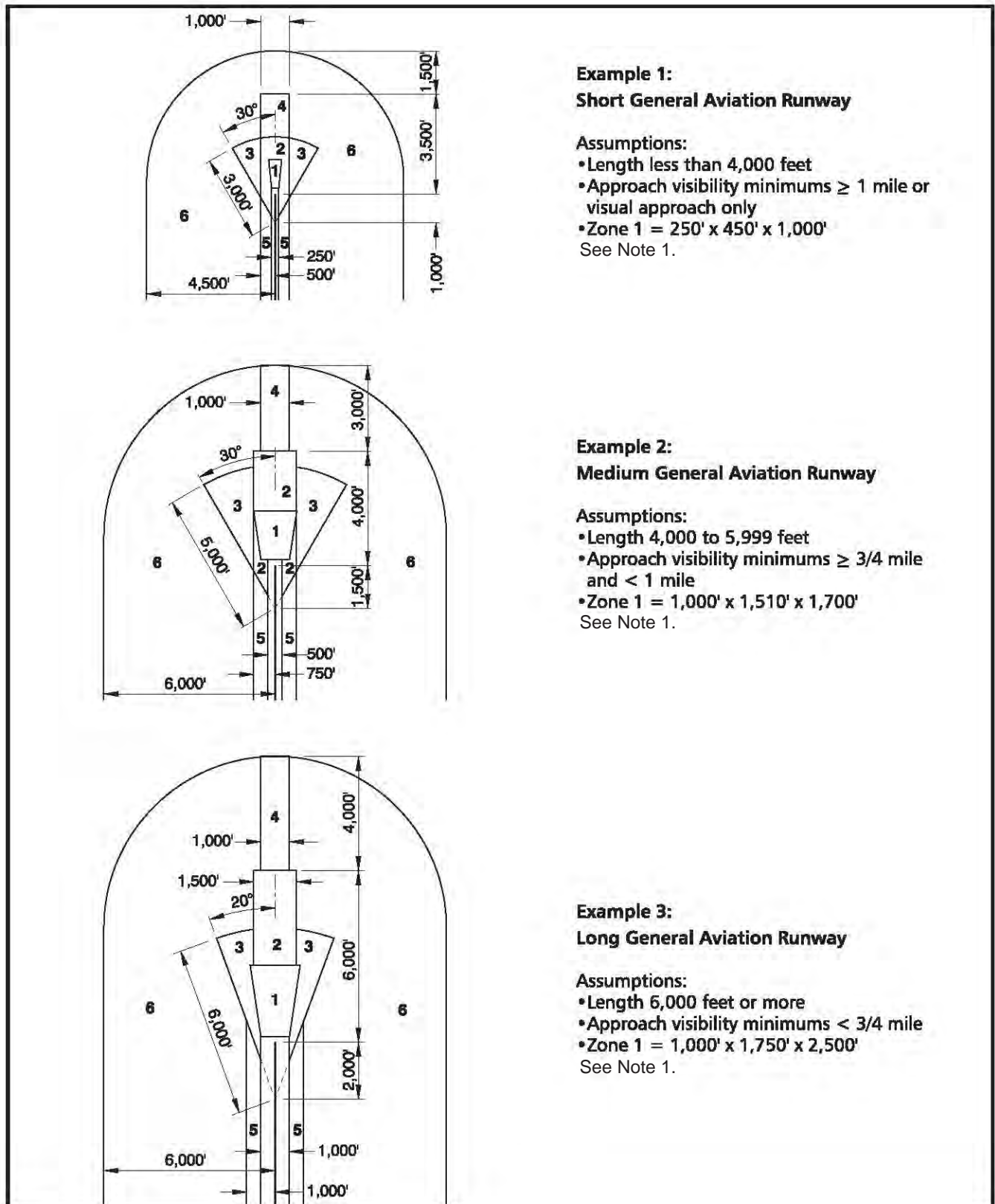
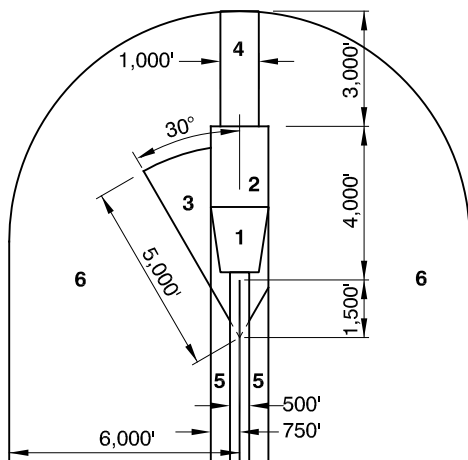


FIGURE 3A

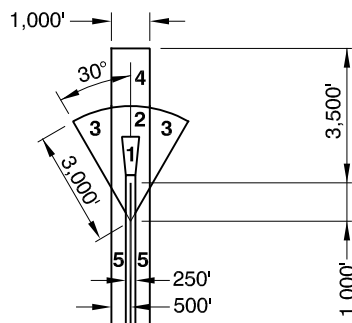
## Safety Compatibility Zone Examples – General Aviation Runways



#### Example 4: General Aviation Runway with Single-Sided Traffic Pattern

##### Assumptions:

- No traffic pattern on right
  - Length 4,000 to 5,999 feet
  - Approach visibility minimums  $\geq 3/4$  mile and  $< 1$  mile
  - Zone 1 = 1,000' x 1,510' x 1,700'
- See Note 1.



#### Example 5: Low-Activity General Aviation Runway

##### Assumptions:

- Less than 2,000 takeoffs and landings per year at individual runway end.
  - Length less than 4,000 feet
  - Approach visibility minimums  $\geq 1$  mile or visual approach only
  - Zone 1 = 250' x 450' x 1,000'
- See Note 1.

#### Legend

1. Runway Protection Zone
2. Inner Approach/Departure Zone
3. Inner Turning Zone
4. Outer Approach/Departure Zone
5. Sideline Zone
6. Traffic Pattern Zone

#### Notes:

1. RPZ (Zone 1) size in each example is as indicated by FAA criteria for the approach type assumed. Adjustment may be necessary if the Approach type differs.
2. See Figure 3A for factors to consider regarding other possible adjustments to these zones to reflect characteristics of a specific airport runway.
3. See Figures 4B through 4G for guidance on compatibility criteria applicable with each zone.

*These examples are intended to provide general guidance for establishment of airport safety compatibility zones. They do not represent California Department of Transportation standards or policy.*

FIGURE 3A CONTINUED

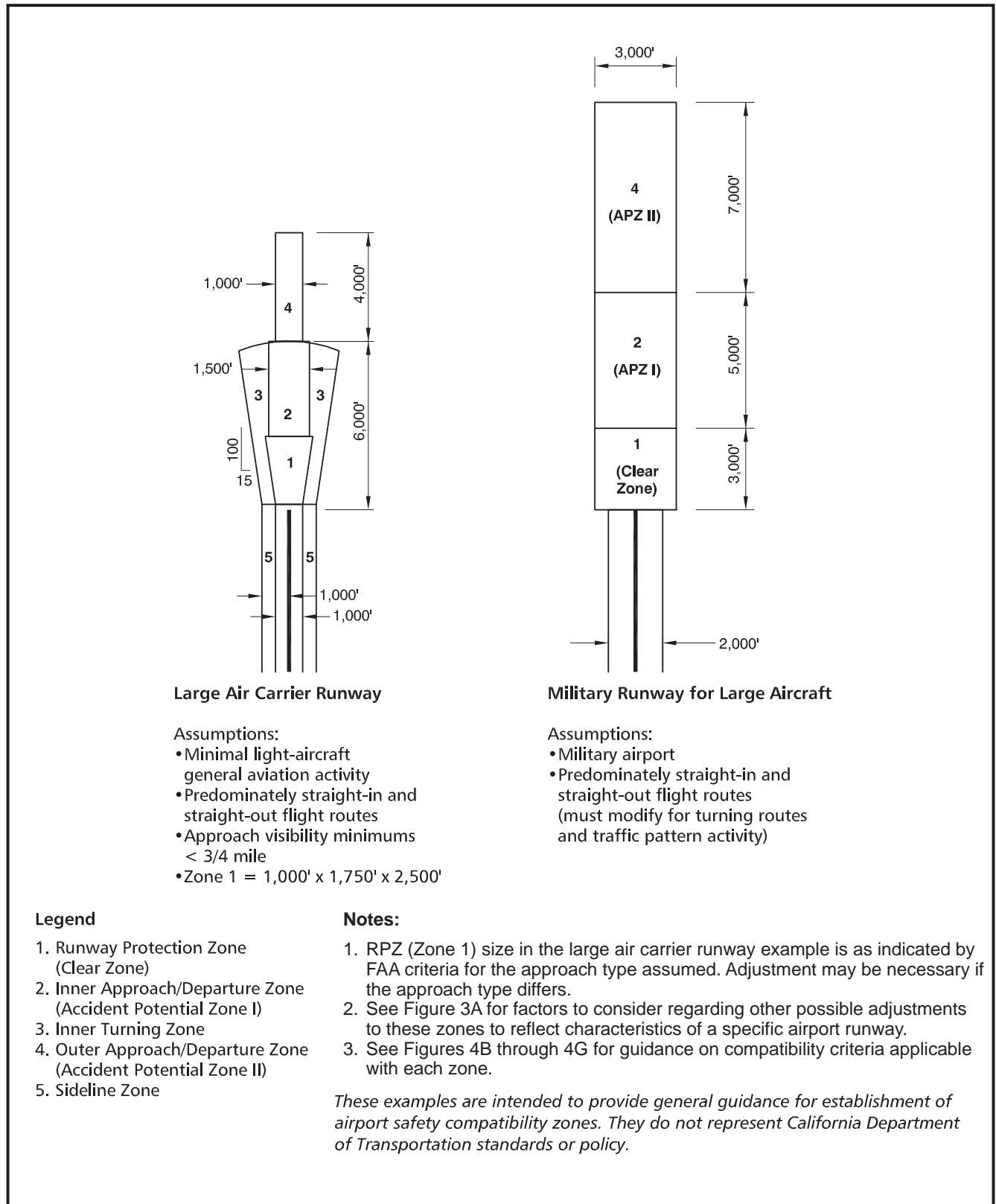


FIGURE 3B

## Safety Compatibility Zone Examples – Large Air Carrier and Military Runways

To bring this information into better focus, a series of tables examining the concerns associated with each of the six zones has been created for this edition of the *Handbook*. The tables, which also provide guidance regarding land use compatibility criteria for each zone, are included in Chapter 4.

### ***Adjusting Generic Safety Zones to Individual Airports***

The generic safety zones presented in the preceding section are intended just as a starting place for the development of zones appropriate for a particular airport. In some cases, the zones might be quite suitable as is. In most instances, however, some degree of adjustment of the generic zones is necessary in recognition of the physical and operational characteristics of the airport. This section provides guidance on factors to consider when applying and adjusting the generic zones to suit an individual airport.

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*An important concept to understand when adjusting safety zones to fit a particular airport is the interrelationship between the size of the zone and the criteria applicable within them. For example, to the extent that a decision is made to shrink the zones relative to the generic dimensions, then the risks in the remaining area can be assumed to be correspondingly higher unless the runway has very little use. The compatibility criteria should be more stringent as a result. Because attempting to adjust both variables at the same time can get confusing, the recommended approach is to begin by defining the safety zones, focusing on the aeronautical factors that affect their size and shape. The criteria can then be established and, once that is done, the zone boundaries can be fine tuned if necessary.*

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The first step in delineating safety zones for an individual airport is to decide which of the generic sets of zones is most applicable. Runway length is a primary consideration. However, if the length falls near the break point between two of the generic groups, it may be appropriate to define zones that are between the sizes of the two groups. The type of aircraft that use the runway can also be considered in this regard. For example, if a runway has little use by twin-engine or business jet aircraft (maybe another, longer, runway is available for these aircraft), then the smaller zones associated with the shorter runway length group may be appropriate. On the other hand, a short runway used by the more demanding types of aircraft may warrant starting with a larger set of safety zones.

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*It should be noted that the three runway length groupings are not a hard and fast rule—they were created for the convenience of the Handbook users. The total accident database was divided into three roughly equal groups with enough points in each to be statistically usable. If more data were available, smaller runway length increments could have been used. Also, a group could just as easily have been created encompassing runway lengths from 3,000 to 5,000 feet. See the discussion regarding adjusting the generic zones for individual runways for factors to consider when a runway length falls at a dividing point between the groups examined here.*

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Another basic adjustment that should be made is with regard to Zone 1. Its dimensions should match the size of the runway protection zone at each end of the runway regardless of the runway length. Next, adjustments need to be made at airports with multiple runways. In most cases, where zones from two runways overlap, the lower numbered zone should control. For example, if Zone 2 from one runway overlaps Zone 5 of another runway, the criteria for Zone 2 should be used.



Various other aeronautical factors that may warrant adjustments to the sizes or shapes of the generic zones are listed in Table 3A. Some of these factors relate to the configuration of the runways. Others are dictated by the way the runways are used.

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*A*mong the adjustment factors noted in Table 3A below are the peculiarities of the flight routes normally flown at a particular airport. While this factor is relevant and should be considered, it is also essential to recognize that the route followed by an aircraft when in distress may not be a normal route. Aircraft accidents can occur in places seldom overflown by aircraft.

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Several other factors deserve consideration when defining safety zones. These factors involve characteristics of the airport environs.

- ◆ **Airport Area Topography**—Characteristics of the terrain in the vicinity of an airport may need to be considered when setting safety compatibility zone boundaries. The presence of high terrain, the edge of a precipice, or other such features may influence the location of aircraft traffic patterns. Extension of safety zones may be justified in places where high terrain results in aircraft flying at a relatively low altitude above the ground. Also, some locations might have reduced levels of risk because they are effectively shielded by nearby higher terrain.
- ◆ **Locate Boundaries Based on Geographic Features**—Another manner in which safety zone shapes and sizes might be adjusted in response to existing urban development is to have the zone boundaries follow established geographic features. Such features might include, roads, water courses, parcel lines, etc. Such adjustments should be made in a manner that provides a level of safety equivalent to that afforded by the applicable generic safety compatibility zones. Though the advent of graphic information systems (GIS) perhaps makes this approach less necessary than in years past, basing zone boundaries on geographic features can still simplify implementation of an ALUCP, particularly one utilizing the composite zone method.

### **Guidelines for General Aviation Runways**

Figure 3A depicts basic guidelines for general aviation runway safety compatibility zones. Five variations are shown:

- ◆ General aviation runway with length of less than 4,000 feet and visibility minimums of 1 mile or visual approaches only;
- ◆ General aviation runway with length of 4,000 to 5,999 feet and instrument approach visibility minimums below 1 mile, but not lower than 3/4 mile;
- ◆ General aviation runway with length of 6,000 feet or more and a instrument approach visibility minimums below 3/4 mile;
- ◆ General aviation runway with traffic pattern on one side only; and
- ◆ General aviation runway with very-low activity levels (less than 2,000 takeoffs and landings projected per year at the runway end under consideration).

**TABLE 3A: SAFETY ZONE ADJUSTMENT FACTORS  
(AIRPORT OPERATIONAL VARIABLES)**

The generic sets of compatibility zones shown in Figures 3A and 3B may need to be adjusted to take into account various operational characteristics of a particular airport runway. Among these characteristics are the following:

- Instrument Approach Procedures—At least within the final two to three miles, which are of greatest interest for compatibility planning, the flight paths associated with precision instrument approach procedures are highly standardized. Other types of instrument approach procedures are less uniform, however. If such procedures are available at an airport, ALUCs should identify the flight paths associated with them and the extent to which they are used. Procedures that are regularly used should be taken into account in the configuration of safety zones (and in setting height limits for airspace protection). Types of procedures which may warrant special consideration include:
  - Circling Approaches: Most instrument approach procedures allow aircraft to circle to land at a different runway rather than continue straight-in to a landing on the runway for which the approach is primarily designed. When airports have straight-in approaches to multiple runway ends, circling approaches are seldom necessary. However, when only one straight-in approach procedure is available and the wind direction precludes landings on that runway, aircraft may be forced to circle to land on at another runway end. Pilots must maintain sight of the runway while circling, thus turns are typically tight. Also, the minimum circling altitude is often less than the traffic pattern altitude. At airports where circling approaches are common, giving consideration to the associated risks when setting safety zone boundaries is appropriate.
  - Non-Precision Approaches At Low Altitudes: Non-precision instrument approach procedures often involve aircraft descending to a lower altitude farther from the runway than occurs on either precision instrument or visual approaches. An altitude of 300 to 400 feet as much as two to three miles from the runway is not unusual. The safety (and noise) implications of such procedures need to be addressed at airports where they are in common use. (A need for corresponding restrictions on the heights of objects also exists along these routes.)
  - Non-Precision Approaches Not Aligned With The Runway: Some types of non-precision approaches bring aircraft toward the runway along a path that is not aligned with the runway. In many cases, these procedures merely enable the aircraft to reach the airport vicinity at which point they then proceed to land under visual conditions. In other instances, however, transition to the runway alignment occurs close to the runway and at a low altitude.
- Other Special Flight Procedures Or Limitations—Single-sided traffic patterns represent only one type of special flight procedure or limitation that may be established at some airports. Factors such as nearby airports, high terrain, or noise-sensitive land uses may affect the size of the airport traffic pattern or otherwise dictate where and at what altitude aircraft fly when using the airport. These procedures may need to be taken into account in the design of safety compatibility zones.
- Runway Use By Special-Purpose Aircraft—In addition to special flight procedures, certain special-purpose types of aircraft often have their own particular flight procedures. Most common among these aircraft are fire attack, agricultural, and military airplanes. Helicopters also typically have their own special flight routes. The existence of these procedures needs to be investigated and, where warranted by the levels of usage, may need to be considered in the shaping of safety zones.
- Small Aircraft Using Long Runways—When small airplanes take off from long runways (especially runways in excess of 8,000 feet length), it is common practice for them to turn toward their intended direction of flight before passing over the far end of the runway. When mishaps occur, the resulting pattern of accident sites will likely be more dispersed around the runway end than is the case with shorter runways. With short runways, accident sites tend to be more tightly clustered around the runway end and along the extended runway centerline because aircraft are still following the runway heading as they begin their climb.
- Runways Used Predominantly In One Direction—Most runways are used sometimes in one direction and, at other times, in the opposite direction depending upon the direction of the wind. Even when used predominantly in one direction, a busy runway may experience a significant number of operations in the opposite direction (for example, a runway with 100,000 total annual operations, 90% of which are in one direction, will still have 10,000 annual operations in the opposite direction). Thus, in most situations, the generic safety zones—which take into account both takeoffs and landings at a runway end—are applicable. However, when the number of either takeoffs or landings at a runway end is less than approximately 2,000 per year, adjustment of the safety compatibility zones to reflect those circumstances may be warranted.
- Displaced Landing Thresholds—A displaced threshold moves the landing location of aircraft down the runway from where they would land in the absence of the displacement. The distribution pattern of landing accident sites as shown in Appendix F would thus shift a corresponding amount. The pattern of accident locations for aircraft taking off toward that end of the runway does not necessarily shift, however. Whether the runway length behind the displaced threshold is usable for takeoffs toward that end of the runway is a key factor in this regard. The appropriateness of making adjustments to safety zone locations in response to the existence of a displaced threshold needs to be examined on a case-by-case basis. The numbers of landings at and takeoffs toward the runway end in question should be considered in making this determination.

### ***Runway Length and Approach Visibility Variables***

The primary variable among the general aviation runway safety zone examples shown in Figure 3A is the runway length. Additionally, different assumptions are made as to the approach visibility minimums for each runway length grouping. For purposes of illustration, longer runways are assumed to have better instrument approaches. Adjustments to the safety zones may be appropriate for runway ends having approaches that do not match the assumptions noted.

Table 3B provides supporting data for three of the general aviation airport safety compatibility zone examples, one in each runway length group. For each of the suggested zones, the table indicates the acreage of the zone and the percentage of arrival, departure, and total accidents which are encompassed within that zone. The capture rates—percentage of accidents divided by acreage—is listed as well.

### ***Single-Sided Traffic Pattern***

The single-sided traffic pattern example eliminates the turning zone on the non-pattern side of the runway. This configuration assumes that aircraft are less likely to crash in locations over which they normally do not fly. (Insufficient information is available in the general aviation accident database to better assess this operational configuration.) It is recognized, however, that the potential exists for aircraft to deviate to the non-pattern side on either takeoff or landing, especially under emergency conditions. Some amount of buffer is thus important to maintain. Note that the example shown is for a runway in the 4,000-to-5,999-foot length category. Similar safety zone configurations can be devised for other runway lengths.

### ***Low-Activity Runways***

The other operational variable that calls for adjustment of the compatibility zones is for runways where activity levels are currently very low and are forecasted to remain that way indefinitely. Clearly, the likelihood of an aircraft accident happening is reduced when operational volumes remain low. As suggested previously, this reduced risk could be reflected in compatibility policies either by adjusting the safety zones or by modifying the compatibility criteria. The low-activity runway diagram in Figure 3A still works on the basis that the size and shape of the zones are based on the spatial pattern of aircraft accidents, which are generally the same regardless of the number of operations. However, certain changes can be made when two things are considered: 1) with low activity airports, aircraft tend to fly straight in and out, rather than following a traffic pattern; and 2) because of this type activity, the probability of an accident in some locations drops to the point that land use restrictions are hard to justify, thus eliminating the need for a safety zone. Safety compatibility criteria are a reflection of the potential consequences of an accident and that potential does not change even if the activity is low. Furthermore, safety zone shapes and sizes can be more readily adjusted for a single low-activity runway at an otherwise busy airport. Modifying the compatibility criteria would require having different criteria for different runways. In either case, however, activity occurring on a runway, no matter how minor, must be accounted for.

**TABLE 3B: ANALYSIS OF SAFETY ZONE EXAMPLES  
(GENERAL AVIATION RUNWAYS)**

Safety Zone	Example 1: Runway Length Less than 4,000 Feet			Example 2: Runway Length 4,000 to 5,999 Feet			Example 3: Runway Length 6,000 Feet or More		
	% of Points	Acres	% / Acre	% of Points	Acres	% / Acres	% of Points	Acres	% / Acres
<b>Arrival Accident Sites</b>									
Primary Surface	29%	-	-	2%	-	-	11%	-	-
Zone 1: Runway Protection Zone	27%	8	3.35	26%	49	0.53	25%	79	0.32
Zone 2: Inner Approach/Departure Zone	15%	44	0.34	9%	101	0.09	12%	114	0.11
Zone 3: Inner Turning Zone	2%	50	0.04	5%	151	0.04	6%	131	0.05
Zone 4: Outer Approach/Departure Zone	3%	35	0.07	5%	69	0.08	8%	92	0.09
Zone 5: Sideline Zone	1%	-	-	3%	-	-	1%	-	-
Zone 6: Traffic Pattern Zone	10%	-	-	11%	-	-	21%	-	-
Total: Zones 1-6 + Primary Surface	87%	-	-	79%	-	-	85%	-	-
<b>Departure Accident Sites</b>									
Primary Surface	9%	-	-	9%	-	-	16%	-	-
Zone 1: Runway Protection Zone	17%	8	2.09	14%	49	0.28	13%	79	0.17
Zone 2: Inner Approach/Departure Zone	28%	44	0.63	11%	101	0.11	3%	114	0.02
Zone 3: Inner Turning Zone	5%	50	0.10	9%	151	0.06	8%	131	0.06
Zone 4: Outer Approach/Departure Zone	2%	35	0.06	4%	69	0.06	3%	92	0.03
Zone 5: Sideline Zone	8%	-	-	8%	-	-	5%	-	-
Zone 6: Traffic Pattern Zone	24%	-	-	37%	-	-	39%	-	-
Total: Zones 1-6 + Primary Surface	94%	-	-	91%	-	-	86%	-	-
<b>All Accident Sites</b>									
Primary Surface	18%	-	-	15%	-	-	13%	-	-
Zone 1: Runway Protection Zone	21%	8	2.65	21%	49	0.40	20%	79	0.26
Zone 2: Inner Approach/Departure Zone	22%	44	0.50	10%	101	0.10	8%	114	0.07
Zone 3: Inner Turning Zone	4%	50	0.08	7%	151	0.05	7%	131	0.05
Zone 4: Outer Approach/Departure Zone	2%	35	0.07	5%	69	0.07	6%	92	0.07
Zone 5: Sideline Zone	5%	-	-	5%	-	-	3%	-	-
Zone 6: Traffic Pattern Zone	18%	-	-	23%	-	-	29%	-	-
Total: Zones 1-6 + Primary Surface	91%	-	-	85%	-	-	85%	-	-

**Notes:**

Totals may not equal the sum of the numbers above because of mathematical rounding.

See Figure 3A for the shapes and dimensions of each zone.

Accident site locations as indicated in expanded general aviation aircraft accident database (see Appendix E).

Obvious questions posed by the idea of modifying safety zones for low-activity runways are:

- ◆ How low must the activity level continue to be for the runway to be considered low activity?
- ◆ How much can the safety zones be adjusted in response to the low activity?

In each case, the answer is a relative one. The assumption employed in the example here is that the runway end under consideration has fewer than 2,000 total takeoffs and landings projected annually (roughly 6 operations per day). Less modification is justified when the activity is higher. Beyond about 10,000 annual operations, the basic safety zone configuration should be applied.

The other factor is that locations close to the runway remain critical even when the activity is low, particularly if the development has more than low density uses. FAA criteria for runway protection zones, for example, do not depend upon aircraft operations volumes, only the types of approach the runway has and the type of aircraft it accommodates. Thus, depending upon where the common flight tracks are located, it is the outer safety zone and/or the turning zone which can most reasonably be modified. In defining safety zones for low-activity runways, special consideration also needs to be given to the mix of aircraft and the existence of any common but unusual flight tracks. Runways used primarily by agricultural aircraft are a prime example of such situations. Safety zones for low-activity runways that are sometimes used by large aircraft also need to be carefully evaluated.

### ***Guidelines for Large Air Carrier Runways***

There are numerous factors that distinguish the risks associated with runways predominantly used by commercial air carrier aircraft in passenger service from those used for general aviation purposes:

- ◆ Commercial air carrier aircraft are flown by professional pilots;
- ◆ Commercial air carrier aircraft pilots are instrument rated;
- ◆ Commercial air carrier aircraft pilots are more experienced and fly more frequently;
- ◆ Typically, there are at least two pilots in the cockpit;
- ◆ Many flights are conducted under the more restrictive requirements of FAR Part 121, 135, etc.;
- ◆ The majority of flights are conducted under instrument flight plans, even when weather does not require it;
- ◆ The vast majority of aircraft have multiple engines and can remain airborne following the loss of one engine;
- ◆ Aircraft maintenance programs are monitored by the FAA ;
- ◆ Aircraft are much newer on average than small aircraft in the general aviation fleet; and
- ◆ Essentially all of these airports have electronic landing aids.

All of these factors support the very low frequency of commercial aviation accidents. At air carrier airports, noise tends to be such a dominant consideration that safety is seldom discussed. However, the consequences of an off-airport air carrier accident are potentially devastating. For compatibility planning purposes, defining realistic safety criteria is complicated by the fact that many busy air carrier airports were established decades ago and are now surrounded by higher densities of urban development.

The accident database relied upon in defining safety zone guidelines for general aviation airports contain data only on general aviation aircraft accidents. Equivalent data for air carrier accidents is comparatively scant. Data in Appendix E shows the location pattern for some three dozen near-airport commercial aircraft accidents. A British study also cited in Appendix E includes additional data, but it is not formatted in a manner showing the overall scatter pattern (data along and lateral to the extended runway centerline are separately summarized).

Both studies portray similar results. The highest concentration of accidents sites are within approximately 1,500 feet of the runway end, but significant numbers occur within an area extending about two miles beyond the runway end. Most of the sites are directly along the runway centerline and the majority of the remainder are within 1,000 feet of the centerline.

This data provides the basis for the safety zones for large air carrier runways depicted in Figure 3B. These zones assume minimal activity by light general aviation aircraft. The example shown also assumes that the runway length is 8,000 feet or more and that essentially all flights are flown straight in and out along the extended runway centerline. To the extent that any of these assumptions do not strictly apply to a specific airport, modification of the indicated zones should be considered.

As for the criteria applicable within these zones, the presence of large aircraft might argue for greater stringency. That is, the potential consequences of an air carrier aircraft accident are much greater than they are for small, general aviation aircraft, thus land uses should be more restricted. However, this risk factor is largely offset by the significantly lower frequency of accidents by airline aircraft. Also, the most at-risk locations can be protected by making the most restricted zones relatively large as shown in Figure 3B.

#### ***Guidelines for Military Runways***

Guidelines set forth by the U.S. Department of Defense as part of its AICUZ program are the appropriate starting point for safety compatibility policies for military airport runways. For the U.S. Air Force (USAF), Air Force Instruction (AFI) 32-7063 provides implementing procedures for AICUZ preparation for USAF installations, while OpNav Instruction 11010.36C sets forth AICUZ instructions for naval installations. The federal government has prepared individual AICUZ plans for all major military airports.

The AICUZ -recommended APZs are illustrated in Figure 3B. The depicted zones assume that flight tracks are straight-in and straight-out. ALUCP preparers should coordinate with military staff to determine if different or additional tracks are used on a regular basis, and if so, determine whether the APZs should be modified or expanded. Consideration may also need to

be given to providing safety zones lateral to the runway if these areas are not fully contained within the boundaries of the military facility.

The safety compatibility criteria suggested in AICUZ guidelines tend to represent *minimum standards* (more so with respect to noise than safety). Also, the criteria are formatted using a detailed listing of land uses types. ALUCs may choose to use the AICUZ guidelines directly. Alternatively, the safety compatibility guidelines indicated in this *Handbook* may be appropriate, particularly where the ALUC utilizes this format for safety compatibility criteria at other airports within its jurisdiction. In either case, the specific criteria should be reviewed and revised as necessary to fit the operational characteristics of the specific airfield and the land use characteristics of the surrounding area. Moreover, PUC Section 21675 (b) requires that the ALUC adopt an ALUCP that is "consistent with the safety and noise standards in the [AICUZ] prepared for that military airport." For additional guidance on collaboration between ALUCs, local jurisdictions, and military leadership for the purposes of compatibility planning, see the *California Advisory Handbook for Community and Military Compatibility Planning*, which is published by the Governor's Office of Planning and Research (OPR).

### **Guidelines for Heliports**

Very little information is available upon which to base safety compatibility guidelines for heliports. No useful compilation of data on the location of helicopter accidents in the proximity of heliports is known to exist. The only significant policy guidance is contained in the FAA *Heliport Design* Advisory Circular (AC 150/5390-2B), issued on September 30, 2004. The primary concerns of that document are with respect to the design of the touchdown and liftoff pad itself and requirements for obstruction free approach/departure paths.

The one additional FAA safety -related guideline—described as applicable only to public-use facilities—is for creation of heliport protection zones. These zones, equivalent to runway protection zones at airports, extend 280 feet from the edge of the final approach and takeoff area. As with runway protection zones, the helipad protection zone should be clear of incompatible objects and any land uses involving a congregation of people.

Establishment of heliport protection zones is a desirable safety -compatibility objective for all heliports. There are practical limitations to doing so, however. One is that, even when approach/departure routes are formally defined and approved, the highly maneuverable capabilities of helicopters means that their actual routes may differ. The other is that, except for facilities on an airport, the heliport protection zone is likely to extend onto adjacent property.

To the extent that is practical, buildings (particularly ones higher than the heliport itself) and congregations of people should be avoided within helipad protection zones. Once a heliport is established, the facility owner, local land use jurisdictions, and ALUC should take action to preserve compatible uses in the heliport protection zones and, even more critically, to prevent obstructions to the approach/departure surfaces.

### ***Guidelines for Private Airports***

Since personal use airports are not subject to the *Handbook*, responsibility for airport land use compatibility planning falls to local government. When preparing general or specific plans, local governments should consider potential safety issues with regards to development near existing personal use airports, and deliberate on, at a minimum, the safety guidance appropriate for the environment in which the airport is located (as outlined in Chapter 4 of this *Handbook*).

### **3.2.4 Airspace Protection**

Relatively few aircraft accidents are caused by land use conditions that are hazards to flight. The potential exists, however, and protecting against it is essential to airport land use safety compatibility.

#### ***Airspace Protection Policy Foundations***

##### ***FAA Guidance***

##### **FAR Part 77 Airspace Surfaces**

To help ensure protection of the airspace essential to the safe operation of aircraft at and around airports, the FAA has established a process that requires project sponsors to inform the agency about proposed construction that could affect navigable airspace. The standards by which the FAA conducts these aeronautical studies are set forth in FAR Part 77, Objects Affecting Navigable Airspace. Specifically, FAR Part 77 establishes standards for:

- ◆ **FAA Notification.** Notifying the FAA about any proposed construction or alteration of objects—whether permanent, temporary, or of natural growth—that could be a hazard to flight;
- ◆ **Imaginary Surfaces.** Defining an airport’s airspace, referred to as ‘imaginary surfaces’; and
- ◆ **Aeronautical Studies.** Determining obstructions to navigable airspace and the potential hazardous effects of such obstructions on the safe and efficient use of that airspace.

##### ***Limits on Federal Authority under FAR Part 77***

The FAA’s authority to protect the navigable airspace from obstructions and other hazards, including existing and proposed structures, is predominantly derived from Title 49 U.S.C. Section 44718. However, Section 44718 does not provide specific authority for the FAA to regulate or control of off-airport real property. Nevertheless, the FAA does have authority to require that sponsors of new objects that could be airspace obstructions submit notice to the agency prior to the construction as outlined below. Persons failing to comply with the provisions of FAR Part 77 are subject to civil penalty under Section 902 of the Federal Aviation Act of 1958, as amended and pursuant to 49 U.S.C. Section 46301(a).

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***P*** *Primary responsibility for preventing hazardous obstructions to airport airspace rests with state and local governments and the airport operator.*

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If new airspace obstructions are created or, as may happen with the growth of trees or other vegetation, are newly identified, federal action is primarily limited to three possibilities:

- ◆ **Reduced Instrument Approach Minimums.** For airports with instrument approaches, an obstruction could necessitate modification to one or more of the approach procedures (particularly greater visibility and/or cloud ceiling minimums) or even require elimination of an approach procedure.
- ◆ **Reduced Runway Length.** Airfield changes, such as displacement of a landing threshold, could be required (especially at airports certificated for commercial air carrier service).
- ◆ **Reduced Federal Aid.** The owner of an airport could be found in noncompliance with the conditions agreed to upon receipt of FAA grant assurances, airport development or property acquisition grant funds and could become ineligible for future grants (or, in extreme cases, be required to repay part of a previous grant).

### **FAA Notification**

Subpart B, Notice of Construction or Alteration, of the regulations requires that the FAA be notified of any proposed construction or alteration of objects within 20,000 feet of a runway and having a height that would exceed a 100:1 imaginary surface (1 foot upward per 100 feet horizontally) beginning at the nearest point of the runway. This requirement applies to runways more than 3,200 feet in length; for shorter runways, the notification surface has a 50:1 slope and extends 10,000 feet from the runway; for heliports, the notification surface has a 25:1 slope and extends 5,000 feet from takeoff and landing area, also referred to as the FATO. Notification is required with regard to any public-use or military airport and heliport.

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*Note that these notification surfaces have a much shallower slope and extend farther from the runway than the obstruction surfaces defined by Subpart C of the regulations typically shown in an airspace plan as described below.*

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Also requiring notification is any proposed object more than 200 feet in height regardless of proximity to an airport.

Exceptions to the notification requirement are allowed for “any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded would not adversely affect safety in air navigation.”

When determining the height of structures, it is important to consider all of their components, including elevator shafts, flag poles, and antennas that would extend above the roof level. Furthermore, proposed objects do not need to be permanent to require submittal of a notification. Notice also must be provided for temporary objects such as construction cranes. Such objects are critically important to airspace protection in that they often are taller than the ultimate height of the structure. Mobile objects on roads must be taken into account as well. To allow for vehicles, 17 feet must be added to the road elevation of Interstate highways, 15 feet

added for other public roadways, and 10 feet to private roads. A 23-foot clearance over railroad lines is required.

The notification is to be provided using FAA Form 7460-1, Notice of Proposed Construction or Alteration. The notice can be submitted on-line (see Appendix B for on-line submittal procedures of Form 7460). Receipt of the notice enables the FAA to evaluate the effect of the proposed object on air navigation and chart the object or take other appropriate action to ensure continued safety. There is no cost associated with the filing.

#### ***FAR Part 77 Surfaces for Compatibility Planning***

Subpart C, *Obstruction Standards*, of FAR Part 77 establishes the standards for determining obstructions to air navigation. This subpart defines a set of imaginary surfaces that differ from those used for FAA notification. The imaginary surfaces are established with relation to an airport and each runway. The slope and dimension of each imaginary surface is based on the type of approach available or planned for each runway (e.g., visual, nonprecision, precision). The imaginary surfaces extend to about two to three statute miles around airport runways and approximately 9.5 statute miles from the ends of runways having a precision instrument approach. The five types of imaginary surfaces for civil airports are:

- ◆ **Primary Surface.** The primary surface is longitudinally centered on a runway and has the same elevation as the elevation of the nearest point on the runway centerline. When the runway has a prepared hard surface, the primary surface extends 200 feet beyond each end of that runway. The width of the primary surface ranges from 250 to 1,000 feet depending on the existing or planned approach and runway type. The primary surface must be clear of all obstructions except those fixed by their function, such as runway edge lights, navigational aids, or airport signage. The majority of the primary surface is controlled by runway safety area criteria contained in FAA Advisory Circular 150/5300-13, *Airport Design*, and almost always lies within airport-controlled property.
- ◆ **Approach Surface.** The approach surface is longitudinally centered on the extended runway centerline and extends outward and upward from the end of the primary surface. The slope of the approach surface is based upon the type of approach available or planned for each runway: 20:1 (visual), 34:1 (nonprecision), or 50:1 (precision). The length of the approach surface varies from 5,000 to 50,000 feet depending on the approach type.
- ◆ **Transitional Surface.** The transitional surface extends outward and upward at right angles to the runway centerline and extends at a slope of 7 feet horizontally for each one-foot vertically (7:1) from the sides of the primary and approach surfaces. The transitional surfaces extend to the point at which they intercept the horizontal surface at a height of 150 feet above the established airport elevation (i.e., highest runway end elevation).
- ◆ **Horizontal Surface.** The horizontal surface is a horizontal plane located 150 feet above the established airport elevation and encompasses an area from the transitional surface to the conical surface.
- ◆ **Conical Surface.** The conical surface extends upward and outward from the periphery of the horizontal surface at a slope of 20 feet horizontally for every one-foot vertically (20:1) for a horizontal distance of 4,000 feet. Height limits for the surface range from 150 feet above the airport elevation at the inner edge to 350 feet at the outer edge.

Similar, but different airspace surfaces apply to military airports. The dimensions differ and there are two additional surfaces: a clear zone surface and an outer horizontal surface. The latter extends to a horizontal distance of 30,000 feet from the runway ends.

By definition, any object that penetrates one of the imaginary surfaces is deemed an obstruction to air navigation. However, not all obstructions are necessarily hazards. The determination of whether an object would be a hazard to air navigation is made as part of an aeronautical study conducted by the FAA as described above. See Figure 3C for FAR Part 77 Imaginary Surfaces for civilian airports.

### ***FAA Aeronautical Studies***

When the FAA receives a Notice of Proposed Construction (Form 7460-1) submitted in accordance with Subpart B requirements, Subpart D dictates that the FAA conduct an aeronautical study of the proposal. Accordingly, the FAA disseminates the information to different divisions within the agency. Each division specializes in different FAA regulations and orders and provides comments within their own expertise.

“In the aeronautical studies, present and future IFR and VFR aeronautical operations and procedures are reviewed and any possible changes in those operations and procedures and in the construction proposal that would eliminate or alleviate the conflicting demands are ascertained.”

The regulations do not specify a time limit for the FAA to complete an aeronautical study, but a typical turn-around time is 30 to 45 days. If the FAA requests additional information, the applicant will have a period of time (normally 30 days) to provide the requested data. Failure to provide the requested information will result in a termination of the study and the need to re-apply.

After the FAA completes its aeronautical study of the proposed construction, it usually issues a letter indicating its determination as to whether the specific proposal studied would be a hazard to air navigation. The letter determinations include:

- ◆ **Determination of No Hazard (DNH).** The study did not reveal any substantial adverse effect and can proceed on that basis. For example, if the object is shielded by other taller objects or is located away from the normal traffic patterns and instrument approach routes, the outcome in most cases will be a “Determination of No Hazard” even if the object is technically an obstruction. As a condition for non-objection, the FAA may recommend that the object be marked and lighted in accordance with FAA standards. The letter may include optional information such as the basis from which the conclusion was made, identification of obstruction standards exceeded, cautionary aeronautical/operational impacts (e.g., to VFR operations, traffic patterns, etc.), valid aeronautical comments received during circulation/review, marking/lighting requirements, petition deadlines, etc.
- ◆ **Notice of Presumed Hazard (NPH).** Indicates the proposed structure exceeds obstruction standards and/or will have an adverse effect on navigable airspace. The goal of the notice is to allow the sponsor an opportunity to amend the proposal to avoid the impact. The FAA will work with the sponsor to seek modification to eliminate the problem. Adjustments to aviation requirements that would accommodate the proposed object are investigated as well. These letters normally require a response within 60 days of issuance. Once the deadline

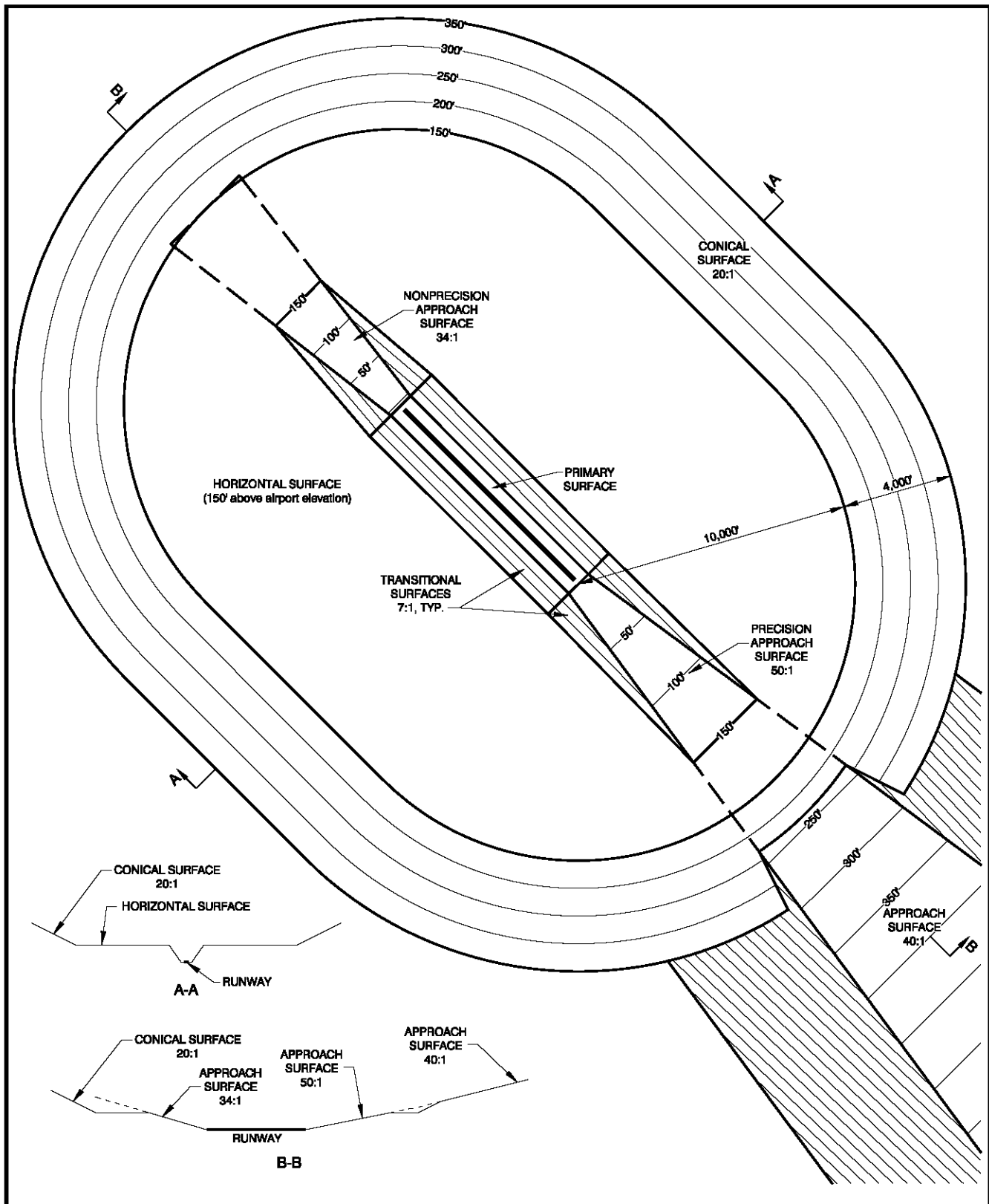


FIGURE 3C

## Example of Civil Airport Airspace Protection Surfaces – FAR Part 77

passes, the FAA assumes the project has been terminated. No further action will be taken unless the sponsor submits a new 7460 submission to restart the process. Alternatively, a written response from the sponsor before the deadline will result in either a new determination (e.g., DNH) or will require the FAA to undertake further study to determine adverse impacts.

- ◆ **Determination of Hazard (DOH).** This letter indicates that substantial adverse impact could not be eliminated during the negotiation period following the NPH and the affected aeronautical operations cannot be adjusted to accommodate the structure without substantial adverse effect. Even under these circumstances, however, the determination is advisory and the FAA has no authority to prevent construction of the object. Federal action in response to new airspace obstructions is primarily limited to the three possibilities noted above under the section entitled “Limits on Federal Authority under FAR Part 77.”

Unless otherwise specified in the letter, DNH determinations are valid for a period of 18 months from the issue date, while DOH determinations have no expiration date. The letter will normally include a petition deadline 30 days following the issue/effective date. Unless a valid petition is filed, the determination becomes final 40 days following the issue/effective date.

In the broader context of compatibility planning, the significance and limitations of FAA aeronautical study determinations are essential to recognize. These studies only address airspace issues. Due to the FAA’s limited authority on matters related to local land use decisions, a DNH by the FAA does not equate to compatibility with an adopted ALUCP. The FAA’s jurisdiction, insofar as it relates to local land use regulations, is limited to authority over airspace and environs within the Runway Protection Zone (as long as it’s within the confines of airport property). Should the FAA find that a proposed land use presents no hazard to air navigation, it may still warrant ALUC review, particularly if the proposed land use was not already evaluated during the update to a general or specific plan (and thereby found to be consistent by the ALUC during that process). Compatibility with regard to noise, the density or intensity of the land use, and other factors also must be considered in the local decision. Height of the structure and its affect on airspace is only one part of the puzzle. In other words, an FAA DNH is not a determination that no airport land use compatibility issues exist, and an ALUC may find a project incompatible for other reasons, regardless of the issuance of a DNH.

### ***Other FAA Airspace Surfaces***

In addition to the FAR Part 77 surfaces, there are other airspace surfaces that are evaluated by the FAA for obstructions. Three of these surfaces are worth mentioning since they may contribute to the height limitations near airports with instrument approaches and/or air carrier operations.

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***T**erminal Instrument Procedures are the navigational procedures used by aircraft to find, land, or depart an airport. The instrument flight procedures are predicated upon the specifications stated in TERPS and, when used, are intended to keep aircraft within the allocated airspace.*

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- ◆ **TERPS Clearance Surfaces.** The United States Standard for Terminal Instrument Procedures (TERPS), as described in FAA Order 8260.3B, June 2009, establishes clearance requirements for all en route and terminal (airport) instrument procedures including

approach, landing, missed approach, and departure. The TERPS clearance surfaces exactly match the instrument procedures in effect at an individual airport. Unlike FAR Part 77 surfaces, the elevations of which are set relative to the runway end elevations irrespective of surrounding terrain and obstacles, the TERPS surface elevations are directly determined by the location and elevation of critical obstacles. By design, neither the ground nor any obstacles can penetrate a TERPS surface.

TERPS surfaces utilize what is known as ‘required obstacle clearance (ROC)’ bands for all flight segments of the instrument procedure. Placing the bottom surface of the ROC band on top of the highest obstacle within a segment yields the minimum altitude for that segment. When an obstruction penetrates a TERPS clearance surface, the ROC is maintained by raising the minimum altitude for that segment and adjusting the adjacent flight segments. In terms of instrument flight procedures, a penetration of a TERPS clearance surface is considered a hazard to flight and can dictate that minimum flight visibility and altitudes be raised or the instrument course be realigned. In severe instances, obstructions can force a procedure to be cancelled altogether. These consequences reduce the operating utility of the airport.

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***R**epresentative Example: Required Obstacle Clearance (ROC)—The minimum measure of obstacle clearance considered by the FAA to supply a satisfactory level of vertical protection.*

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- ◆ **Departure Surface for Instrument Runways.** This surface is applied to runways with an instrument approach and is defined in FAA Advisory Circular 150/5300-13, Change 15, Appendix 2. This surface has a slope of 40:1 starting from the departure end of the runway with corresponding dimensions of 1,000 feet inner width, 6,466 feet outer width, 10,200 feet in length. Objects penetrating this surface may affect departure procedures, just as approach procedures can be affected by these same penetrations.
- ◆ **One-Engine Inoperative (OEI) Obstacle Identification Surface.** For runways and airports that support air carrier operations, FAA Advisory Circular 150/5300-13, Change 15, Appendix 2 recommends identifying objects that would penetrate this departure surface. The OEI surface starts at the same elevation as the departure end of the runway and slopes upward at 1 foot vertically to 62.5 feet horizontally (62.5:1). The inner width of the OEI surface is 600 feet, the outer width is 12,000 feet, and the surface extends for a distance of 50,000 feet along the extended runway centerline. This area is much larger than the surfaces provided for in FAR Part 77 and TERPS making it difficult to coordinate the potential impacts to airspace and airport operations should an obstruction exist.

The OEI surface developed by the FAA is intended to encompass and provide protection for all the possible variations of the specific OEI surfaces developed by air carrier operators. Under FAR Part 25, every air carrier operator of transport category airplanes is required to have an OEI surface in place for each airport it serves. The OEI surface sets the maximum departure weights for air carrier aircraft. The OEI surface is unique to each operator, aircraft type and airport served. The air carrier-specific OEI surfaces are typically narrower than the FAA’s standard OEI surface and/or have slight turning procedures.

Although the FAA has no direct role in protecting the OEI surface from obstructions, the protection of the OEI airspace can be critical to preserving the viability of commercial air service at airports and should be considered when evaluating land use compatibility impacts near airports. That is, data regarding penetrations to this surface are provided for information and use by the air carrier s operating from the airport.

The importance of maintaining these surfaces clear of obstructions is critical to protecting navigable airspace and preserving the utility of an airport. These surfaces are typically more controlling or restrictive in terms of limiting heights of objects than the FAR Part 77 obstruction surfaces. However, a significant downside of using these surfaces for compatibility planning purposes is that they are highly complex compared to the relative simplicity of FAR Part 77 obstruction surfaces. Also, the configuration and/or elevations of these surfaces can change not only in response to new obstacles, but as implementation of new navigational technologies permit additional or modified instrument procedures to be established at an airport.

### ***Other Federal Airspace Protection Guidance***

Additional guidelines regarding protection of airport airspace are set forth in other FAA documents. In general, these criteria specify that no use of land or water anywhere within the boundaries encompassed by FAR Part 77 should be allowed if it could endanger or interfere with the landing, take off, or maneuvering of an aircraft at an airport (FAA–1987). Specific characteristics to be avoided include:

- ◆ Creation of electrical interference with navigational signals or radio communication between the airport and aircraft ;
- ◆ Lighting which is difficult to distinguish from airport lighting;
- ◆ Glare in the eyes of pilots using the airport;
- ◆ Smoke or other impairments to visibility in the airport vicinity; and
- ◆ Uses which attract birds and create bird strike hazards.

Bird strike and other forms of wildlife hazard have become a major concern internationally. In the United States and Canada, reduction and management of wildlife hazards are of particular concern. With regard to bird strike hazards, the FAA specifically considers waste disposal sites (sanitary landfills) to be incompatible land uses if located within 10,000 feet of a runway used by turbine-powered aircraft or 5,000 feet of other runways. Any waste disposal site located within five statute miles of an airport is also deemed incompatible if it results in a hazardous movement of birds across a runway or aircraft approach and departure paths. Caution should be exercised with regard to certain other land uses—including golf courses and some agricultural crops—in these locations to ensure that wildlife hazards do not result (FAA–1997). (Additional guidance on the issue of hazardous wildlife can be found in the FAA’s Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*.)

Furthermore, federal statutes (49 U.S.C. §44718(d)) now prohibit new “municipal solid waste landfills” within six miles of airports that: (1) receive FAA grants, and (2) primarily serve general aviation aircraft and scheduled air carrier operations using aircraft with less than 60 passenger seats. A landfill can only be built within six miles of this class of airports if the FAA concludes that it would have no adverse effect on aviation safety (FAA–2000b).

***State of California***

The State Aeronautics Act (PUC Section 21001 et seq.) provides for the right of flight over private property, unless conducted in a dangerous manner or at altitudes below those prescribed by federal authority (PUC Section 21403(a)). No use shall be made of the airspace above a property which would interfere with the right of flight, including established approaches to a runway (PUC Section 21402). The Act also authorizes Caltrans and local governments to protect the airspace defined by FAR Part 77. The Act prohibits any person from constructing any structure or permitting any natural growth of a height which would constitute a hazard to air navigation as defined in FAR Part 77 unless Caltrans first issues a permit (PUC Section 21659). The permit is not required if the FAA has determined that the structure or growth does not constitute a hazard to air navigation or would not create an unsafe condition for air navigation. Typically this has been interpreted to mean that no penetrations of the FAR Part 77 imaginary surfaces is permitted without a finding by the FAA that the object would not constitute a hazard to air navigation.

Furthermore, no payments shall be made from the Aeronautics Account for expenditure on any airport or for the acquisition or development of any airport, if the department determines that the height restrictions around the airport are inadequate to provide reasonable assurance that the landing and taking off of aircraft at the airport will be conducted without obstruction or will be otherwise free from hazards (PUC Section 21688).

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*Note that other parts of state law— the Government Code and Public Resources Code, in particular— establish various requirements for compatibility planning and the review of development near airports, but do not set specific compatibility criteria .*

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**3.3 COMPATIBILITY CRITERIA TABLES AND MAPS**

Understanding the regulatory background and the means by which the four compatibility concerns can be measured and depicted is one part of the compatibility planning process. The other piece of the puzzle is to relate these strategies to a specific airport environment; both geographically and for various categories of land uses. This is done by means of a compatibility criteria table or tables— although sometimes a list or outline format is used—together with one or more compatibility zone maps.

- ◆ **Tables**—Compatibility criteria tables provide the measures by which land use categories can be evaluated for compatibility with the airport impacts identified for various portions of the airport environs.
- ◆ **Maps**—Compatibility maps show where the various criteria geographically apply within the airport environs. Generally, the maps divide the airport environs into a series of zones in which a progressively greater degree of land use restrictions apply the closer the zone is to the airport.



### 3.3.1 Compatibility Criteria Table and Map Formats

Three basically distinct table and map formats have evolved among the ALUCPs adopted by ALUCs in California. As with many other facets of compatibility planning, there are advantages and disadvantages to each choice with none being clearly the best.

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**A**ll of these formats are acceptable options for ALUCPs.

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#### **Separate Criteria Tables and Maps**

The traditional approach to compatibility criteria tables and maps is to have separate sets for each type of impact. For noise, the table indicates whether each land use classification is or is not acceptable within various ranges of noise exposure as measured on the CNEL scale. For safety, the relationship is between each land use category and the degree of accident risk at locations around the airport. An airspace protection map indicates the allowable heights of objects near the airport. Finally, overflight concerns can be addressed by a map showing where any associated compatibility policies apply.

- ♦ **Advantages**—The chief advantage to this approach is that the relationships between the noise and safety concerns and the associated criteria are relatively obvious. For example, at a minimum, residences should not be exposed to noise levels above 65 CNEL and schools and shopping centers should not be situated in a RPZ.

A second advantage is that the resulting large number of zones (because noise and safety each have their own set of zones and airspace protection is also separately considered) gives greater flexibility in adjusting the compatibility criteria to suit the circumstances. This flexibility can be particularly important in urban areas where site design and other specific features of the development can become critical to determining the compatibility of a proposed land use.

- ♦ **Disadvantages**—The disadvantages involve ease of use and occasional confusion in application. Although technically sound, the use of separate criteria and maps can be more complicated and require greater understanding of compatibility concepts. For any given land use classification or individual development proposal to be evaluated, it must be checked against multiple sets of criteria tables and maps—noise, safety, and overflight impacts—as well as a map of protected airspace. For a given location, one type of land use may be acceptable with respect to noise, but not for safety; another use may be just the opposite; and, taken together, most forms of urban land use development may sometimes appear to be ruled out.

#### **Composite Criteria Table and Map**

A different and equally common approach is one that simplifies compatibility assessments by condensing the various factors down to a single set of criteria presented in one table and one map for each airport. The map defines a small number of these discrete zones—preferably no more than five or six—which represent locations with similar *combinations* of noise, safety hazard, and overflight exposure. Airspace protection criteria can sometimes be included as well.

An example of such zones might combine the various factors as follows:

Zone	Location / Compatibility Factors
A	<ul style="list-style-type: none"> <li>◆ Runway primary surface and runway protection zones</li> </ul>
B1	<ul style="list-style-type: none"> <li>◆ Inner segment of runway approaches</li> <li>◆ High noise levels; high safety concerns</li> <li>◆ Low-altitude aircraft overflight</li> <li>◆ Height limits as little as 50 feet</li> </ul>
B2	<ul style="list-style-type: none"> <li>◆ Adjacent to runway</li> <li>◆ High noise ; moderate safety concerns</li> <li>◆ Normally no overflights</li> <li>◆ Transitional surface height limit restrictions</li> </ul>
C1	<ul style="list-style-type: none"> <li>◆ Outer portion of runway approach routes, particularly instrument approaches</li> <li>◆ Moderate noise ; moderate safety concerns</li> <li>◆ Overflight at less than normal traffic pattern altitude</li> </ul>
C2	<ul style="list-style-type: none"> <li>◆ Remainder of common traffic patterns</li> <li>◆ Overflight at traffic pattern altitude</li> <li>◆ Potential overflight annoyance concerns</li> </ul>
D	<ul style="list-style-type: none"> <li>◆ Less frequent overflights</li> <li>◆ Remainder of airspace protection surfaces</li> </ul>

- ◆ **Advantages**—One advantage to the composite approach is that it allows most land uses to be evaluated with quick reference to a single table and map. More significantly, though, is that it allows more flexibility in the mapping of compatibility zones (as compared to the separate criteria and map format that offers higher flexibility in defining the compatibility criteria ). As discussed later in this chapter, generic boundaries can be drawn for a limited number of airport classes. These boundaries can then be applied to all similar airports in the ALUC ’s jurisdiction and adjusted as necessary to reflect atypical airport operational characteristics, local geographic boundaries, and established land uses.
- ◆ **Disadvantages**—The major disadvantage to combining compatibility criteria into a single table and map is that the basis for location of the zone boundaries is not always clear. In locations where substantial development may be planned, local planners, property owners, and developers will want to know the specific reasons for any restrictions on property. If more detailed assessment of a complex land use development proposal is necessary, reference to separate noise and safety compatibility tables and maps is often still required.

#### **Categorization of Land Uses**

The other variation in the formatting of compatibility criteria pertains to how land uses are categorized in the compatibility table(s). There are two different approaches to the listing of land uses. Both are common among ALUCPs and, as with the overall format of the tables, each has advantages and disadvantages.

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*Either of these two formats is acceptable. In both cases, however, attention should be paid to minimizing the shortcomings listed among each option’s disadvantages.*

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### ***Functional or Performance-Oriented Characteristics***

This approach entails dividing land uses according to characteristics related to the previously described compatibility planning strategies. It applies primarily to when a composite compatibility table and map are utilized, but could also be employed as a means of evaluating safety compatibility. The number of categories needed is thus kept small. No distinctions are made among different types of land uses with similar functional or performance-oriented characteristics. When this method of land use categorization is used in a compatibility table, the result for most categories is not an indication of whether the land use is compatible or incompatible. Rather, the table establishes a set of criteria based upon specified performance measures which, if satisfied, will result in compatible land use.

A typical set of performance-oriented land use characteristics and their respective compatibility measures follows:

- ◆ Residential Density—For airport compatibility purposes, the chief distinguishing feature among residential land uses is the number of dwelling units per acre. To be compatible with airport activities, the number of dwelling units per acre should not exceed the criterion specified for the compatibility zone where the use would occur.
- ◆ Nonresidential Usage Intensity—The most significant factor among most other types of land use development is the number of people attracted by the use. Safety is the principal concern in this regard, although noise could also be evaluated in this manner. With the exception of certain sensitive uses, the nature of the activity associated with the actual land use is not highly relevant to airport land use compatibility objectives. **See Appendix G for guidance on methods of calculating intensities of nonresidential land uses.**
- ◆ Sensitive Uses—This category includes land uses which, because of their special sensitivity, should be excluded from certain locations near airports even if they meet other quantitative criteria. Children's schools, day care centers, hospitals, nursing homes, and other highly risk-sensitive, or low-mobility uses are primary examples. Uses involving storage of large quantities of hazardous materials also fit into this category on the basis of safety. In terms of noise, uses such as an amphitheater might be considered unacceptable near an airport regardless of the number of people exposed to the noise.
- ◆ Open Land—Requirements for open land usable for the emergency landing of aircraft near an airport apply regardless of the overall land use classification of the property. The associated criteria indicate what percentage of the land area in each compatibility zone should be devoted to functional open space.
- ◆ Permitted Heights—Another land use characteristic that can be incorporated into a composite compatibility table is the height that structures clearly can attain without penetration of the airport airspace. Including permitted heights as a criterion in a composite compatibility zone works best at airports in relatively level terrain. At airports where elevations of the surrounding terrain vary substantially, special provisions might need to be made to account for the lack of consistent relationship between the height permitted and the location of the individual compatibility zones.

Advantages and disadvantages of this style of land use categorization include:

- ◆ Advantages—The principal advantage of performance-oriented categorization of land uses is that this method directly addresses factors pertinent to compatibility. Recognition is given

to significant land use characteristics that might not be distinguished in a traditional listing of land uses.

- ◆ **Disadvantages**—The primary disadvantage of performance-based land use categories is that assessing the compatibility of a particular land use designation or individual development proposal requires interpretation of the associated criteria (except for residential uses). If, for example, data regarding the usage intensity is not available, then compatibility evaluation will require reliance on information sources (building and fire code standards, for example) that may not accurately reflect the aviation-related concerns. The results may not always be consistent with previous determinations.

#### ***Detailed Listing Format***

One approach is to divide the full range of land uses into specific classes. The number of classifications might be relatively few in number—residential, commercial, industrial, public facility, etc.—as commonly found in general plans or specific plans. Alternatively, a much more narrowly defined listing might be utilized—one in which the broader land use categories are divided into more precise subcategories.

The detailed listing approach to land use categories works with either separate or composite compatibility tables and maps.

- ◆ **Advantages**—The advantage of the detailed listing approach is that it removes most of the need for interpretation of standards as required within the performance-oriented categories. Each listed use can be denoted as either compatible or incompatible. This greatly simplifies the task of local planners when they must evaluate an individual development proposal either with respect to the ALUCP directly or the local agency's plan and/or regulations. Even when using a detailed list, however, performance criteria (i.e., density/intensity limits, etc.) need to be set first.
- ◆ **Disadvantages**—The major disadvantage of this method is that, unless the land use categories are defined very narrowly, the usage intensity (the number of people per acre) and other characteristics that affect compatibility, might cover a wide range. Indicating that a particular land use is compatible with the airport could result in development of an activity that clearly exceeds the intensity considered acceptable. Oppositely, listing a land use as incompatible might preclude a development that could be a good airport neighbor. Some ALUCs resolve this problem by including a third consistency category: conditionally compatible. Assessment of the compatibility of an individual development proposal then usually requires returning to functionally oriented criteria as described below.

Another potential difficulty with including a detailed listing of land uses in an ALUCP is that the selected categories may not conform to those used by the local land use jurisdictions. This is particularly likely to occur when the ALUCP covers multiple airports and encompasses several jurisdictions, each with its own set of land use categories.

#### ***Preparing Compatibility Maps***

Regardless of the format used, several important factors should be considered when preparing the maps for a particular airport.

### ***Basic Determinants of Compatibility Zone Boundaries***

The manner in which compatibility zone boundaries are determined depends to some extent upon the map format utilized.

- ◆ **Separate Compatibility Maps**—With this format, each map directly reflects the associated airport impacts:
  - *Noise*: CNEL contours directly from the computer output or with minor graphical clean-up can be utilized. The lowest CNEL contour depicted may vary depending on how sensitive the surrounding community is to aircraft noise.
  - *Overflight* : Areas where overflight compatibility criteria apply may be shown on noise or safety compatibility maps. Alternatively, areas of potential overflight concern can be separately depicted.
  - *Safety* : ALUCs that separately map each compatibility concern typically establish three to six safety zones reflecting assumed accident potential. The distinct zones might include: the runway protection zone; an approach zone (perhaps divided into two segments); a traffic pattern overflight zone; and sometimes a zone encompassing areas adjacent to the runway.
  - *Airspace Protection*: The height-limit component of airspace protection can be mapped by utilizing FAR Part 77. Critical TERPS surfaces can be added as appropriate. Zones related to bird strike hazards and visual and electronic interference concerns are seldom mapped.
- ◆ **Composite Criteria Maps**—Creation of a composite compatibility zone map for an airport starts with preparation of the separate compatibility maps as described above. These maps are then reviewed in combination with each other to identify locations where the overall extent of noise, risk, and other impacts are similar. Preferably, no more than five or six composite zones should be created.

Even when a composite map is used for noise, safety, and overflight compatibility evaluation, a separate map is usually prepared to allow precise assessment of airspace protection requirements.

### ***Relationship of Zone Boundaries to Geographic Features***

The location of airport-related impacts is mostly determined by the location of runways, flight routes, and other aviation-related factors, not geographic features of the airport environs. While defining compatibility zone boundaries based strictly on the impacts provides the closest relationship to those impacts, the resulting maps are not as easy for local planners to use. The alternative is to adjust the zone boundaries to follow geographic features, existing land use development, and other local land use characteristics. By so doing, situations where a compatibility zone boundary splits a parcel can be minimized.

Adjustment of boundary lines is generally more practical in urban areas, because they offer more choices of roads, parcel lines, and other geographic features, than in rural locations where these features are more widely spaced. Also, the composite criteria format better lends itself to boundary adjustments than do separate compatibility maps.

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*Adjustment of compatibility zone boundaries to follow geographic features is acceptable provided that the area within each of the resulting zones is reasonably uniform with respect to the extent of airport-related impacts which it experiences.*

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#### **Relationship of Compatibility Zones to Overall Planning Area**

The overall planning or influence area for an airport is normally the area encompassed by a composite of each of the individual compatibility zones. For most civilian airports, the most geographically extensive compatibility concern is the airspace protection area defined by the outer edge of the FAR Part 77 conical surface. This distance equals 9,000 feet from the runway primary surface for small airports with no instrument approaches and 14,000 feet for most other civilian airports (the primary surface extends 200 feet beyond the runway end).

There are exceptions to this basic rule, however.

- ◆ Precision Instrument Runways—The FAR Part 77 approach surface for precision instrument runways extends 50,000 feet (nearly 10 miles) from the runway primary surface. Considering that the height limit at this distance is 1,200 feet above the runway end elevation, establishing an airport influence area (AIA) of that size solely for the purposes of airspace protection is usually unnecessary. However, where rising terrain is a factor or where other types of approaches place aircraft at a low altitude several miles from the runway, extension of the AIA beyond the conical surface may be appropriate.
- ◆ Major Flight Routes—Major flight routes to and from busy airports, especially major airline airports and some military fields, can produce overflight impacts and sometimes even noise contours that extend beyond the FAR Part 77 boundaries. If corresponding compatibility policies are designated for these locations, the AIA boundary would be extended accordingly.
- ◆ Limited-Use Airports—At some airports, aircraft-related impacts are limited almost exclusively just to portions of the airport environs (because certain runways are seldom used, for example, or because the traffic pattern is situated only on one side of the runway). In these situations, the AIA can sometimes be reduced to less than the area encompassed by the FAR Part 77 surfaces. If this is done, however, steps need to be taken to assure that tall objects situated within the excluded area do not constitute significant airspace obstruction concerns.
- ◆ Military Airports—Military airports have their own separate set of FAR Part 77 airspace surfaces. These surfaces cover a much more extensive area than for civil airports: a minimum of 30,000 feet from the runways in all directions plus 50,000 feet along the runway approaches.
- ◆ Default Boundaries—If an ALUC has not adopted an influence area boundary for a particular airport, then (in accordance with Section 21675.1(b)) the default “study area” includes all land within two miles of the airport boundary (not the runway). Some ALUCs may choose to maintain approximately this boundary when adopting an ALUCP.

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*An alternative to stretching the airport planning area boundary simply to encompass the outermost limits of the FAR Part 77 airspace surfaces is to require that any proposed construction more than 200 feet in height be submitted to the ALUC for review regardless of where the object would be located. Proposed construction of this height also must be referred to the FAA for review in accordance with FAR Part 77.*

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ALUCs should take two additional factors into account when defining AIA boundaries. One consideration is that all of the AIA should be subject to at least one type of compatibility policy even if it is only height limits. If there are no compatibility restrictions or other conditions applicable within a portion of the influence area, the boundary should be redrawn to reduce its size. The second point—one emphasized in Chapter 2—is that state law (Section 21675 (c) ) requires ALUCs to consult with affected local jurisdictions before adopting or modifying an AIA boundary.

### ***Base Map Alternatives***

An important step in the mapping of an airport's compatibility zones is selection of an appropriate base map. Common alternatives include:

- ◆ **Geographic Information System (GIS) Mapping**—These computer-based mapping and data systems have become common in local government. When used in planning departments, street systems, parcel lines, and other geographic elements usually form the base map and then a variety of information associated with each parcel is included in the database. GIS maps are typically geo-referenced, thus assuring that at least major features—especially section corners—are geographically accurate. When a GIS has been established, addition of compatibility zones as another data layer or “theme” is highly advantageous. By so doing, the likelihood that compatibility criteria will be overlooked during local review of a development proposal is reduced.
- ◆ **Parcel Maps**—When GIS mapping is not available, a common alternative is a composite parcel map assembled from assessor's maps or other sources. Producing a reasonably accurate base map from smaller parcel maps can often be a challenge.
- ◆ **Land Use or Zoning Maps**—If sufficiently detailed, the same base maps as used for local land use or zoning purposes offer another alternative when a GIS has not been established.
- ◆ **Topographic Maps**—Topographic maps prepared by the U.S. Geological Service (USGS) are obtainable for all areas of California in both printed and digital form. Because these maps show ground elevations, they are particularly useful for airspace protection plan mapping. However, topographic maps do not show enough detail to facilitate finding particular locations within urban areas and they are generally outdated as well.

A note of caution regardless of the source of the base map: airport runways frequently are not shown, are not accurately located, or are not the correct length. Since most compatibility zones are typically tied to the runway position, not other geographic features, steps should be taken to assure that the runway is correctly depicted. A current airport layout plan indicating the geographic coordinates of the runway ends is an ideal source of runway location data. When GIS is used, this data can be directly entered into the system. Although normally not as precise, aerial photographs can also be used as a means of establishing the placement of a runway on a base map.

## **3.4 COMPATIBILITY PLANNING FOR SPECIFIC AIRPORT TYPES**

The State Aeronautics Act requires that ALUCPs be prepared for various types of airports. While each airport presents a distinct combination of characteristics, both operationally and in terms of surrounding land uses, even broader differences are apparent among the various airport

categories. The relative extensiveness of noise versus safety concerns varies between a typical air carrier airport and a typical general aviation facility, for example. The availability of data from which to develop an ALUCP also tends to differ from one airport type to another. The discussion in this section focuses on the distinctive compatibility planning concerns and approaches common to each category:

- ◆ Air carrier airports ;
- ◆ General aviation airports ;
- ◆ Converted military airports;
- ◆ Military airports ; and
- ◆ Heliports.

### 3.4.1 Air Carrier Airports

Several factors distinguish compatibility planning for air carrier airports from that for most other facilities. Some of these factors pertain to the substance of the compatibility policies, others involve the resources available for preparation of the ALUCP.

From a compatibility standpoint, noise is usually the dominant concern. The 65 CNEL contour for a major air carrier airport can extend far beyond the runway ends. Lower noise level impacts can encompass several square miles of the airport environs.

As a practical matter, though, the ability of ALUCs to address compatibility matters around air carrier airports is often limited. Most air carrier airports in California are situated in existing, highly urbanized communities. Where new development is allowed, noise insulation programs and the requirement for aviation easements are a major component of land use compatibility policies both for the ALUC and the airport itself.

The second distinct factor about compatibility planning for air carrier airports is that data and other resources needed for plan preparation are typically more readily available than for other airports. To start with, these facilities typically have full-time staff specifically assigned to dealing with noise, land use compatibility, and other issues affecting the surrounding communities. Recent calculations of current noise contours and up-to-date projections of future activity levels and noise impacts are commonly available. Moreover, noise monitoring and radar flight track data may be available to increase the precision of both current and projected noise contours. For planning purposes, however, the predictions for the noise environment in the distant future (20+ years) are more important than the measurements of noise in the past.

### 3.4.2 General Aviation Airports

The characteristics of general aviation airports and their environs vary widely. They range from very busy “reliever” airports in metropolitan areas to minimally used facilities in rural locations. The extent of compatibility issues and the availability of data from which to create an ALUCP also run the full gamut.



For an average general aviation airport, noise, safety, airspace protection, and overflight compatibility concerns are all important issues to be addressed in ALUCPs. Moreover, because many general aviation airports are located on the fringes of urban areas, both the threat of new incompatible development and the opportunity for ALUCs to help preserve compatible land uses are great.

Available activity level, noise impact, and other data needed for compatibility planning is not normally as extensive as for air carrier airports. Essential information often must be gathered from a variety of sources ranging from airport master plans to interviews with airport staff and others familiar with operation of the airport. Obtaining data on the locations of principal flight routes can be particularly difficult, yet of key importance at moderately busy facilities. Again, planning for the distant future is highly important.

### **3.4.3 Converted Military Airports**

A series of federal Base Realignment and Closure (BRAC) Acts since the 1980s has led to closure of numerous military bases across the country. In California, many airfields located on closed bases have been (or could be) converted to civilian use. Most of these airports are major facilities with long runways capable of accommodating almost any type of aircraft. Because of the wide range of future operational scenarios possible for converted military airports and their lack of history as civilian facilities, preparation of ALUCPs for them can be particularly challenging. In this regard, there are two key issues which ALUCs need to address: the timing of ALUC involvement in the conversion process, and the assumptions regarding future airport configuration and use.

#### ***Timing of ALUC Involvement in Conversion Process***

Conversion of a military base to civilian use entails a lengthy series of steps. In practice, the process generally entails four distinct sub-processes:

- ◆ The military's property disposal process;
- ◆ The community reuse planning process;
- ◆ The environmental review process; and
- ◆ The environmental clean-up process.

These processes are not sequential. Rather, there are many overlaps and interconnections among them. The individual processes may be delayed, halted, and then started again and they do not necessarily span the same period of time.

After the decision to close a military base has been made, other federal agencies have first option to obtain all or part of the property. Any property deemed surplus to federal needs is made available to local government entities and certain community organizations in accordance with the community's reuse plan. Major steps in the reuse and environmental review processes are summarized in the above inset.

ALUCs can get involved in the conversion process at any time. The State Aeronautics Act does not specifically mention military base conversions or when ALUCs should become involved. The only statutory requirement stems from ALUCs' responsibility to review proposed airport construction plans prior to their adoption by the local reuse authority or a successor entity chosen to operate the airport (as required by the PUC Section 21661.5 ). Most often, this step does not occur until relatively late in the conversion process, after many key decisions have been made. Given these circumstances, it is usually wise for an ALUC to become involved early in the process, albeit at a very modest level initially. For example, initial consultations with ALUC staff may be appropriate at step 4 or 5 (see above). Conversion of military bases typically involves allocation of land and facilities among many competing uses. Early in the conversion process, ALUCs should make sure that decision-makers are aware that enough land needs to be retained to afford maximum compatibility with the eventual civilian aviation use. Initially, it should be sufficient to note that, while the areas beyond the runway ends are the most sensitive, all areas which will be routinely overflowed have potential compatibility concerns. These compatibility concerns will likely involve land both on the base and in its environs. The next point at which an ALUC can be of service is during the development and analysis of alternative uses. ALUCs should seek to ensure that every alternative involving an aviation use includes appropriate compatibility measures. Existing ALUC policies can be used to formulate preliminary compatibility zone boundaries for each alternative.

Once a preferred alternative is selected, the ALUC needs to be satisfied that the environmental documents (under CEQA and NEPA) include consideration of the full range of compatibility concerns. Limiting consideration to noise contours associated with future civilian aviation uses is not sufficient. Safety and overflight impacts must also be considered. This is also the time to make certain that off-base land use designations support the civilian airport use. There may be pressures to permit residential uses (as well as schools, etc.) closer to the civilian airport than was permitted when used by the military.

#### ***Assumptions Regarding Future Airport Configuration and Use***

A base reuse plan and/or airport master plan together with their associated environmental documents will typically contain most of the elements necessary to prepare an ALUCP:

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*A potential shortcoming of these plans is that the forecasts may not extend far enough into the future to adequately serve the purposes of airport land use compatibility planning. As discussed in Chapter 2, noise impacts associated with an airport capacity level of activity may warrant evaluation.*

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- ◆ A physical plan for the airfield showing the location and dimensions of runways and types of instrument approaches, both current and future;
- ◆ A description of the future roles of the airport, including the mix of aircraft types;
- ◆ Forecasts of aircraft activity; and
- ◆ Noise contours associated with the forecast level of activity.

Inherently, the base conversion process requires greater speculation about future civilian aviation uses than would a master plan for an existing civilian airport. First, there is typically no history of civilian aeronautical use or only very specialized civilian use. Secondly, there is commonly an explicit marketing or promotional aspect to conversion plans. The first factor increases the uncertainty, while the second tends to inflate the magnitude and scope of future activities.

Since land uses tend to endure for long periods of time, it is appropriate for aviation forecasts to anticipate activity levels at the high end of the range of plausible levels. Forecasts that are somewhat high will help preserve an envelope within which future aviation activities can take place in harmony with nearby land uses.

ALUCs are not empowered to determine what the future airfield configuration, airport role, or activity levels will be. State statutes direct that an ALUCP must be based upon an airport master plan. A base reuse plan can be expected to contain the elements of an airport master plan. However, if an ALUC is presented with a reuse plan that is so visionary that the anticipated civilian aviation use strains the bounds of credibility, it is faced with a dilemma.

State law anticipates that ALUCs will devise ALUCPs to support the future aviation uses selected by the airports' owners. If an airport's owner has selected a future airfield configuration, role, or activity level that an ALUC considers unrealistic or inappropriate, the ALUC has few options. The most that ALUCs can do is negotiate with the airport owner in an effort to have the airport plan modified to be more realistic or appropriate. Ultimately, state law forces ALUCs to accept plans adopted by airport owners, even if the ALUC considers the plans either unrealistically grandiose or too modest.

### 3.4.4 Military Airports

Adoption of ALUCPs for military airports is required by PUC Section 21675 (b). Several factors make compatibility planning for military facilities distinct from that for civilian airports.

Most of the remaining military airports in California are part of large bases covering extensive land areas. Even the bases located near urban areas tend to have substantial amounts of open land near the runways. These buffer areas are valuable in terms of land use compatibility, especially with regard to safety. The noise impacts of military airports, however, can still extend far beyond the base boundaries due in large part to high noise levels generated by many military aircraft.

A particularly unique aspect of compatibility planning for military airports is that aircraft activity forecasts of the sort done for civilian airports are not very meaningful. Military airport activity levels depend almost exclusively on the mission of the base and on national or international events involving military participation. A typical planning approach thus is to postulate a "maximum mission" for the base. ALUCs wishing to anticipate the potential for yet greater aircraft operations impacts sometimes base their planning on a multiple of the maximum mission activity levels (a multiplier of 1.5 or 2, for example).

The best source of data from which ALUCs can develop an ALUCP for a military airport normally is the AICUZ study, which the U.S. Department of Defense requires for each base. In fact, PUC Section 21675 (b) requires that ALUCs adopt ALUCPs for military airports that are "consistent with the safety and noise standards in the [AICUZ] prepared for that military airport." AICUZ studies contain analyses of noise, accident potential, and height restrictions impacts of aircraft operations. For each of these impacts, a set of land use compatibility criteria are indicated. These criteria are merely recommendations to local land use jurisdictions—other than through acquisition of property, the military has no powers to enforce them.

AICUZ compatibility criteria tend to be minimal in terms of the degree of protection from incompatible land uses which they afford. ALUCs and local jurisdictions can and should consider setting higher standards in their own respective compatibility planning. Ensuring a high degree of land use compatibility around military airports is particularly prudent given the economic importance which major bases have to the surrounding communities and the fact that land use compatibility is one of the factors considered in the government's assessment of which bases to maintain in operation.

### **3.4.5 Heliports**

Compatibility planning for heliports presents another uncommon set of circumstances for ALUCs. As discussed in Chapter 2, the first consideration is to decide which heliports should have ALUCPs. The State Aeronautics Act requires all public-use heliports not located on an airport and all special-use heliports to obtain a Heliport Permit. A public-use heliport would be considered a public airport, and would require an ALUCP. A special-use heliport, most notably those at hospitals, would not require an ALUCP, but the ALUC has the option to prepare one. Any ALUCP prepared for a heliport needs to take into account the unique operational characteristics of helicopters. Because of the steep approach and departure profiles which helicopters normally fly, they are effectively operating in an en route manner once beyond a short distance from the heliport (FAR Part 77 airspace surfaces extend just 4,000 feet from the landing pad). Within the immediate vicinity of a heliport, helicopter noise impacts can be relatively intensive on a single-event scale. However, except for the few heliports which experience a high volume of operations, cumulative noise impact contours are very small. Also, the limited accident data available for helicopters suggests that significant safety concerns are generally confined to within a few hundred feet of the landing pad. Perhaps most important with respect to safety is the necessity of keeping established approach/ departure corridors clear of obstructions.

Given this combination of factors, some restrictions on land use development is appropriate within the immediate vicinity of public-use and special-use heliports. However, except where warranted by high activity levels, more extensive restrictions are normally unnecessary.

## **3.5 ACCOUNTING FOR EXISTING DEVELOPMENT**

The State Aeronautics Act gives ALUCs authority to conduct compatibility planning for areas around public airports only "to the extent that these areas are not already devoted to incompatible uses." This phrase is generally accepted to mean that the commissions have no authority over existing development. In formulation of ALUCP policies, several facets of this limitation are important to take into account.

### 3.5.1 Defining “Existing”

The first issue to be addressed is *when* during the development process a property becomes “devoted to” a certain use and thus constitutes “existing ” development. The State Aeronautics Act does not provide instruction on this issue; therefore, it is necessary to turn to other statutes together with case law for guidance.

A development does not need to be completed in order to be considered an existing use. Instead, at a certain time during the development process, approvals become irrevocable and a use is considered existing, insofar as the ability of local governments to require changes to a project is eliminated. In these circumstances, a project sponsor is considered to have a *vested right* to proceed with the development. *Vested* means “the irrevocable right to complete construction notwithstanding an intervening change in the law that would otherwise preclude it” [*McCarthy v. California Tahoe Regional Planning Agency*, 129 Cal.App.3d 222, 230 (1982)].

For the purposes of this discussion, local government approvals can be divided into three categories:

- ◆ Actions that clearly give a developer vested rights;
- ◆ Actions that may provide vested rights depending upon the circumstances; and
- ◆ Actions that do not provide vested rights.

An ALUC should also consult with their legal counsel when determining existing development rights.

#### ***Development Rights Established***

According to the California Supreme Court, the right to develop becomes vested when all *discretionary* approvals for a project have been obtained and only *ministerial* approvals remain. More specifically, vested rights have *not* been established *unless* the developer has:

- ◆ Obtained a valid building permit (as distinguished from merely a foundation or other specific permit); *and*
- ◆ Performed substantial work; *and*
- ◆ Incurred substantial liabilities in good faith reliance upon the permit.

[*AVCO Community Developers, Inc. v. South Coast Regional Commission*, 17 Cal.3d 785, 791 (1976)]

To give further certainty to the development process, the State Legislature provided for vested rights to be established by means of two specific types of local actions, the first of which is a *development agreement*. State statutes allow a county or city to enter into a binding agreement with a developer enabling a project to proceed in accordance with policies, rules, and regulations existing and any conditions established at the time of the agreement (Government Code, Section 65864 et seq.). “A development agreement shall specify the duration of the

agreement, the permitted uses of the property, the density or intensity of use, the maximum height and size of proposed buildings, and provisions for reservation or dedication of land for public purposes” (Section 65865.2).

The second form of agreement between a developer and the local land use jurisdiction, which establishes vested development rights, is a *vesting tentative map* (Government Code, Section 66498.1 et seq.). Such agreements “confer a vested right to proceed with development in substantial compliance with the ordinances, policies, and standards in effect at the time the vesting tentative map is approved or conditionally approved” (Section 66498.1(b)). A related California Supreme Court decision noted that: “Tentative map approval is the final discretionary approval issued by a local government under the Map Act; final map approval is merely ministerial if the application for such approval is in substantial compliance with the tentative map and its conditions” [*City of West Hollywood v. Beverly Towers, Inc.*, 52 Cal.3d 1184, 1191 (1991)].

### ***Development Rights Uncertain***

The principal local action falling into a middle ground of potentially establishing vested development rights is issuance of government permit other than a building permit—a *conditional use permit* being the primary example. Court decisions have concluded that such permits effectively provide vested rights only when they function much like a building permit. To qualify, the permit must afford “substantially the same specificity and definition to a project as a building permit” [AVCO, *Supra* at PP. 793-794].

### ***Development Rights Not Established***

A wide variety of governmental permits and other actions have been determined by state appellate courts as being insufficient to form the basis of a vested right to proceed with a development. Some of the court decisions were based upon narrowly defined sets of circumstances. Nevertheless, while some caution should be exercised in applying this list more broadly, the following types of actions generally do not by themselves establish vested rights:

- ◆ Issuance of a tentative tract map (fees and other requirements can be imposed as conditions for subsequent issuance of a building permit);
- ◆ Recording of a final tract map;
- ◆ Issuance of a demolition permit and a foundation permit;
- ◆ Filing of an application for a building permit;
- ◆ Establishment of an assessment district;
- ◆ Extension and/or installation of infrastructure (e.g., roads and utilities); and
- ◆ Issuance of a business license.

### **3.5.2 Implications for ALUCs**

The preceding discussion has several important implications for ALUCs.

### **Define “Existing Land Use”**

ALUC policies should declare as clearly as possible the types of local government approvals that, in the ALUC’s opinion, establish a land use development as effectively “existing” even if actual construction has not taken place. Such development is not subject to ALUC review and also would not be considered for the purposes of the ALUC’s review of local plans and policies. Developments for which vested rights have been obtained must be considered to be existing land uses. Developments which have not become vested may nevertheless be treated as existing land uses, but there is no requirement that the ALUC do so. For example, most ALUCs regard issuance of a valid building permit as giving a development the status of an existing land use even if construction has not yet begun.

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*Because ALUCs have some leeway in how they interpret what constitutes an existing land use, it is important that a definition be included in the ALUCP.*

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Also important to recognize, however, is that receipt of one of these approvals does not eliminate the obligations of a project sponsor to comply with development regulations and conditions that other local, state or federal agencies have established, particularly those published via statute or regulation.

### **Mapping of Existing Land Uses**

Some ALUCs map the locations or parcels in the AIA that it considers to be developed with existing uses at the time of an ALUCP’s adoption. Alternatively, other ALUCs request that an existing land use map to be submitted by affected local governments as part of the consistency process.

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*A current high-altitude, aerial photograph of the airport environs is an excellent tool for this purpose. It shows the extent of development on a broad scale without providing largely unnecessary detail regarding the development status of individual small parcels.*

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### **Existing Residential Parcels**

As a practical matter, an ALUC cannot prevent construction of a dwelling on an existing residential parcel, even one located within a runway protection zone. Construction of a secondary dwelling on such parcels also typically cannot be prohibited where allowed by local zoning (Government Code Section 65852.2 (c)(5)). These points are worth stating in the ALUCP’s policies.

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*Reasonable limitations can nevertheless be set on the height of the structure. Also, where the size of the lot allows, location of the building on the least impacted portion can be encouraged.*

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### **Change of Use**

The limitation on ALUC authority over existing land uses applies only to the extent that the use remains constant. Merely because a land use exists on a property does not entitle the owner to

expand the use, convert it to a different use, or otherwise redevelop the property if new or increased compatibility conflicts would result. To the extent that such land use changes require discretionary approval on the part of the county or city, they may fall within the authority of the ALUC to review. For example, a change involving an amendment to a general or specific plan or zoning ordinance would be reviewable.

### ***Infill Development***

Another special situation which ALUCs should consider when formulating compatibility policies is how to deal with infill development. Since infill is new development (within a largely developed area), it falls under the jurisdiction of an ALUCP. The chief issue with regard to infill occurs when the existing surrounding uses are, and new infill development would be, inconsistent with the ALUC's compatibility criteria. ALUCs are not obligated to allow infill development. The question which ALUCs need to address is whether it is realistic to attempt to prevent technically incompatible development of a small area surrounded by similar existing development.

The topic of infill, and the often related topic of mixed-use development, is discussed further in Section 4.6.

## **3.6 LIMITS ON LAND USE RESTRICTIONS**

While having an airport environs totally devoid of development may be ideal from a land use compatibility perspective, it seldom is a realistic objective. For one, existing development already makes such sterility impossible to achieve at most airports. Moreover, even in sparsely populated areas, tradeoffs generally must be made between an ideal degree of land use compatibility and the community needs for land use development. This section explores some of the legal and practical limitations on the restrictiveness of land use compatibility measures.

### **3.6.1 Inverse Condemnation**

A concern sometimes raised (especially by landowners) with regard to establishment of airport land use restrictions is that the restrictions might constitute inverse condemnation—a *taking* of private property without just compensation. This is not a new concern. The criteria for compensable takings have long been debated in legal literature. Also, many court cases, including some specifically dealing with airports, have delineated when a taking has or has not occurred. Even as far back as 1952, the report of the President's Airport Commission, *The Airport and Its Neighbors*, devoted several pages to the topic.

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*The material presented in this section is written from a professional planning perspective. It is not a legal opinion.*

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Inverse condemnation is a highly complex subject. It is not possible for this *Handbook* to delve into it at length—entire books can and have been written on the topic. Rather, this section is merely a brief summary of the issue as it applies to airport land use compatibility planning. The emphasis is on the implications for ALUCs.



State law does not give ALUCs direct authority over land use. Implementation of an ALUC's policies is accomplished by local agencies through the process of making their general plans, specific plans, and applicable ordinances consistent with the ALUCP. Therefore, a legitimate question is whether it is possible for an ALUC policy to result in a taking through inverse condemnation in the first instance. Without doubt, a property owner who feels aggrieved might sue the ALUC along with other local entities. What the outcome of any such lawsuit might be is uncertain. One view is that, because an ALUC has no assets or taxing powers of its own, either the airport owner or local agency that implements the compatibility policies is more likely than the ALUC to bear the brunt of any such lawsuit. Regardless of whether this assessment is valid, the question of which local agency could more readily be successfully sued is not directly of interest. The issue here concerns the limitations which the potential for inverse condemnation presents in implementation of airport land use compatibility measures. Therefore, more to the point is the issue of what forms and degrees of land use restrictions for airport compatibility purposes are legally sound.

### 3.6.2 Practical Considerations

The sole responsibility of ALUCs is to prevent incompatible land use development and thereby both protect the public from noise and risks and preserve the utility of airports. In carrying out this responsibility, ALUCs should be guided by objective analyses of airport land use compatibility concerns. This focus notwithstanding, ALUCs also need to be practical in their actions. Although ALUCs should not be driven by political, economic, or other non-compatibility-related factors, they should at least be cognizant of them. They should be aware of the effects that their plans and compatibility determinations will have on local land use jurisdictions and the possible reactions which these jurisdictions may have to these matters.

The bottom line is that the most desirable outcome of the compatibility planning process is for local agencies and the public to support and take the necessary measures to implement the compatibility policies adopted by ALUCs. If ALUCs can maintain the integrity of the compatibility planning objectives set forth in the State Aeronautics Act while still accommodating local needs, then they should give careful consideration to any such alternatives.

## 3.7 PROCEDURAL ISSUES

### 3.7.1 Public Notice and Hearing Requirements

The State Aeronautics Act does not specifically require that an ALUC provide public notice or hold a public hearing in order to adopt an ALUCP. Such measures exist elsewhere in state law, however, and in any case are generally prudent.

#### ***Public Notice***

The only mention of public notice requirements in the ALUC statutes is with regard to ALUC action on land use proposals. Section 21675.2(d) says that: "Nothing in this section diminishes the commission's legal responsibility to provide, where applicable, public notice and hearing before acting on an action, regulation, or permit." By extension, this responsibility can be interpreted as

applicable to adoption or amendment of ALUCPs. The question faced by ALUCs and their staffs then becomes one of deciding what type of public notification is appropriate.

The best guidance in this respect is for ALUCs to follow the notice procedures that are applicable to general plans and specific plans. These requirements are set forth in the Government Code (in particular, Sections 65090, 65091, and 65353). Basically, notice must be sent to each affected property owner unless mailing of more than 1,000 such notices would be necessary. In this case, notice may be published in a newspaper of general circulation serving the area affected.

Since most ALUCPs—especially countywide plans covering multiple airports—involve more than 1,000 parcels, providing public notice by means of a local newspaper is common. Many ALUCs, though, find it desirable to supplement the newspaper notice with individual mailings to selected property owners. These owners are ones whose property development potential might be impacted by the ALUCP. Such parcels may include agricultural or other large parcels capable of subdivision under local zoning regulations, and parcels zoned commercial or industrial on which usage intensity limitations would be applied. To the extent that an ALUCP would not establish any new restrictions or limit the subdivision potential of existing residential lots, mailing of notices to the individual owners is normally unnecessary.

The posting of notices on agency websites is increasingly common, as is the use of email notices to alert interested parties. These methods are recommended, but should not replace the use of mailed notices when property owners would be directly affected by an action.

### ***Public Hearings***

ALUC public hearing requirements pertaining to the adoption or amendment of ALUCPs arise only with respect to the establishment of an airport planning area boundary. Other laws applicable to ALUCs also do not require the holding of a public hearing. The Brown Act requires only that ALUC meetings be open to the public, not that public input be received. Furthermore, nothing in the California Environmental Quality Act mandates a public hearing; public input can be limited to correspondence only. From a practical perspective, however, ALUCs are well advised to solicit public and local agency input before adopting an ALUCP, even if a formal public hearing process is not utilized.

## **3.7.2 California Environmental Quality Act**

### ***Environmental Review Requirements***

Historically, opinions regarding whether or not review under the California Environmental Quality Act (CEQA; Public Resources Code (PRC), Section 21000 et seq.) of an ALUCP prior to its adoption or amendment is required have varied. The central issue revolved around whether or not an ALUCP constitutes a “project” under CEQA, which is defined to include the “whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment (California Code of Regulations, Title 14 (“CEQA Guidelines”) Section 15378).” Recent case law has confirmed that the adoption or amendment of an ALUCP is a “project” under CEQA. And practically

speaking, the environmental impacts of an ALUCP arise from its potential to result in displaced development as a result of the potential imposition of more limiting development criteria. Conversely, environmental impacts also may result if the ALUCP would lessen the restrictiveness of development criteria and expand the types of land uses that could be accommodated within an area. The remaining question of what type of environmental document, if any, must be prepared is a separate issue, as explained below.

### ***Muzzy Ranch Co. v. Solano County ALUC***

In *Muzzy Ranch Co. v. Solano County Airport Land Use Commission* (2007) 41 Cal.4th 372, the California Supreme Court found that the Solano County ALUC's adoption of an ALUCP was a "project" for purposes of CEQA.

However, the court also found that adoption of the ALUCP for Travis AFB fell within CEQA's "common sense" exemption, such that no further environmental review was required. (Id. at p. 378; see also PRC Section 21065; CEQA Guidelines Section 15061(b)(3)). In so concluding, the court made clear that the common sense exemption applied because the ALUCP incorporated the *existing* county general plan and zoning provisions concerning the maximum number of permitted dwelling units; therefore, the plan would not result in any displacement that was not otherwise accounted for during the development of the existing land use designations by the local jurisdictions (Id. at p. 389). Where an ALUCP provides more restrictive provisions than the existing general plan/zoning regulations, the court noted that further environmental review may be necessary (i.e., negative declaration, mitigated negative declaration, and/or environmental impact report) to address potential development displacement.

### ***The CEQA Process***

The CEQA Guidelines describe a three-step process for implementing CEQA (CEQA Guidelines Section 15002(k)). The first step is to determine if the project is subject to CEQA. There are two relevant issues at this step. The first is whether or not the proposed action should be considered a "project" within the meaning of CEQA. As discussed above, preparation or amendment of an ALUCP, similar to many other planning actions, should be considered a "project." The second issue is whether or not an exemption applies to the particular project. The possible types of exemption are discussed below.

The second step of the process is the preparation of an Initial Study to determine if the project may have a significant impact on the environment. If there is no substantial evidence that the project will have a significant adverse effect on the environment, the lead agency may prepare a Negative Declaration. If the Initial Study identifies potentially significant effects, but revisions have been incorporated into the project to avoid or reduce those effects to a less-than-significant level, the lead agency may prepare a Mitigated Negative Declaration.

If, on the other hand, the Initial Study shows that the project may have a significant effect on the environment, the third step is the preparation of an Environmental Impact Report (EIR).

### ***The Lead Agency***

Central to the implementation of CEQA is the concept of the “lead agency.” The lead agency is the agency with primary responsibility for carrying out or approving a project. The entity having lead responsibility for ALUCP preparation (as discussed above) will be the CEQA lead agency. The ALUC (or the entity acting in that capacity) will typically fulfill this role.

The lead agency bears primary responsibility for the CEQA process. The lead agency will make the key decisions as to what kind of environmental document is appropriate, and will prepare and adopt that document. A responsible agency is a public agency, other than the lead agency, with some discretionary power over the project. A responsible agency is consulted by the lead agency during the CEQA process and will use the document prepared by the lead agency to support its decision making process for the project.

### ***CEQA Document Approach***

As shown in the *Muzzy Ranch* case, the question of whether or not a project is subject to CEQA is separate from the question of what type of document must be prepared, if any. This section describes the three most common means of compliance: exemption, Negative Declaration, and EIR.

### ***CEQA Exemptions***

There are two broad categories of exemption under CEQA: statutory and categorical. There is a third type of exemption, the “common sense” exemption, that CEQA applies only to projects where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment (CEQA Guidelines Section 15061(b)(3)).

- ◆ **Statutory Exemption**—The California Legislature has provided for complete or partial exemption from CEQA for certain projects. Notable statutory exemptions include feasibility studies, emergency projects (which are narrowly defined), and ministerial projects (this exemption codifies the concept that a “project” under CEQA must include discretion on the part of the lead agency, so where the action is only ministerial, it is not a “project.”). There are no clear statutory exemptions that would apply to the adoption or amendment of an ALUCP.
- ◆ **Categorical Exemption**—Public Resources Code Section 21084 directs the Secretary of Resources to identify classes of projects that do not have a significant effect on the environment and should be exempt from CEQA. These exemptions are called categorical exemptions, and are listed in the CEQA Guidelines (CEQA Guidelines Section 15300 et seq.). It should be noted that there are exceptions to these exemptions that limit their use in certain locations and under certain circumstances. There are currently 33 classes of exemption. Common categorical exemptions include those for ongoing operations (including repair and maintenance), replacement and reconstruction, construction of small structures (such as a single-family home), minor alterations in land use (such as lot line adjustments and minor variances), actions by regulatory actions to protect the environment, and certain in-fill developments. An important concept when considering categorical exemptions is that a substantial change in use, either the type of use or the level of activity, is usually outside the parameters of exemption.

- ◆ **Common Sense Exemption**—While not listed as either a statutory or categorical exemption, there exists in CEQA the “general rule that CEQA applies only to projects that have the potential for causing a significant effect on the environment” (CEQA Guidelines Section 15061(b)(3)). Therefore, “[w]here it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.” (Ibid.) This is sometimes called the “common sense exemption” and should be considered during the first step of the CEQA. As discussed in the *Muzzy Ranch* decision, the ALUC should carefully examine how a proposed plan or plan amendment may change the current policies and standards for future development. These parameters may include: exclusion of certain uses, limitations on residential densities and nonresidential occupancy levels, site design and open space requirements, and building height and other building design requirements. Where the ALUCP would maintain existing development controls, the adoption of that plan may fall within this exemption. However, ALUCs should exercise caution in using this exemption. When there are questions as to the potential for either direct or indirect impacts on the environment, a more conservative approach would be the preparation of an Initial Study.

There is another group of projects that are “exempt” from CEQA, and those are projects that are subject to another certified regulatory program (for example, the permitting of power plants by the California Energy Commission). While these “CEQA equivalents” have an important role in California’s environmental process, ALUCs will infrequently deal with them.

Assuming an exemption applies, a notice of exemption should be prepared and filed in accordance with the procedures articulated in the CEQA Guidelines (CEQA Guidelines Section 15062).

### ***Negative Declaration (and Mitigated Negative Declaration)***

If a project is not exempt from CEQA, the lead agency shall prepare an initial study. The initial study is a preliminary analysis that will direct the lead agency down one of two paths: a negative declaration or an EIR (CEQA Guidelines Section 15063). The initial study typically includes a checklist (such as the one provided in Appendix G of the CEQA Guidelines) that is used to help identify the environmental effects of a project. The checklist entries must be explained, either by a brief narrative or a reference to another information source (such as a plan, study, previous CEQA document, etc.).

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*An annotated checklist is provided in Appendix I to assist ALUCs in preparing an initial study for the adoption or amendment of a ALUCP.*

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If the initial study shows that there is no substantial evidence that the project will have a significant adverse effect on the environment, the lead agency shall prepare a Negative Declaration.

- ◆ **Negative Declaration**—A Negative Declaration is a written statement by the lead agency that briefly describes the reasons that a project, not exempt from CEQA, will not have a significant effect on the environment. The contents of a Negative Declaration typically include a brief description of the project and its location, a proposed finding that the project will not have a significant effect on the environment, and the initial study (CEQA Guidelines Section 15071).

- ◆ **Mitigated Negative Declaration**—A Mitigated Negative Declaration (MND) is prepared for a project when the initial study has identified potentially significant effects on the environment, but (1) revisions in the project plans or proposals made by, or agreed to by, the applicant would avoid the effects or mitigate the effects to a point where clearly no significant effect on the environment would occur, and (2) there is no substantial evidence in light of the whole record before the public agency that the project, as revised, may have a significant effect on the environment (CEQA Guidelines Section 15369.5).

#### ***Environmental Impact Report (EIR)***

An EIR is a detailed informational document that describes and analyzes the significant effects the project may have on the environment, and discusses the mitigation measures or alternatives that would avoid or substantially reduce those effects. The EIR represents the third stage of the CEQA process, and as such is both the most thorough and the most time-consuming form of compliance. While not common, the preparation of an EIR may be the appropriate approach in certain situations, either because there is substantial evidence that the ALUCP may have a significant effect on the environment, or where the ALUCP is prepared as part of a larger plan (such as a specific plan or airport master plan) for which an EIR is required.

## CHAPTER 4

# DEVELOPING AIRPORT LAND USE COMPATIBILITY POLICIES







## Chapter 4

# Developing Airport Land Use Compatibility Policies

## 4.1 OVERVIEW

The purpose of this chapter is to build upon the foundations established in previous chapters and provide guidance on how to develop effective land use compatibility criteria. The goal, when establishing land use compatibility policies, is not only to prevent the encroachment of incompatible land uses, but to also encourage the development of land uses that are both appropriate *and* beneficial to the surrounding community.

As has been emphasized in other chapters of this *Handbook*, developing an effective airport land use compatibility plan (ALUCP) involves not only understanding the regulatory basis for land use restrictions and the ways in which an airport operates, it also requires an understanding of the surrounding communities—including what land uses are there now and what is planned for the future. The policies set forth in an ALUCP do not operate in a vacuum, and are required by law to be reflected in the planning documents of each jurisdiction within an airport influence area (AIA), or are otherwise subject to overrule. Therefore, in order to develop an ALUCP that considers the land use needs of both an airport and surrounding communities, it is recommended that local planners have some level of involvement in the formation of compatibility policies.

**Topics addressed in this chapter include:**

- **Noise Criteria Guidelines;**
- **Overflight Criteria Guidelines;**
- **Safety Criteria Guidelines;**
- **Airspace Protection Guidelines; and**
- **Guidance on developing conditional compatibility criteria.**

## 4.2 NOISE

The basic strategy for achieving noise compatibility in the vicinity of an airport is to prevent or limit development of land uses that are particularly sensitive to noise. Common land use strategies are ones that either involve few people (especially people engaged in noise-sensitive activities) or generate significant noise levels themselves (such as other transportation facilities or some industrial uses).

### 4.2.1 Establishing Cumulative Noise Exposure Criteria

Just as there are no absolute determinants of the noise level at which an individual person will be highly annoyed, there are no absolute scientific measures for establishing which land uses and noise exposures are or are not compatible with each other. The best outcome that can be achieved

is compatibility criteria that will reflect what is appropriate for the communities involved. It is important to remember, however, that what may be considered an acceptable level of noise to a reasonable person will not satisfy 100% of the public.

### ***The Context of Acceptability***

The level of noise acceptable to an individual depends greatly upon the context of the noise and the perspective of the listener—noise to one person may be music to another. Similarly, context is important in determining the level of noise acceptable to a community. The level selected depends upon whether the function of the standards is control and abatement of noise sources or making land uses compatible with those sources.

### ***Methods of Limiting Aircraft Noise Impacts***

Methods of limiting airport noise impacts can be divided into four basic groups. All four categories have significant roles to play if the goal of quieter communities is to be attained. Importantly, the authority for implementation of each method differs.

- ◆ Preventative Measures—Falling into this category are the wide variety of land use planning measures designed to avoid encroachment of incompatible development into airport environs. These measures include general plans, specific plans, and zoning ordinances adopted by local governments. ALUCPs adopted by ALUCs are another example.
- ◆ Remedial Actions—This group of actions is one designed to mitigate current and future noise impacts on established land uses around airports through modification of the land uses. The objective is to change existing incompatible land uses into ones that are compatible or at least more acceptable. Property redevelopment and reuse are examples of remedial actions that can be fostered by local governments and taken by property owners. Airport proprietors can effect remedial action through programs such as property acquisition and soundproofing of existing structures.
- ◆ Source Noise Reduction—From the perspective of most communities, the ideal method of limiting aircraft noise impacts is to reduce aircraft noise at its source. However, local entities—including airports, local land use jurisdictions and ALUCs—have no control over this technique. Responsibility for source noise reduction actions rests with the federal government (which sets standards and conducts research), aircraft manufacturers (which design and build new technology aircraft), and aircraft owners (which place the new aircraft in their fleets). A basic difficulty with implementation of this process is that it takes time between when new technologies are created and when they are put into use.
- ◆ Operational Limitations—Operational methods to reduce noise include a variety of measures affecting how, where, and when aircraft are flown. The principal authority over these actions rests with the federal government and the pilots of aircraft. Airport proprietors have some influence over operational measures by working cooperatively with the FAA and pilots, but only to the extent that the airport proprietors' actions are not preempted by federal law, do not adversely affect safety, and are implemented in a manner which is reasonable, non-arbitrary, and nondiscriminatory. Airport proprietors also can affect where aircraft fly by modifying the configuration of airport runways. Other than when they are also the airport proprietor, local governments have no authority over aircraft operations. Airport Land Use Commissions (ALUCs) are explicitly prohibited from regulating airport operations.

#### **Abbreviations:**

- **dB = Decibel**
- **DNL = Day-Night Average Sound Level**
- **CNEL = Community Noise Equivalent Level**
- **Leq = Equivalent Sound Level**

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*Among the four categories of noise impact reduction methods, preventative measures are the only category in which ALUCs have any authority.*

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### ***Impact Criteria***

Not only does the authority to implement each of the preceding noise impact reduction methods differ, the standards that the methods seek to achieve may vary as well. Indeed, in the case of source noise reduction, even the metric used to measure compliance differs. More specifically, source noise reduction also is evaluated as a single-event metric, whereas the other methods are primarily evaluated in terms of cumulative noise level metrics. Particularly important with respect to the methods over which ALUCs and local land use jurisdictions have authority are differences in objectives for preventative measures versus remedial actions. The noise levels considered appropriate—as opposed to optimum or ideal—under each of these two contexts may not be the same.

In each case, setting appropriate noise level criteria for a community implies that an element of feasibility or cost-effectiveness is being taken into account. For example, within the limits of powers available to local governments, it is usually more feasible to avoid creation of new incompatible land uses than it is to reduce existing noise impacts through land use changes. Moreover, while the benefits or effectiveness may be the same in each case, the cost of eliminating or mitigating existing land use incompatibilities is usually far greater than avoiding it in the first place. *Thus, noise level criteria might justifiably be set lower for new land use development than for triggering action to mitigate existing impacts.*

Even for new development, competing community needs can influence the level deemed to constitute acceptable noise. As examined in Chapter 3, various practical considerations can shift the line of demarcation between acceptable and unacceptable noise exposure. ALUCs need to reflect upon such factors when establishing noise compatibility criteria. In so doing, however, commissions should also remember that their primary responsibility is toward promoting compatibility between airports and proposed land use development in the airport vicinity. Local elected officials can weigh the importance of other factors if they so choose (in so doing, though, they must understand that any action to overrule a decision of an ALUC must adhere to the procedural requirements set forth in state law).

## **4.2.2 Variables Affecting Cumulative Noise Level Criteria**

Most federal and state regulations and policies set 65 decibel (dB) Day-Night Average Sound Level (DNL) or Community Noise Equivalent Level (CNEL) as the basic limit of acceptable aircraft noise exposure for residential and other noise-sensitive land uses. Often overlooked, though, is that this standard has been set with respect to relatively noisy urban areas. *For quieter settings and many—if not most—airports in California, 65 dB CNEL is too high of a noise level to be appropriate as a standard for land use compatibility planning.* This view is particularly evident with respect to the evaluation of proposed new land use development. Federal policy articulated by the Federal Aviation Administration (FAA) has evolved to where the agency now will “respect and support” local establishment of a lower threshold of noise exposure

acceptability. On the other hand, special situations continue to exist in which noise exposures above 65 dB CNEL may be regarded as appropriate.

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*As discussed elsewhere, DNL is the only metric for which there is a substantial body of research data defining the relationship between noise exposure and people's reactions (as noted in Appendix D, the CNEL metric used in California is essentially the same as DNL).*

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Clearly, the level of noise deemed acceptable in one community is not necessarily the same in another. Therefore, the issue that needs to be examined is what factors influence setting of appropriate noise level criteria.

### 4.2.3 The Concept of Normalization

A long-standing method of adjusting noise levels in a community is the concept of “normalization.” The normalization concept has its origin in research done for the U.S. Air Force in the 1950s. The purpose of the research was to establish a method for adjusting aircraft noise levels used for determining and predicting expected community reactions. The adjustments take into account local conditions as described below. National recognition and support of normalization appeared in the U.S. Environmental Protection Agency’s (EPA) Community Noise (1971) and “Levels” (1974) documents. The California Department of Transportation (Caltrans) also used the normalization process in its development of noise standards for California airports, and the California Governor’s Office of Planning and Research continues to include the normalization procedure in its General Plan Guidelines (2003).

The normalization procedure was originally designed to adjust or “normalize” actual measured noise levels so that the effects of different noises on different communities could be compared more reliably. Over the years, planners have also found normalization to be a valuable tool for establishing appropriate noise level limits for new noise-sensitive development in the vicinity of an airport. This latter application of normalization is particularly well-suited to airport land use planning.

The normalization procedure takes into account four categories of adjustment factors associated with the noise source and the characteristics of the affected community:

- ◆ Seasonal characteristics of the noise;
- ◆ Background noise level in the community, absent distinct noise events;
- ◆ Previous exposure to, and attitudes toward, the noise; and
- ◆ Whether the noise includes pure tones or impulse characteristics.

Table 4A lists the complete set of normalization factors and recommended adjustments to measured noise levels. To use this table for the purpose of setting a land use compatibility noise-level criterion, the values must first be reversed (positive for negative and vice versa). The results can then be applied to adjust a baseline noise-level criterion. In California, a commonly used baseline criterion is a CNEL of 65 dB. As discussed earlier, this criterion is indicated in the noise standards for California airports, in FAA guidelines, and elsewhere. It is the cumulative noise level defined as being acceptable to a reasonable person (a person whose sensitivity to aircraft noise is near the middle of public response) residing in an urban setting in the vicinity of an airport.

The two examples on the top of the following page illustrate the use of normalization in airport land use compatibility planning.

**TABLE 4A: ADJUSTMENT FACTORS FOR OBTAINING NORMALIZED CNEL**

Type of Correction/Description	Added to Measured CNEL in dB
<b>Seasonal Correction</b>	
Summer (or year-round operation).	0
Winter only (or windows always closed).	-5
<b>Correction for Outdoor Noise Level Measured in Absence of Intruding Noise</b>	
Quiet suburban or rural community (remote from large cities and from industrial activity and trucking).	+10
Normal suburban community (not located near industrial activity).	+5
Urban residential community (not immediately adjacent to heavily-traveled roads and industrial areas).	0
Noisy urban residential community (near relatively busy roads or industrial areas).	-5
Very noisy urban residential community.	-10
<b>Correction for Previous Exposure &amp; Community Attitudes</b>	
No prior experience with the intruding noise.	+5
Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise.	0
Community has had considerable previous exposure to the intruding noise and the noise maker's relations with the community are good.	-5
Community aware that operation causing noise is very necessary and it will not continue indefinitely. This correction can be applied for an operation of limited duration and under emergency circumstances.	-10
<b>Pure Tone or Impulse</b>	
No pure tone or impulsive character.	0
Pure tone or impulsive character present.	+5
Notes:	
<ul style="list-style-type: none"> <li>• Source document uses the equivalent DNL metric.</li> <li>• See text for guidance on application of these factors to setting maximum noise level criteria for new land use development near airports.</li> <li>• Source: U.S. Environmental Protection Agency (1974)</li> </ul>	

**EXAMPLES OF USING NORMALIZATION IN AIRPORT LAND USE COMPATIBILITY PLANNING**

<b>Factor</b>	<b>Characteristics Present in Community</b>	<b>Correction</b>
<b>Example 1: An urban residential community near a major air carrier airport.</b>		
Seasonal Character of Noise:	Year-round operation	0
Community Setting:	Typical urban residential background noise levels	0
Previous Community Exposure to Noise:	Some exposure, but no control of noise	0
Noise Qualities:	No pure tones or impulse characteristics	0
Under these conditions, no corrections would be made to the basic CNEL 65 dB criterion as the design guideline.		
<b>Example 2: A small airport in a quiet location.</b>		
Seasonal Character of Noise:	Year-round operation	0
Community Setting:	Quiet suburban area	-10 dB
Previous Community Exposure to Noise:	Some exposure, but no control of noise	0
Noise Qualities:	No pure tones or impulse characteristics	0
Under these assumptions, a total correction of minus 10 dB would be applied to the basic criterion of CNEL 65 dB. A community fitting these conditions therefore may find that a criterion of CNEL 55 dB should be set as the maximum acceptable noise exposure for new residential and other noise-sensitive land use development.		

ALUCs are encouraged to consider the normalization factors listed in Table 4A when setting noise level limits for new noise-sensitive development in the vicinity of an airport. However, caution should be exercised in the event that the normalization procedure indicates a planning criterion greater than a CNEL of 65 dB. With few exceptions, new noise-sensitive land uses should not be allowed where current or projected airport related noise exceeds a CNEL of 65 dB. To do so would be inconsistent with the overall goals and objectives of the noise standards for California airports.

*ALUCs are encouraged to consider the normalization factors listed in Table 4A when setting noise level limits for new noise-sensitive development in the vicinity of an airport.*

It should also be noted that normalization is not applicable to implementation of the noise standards for California airports. The noise standards are formal regulations that have their own requirements separate from land use planning guidelines.

At the present time, normalization is the best method available for quantitatively adjusting noise levels to account for local conditions in an effort to establish appropriate noise limits for noise-sensitive land uses near airports. Its applicability is perhaps greatest in relatively quiet suburban or rural communities.

### ***Varying Noise Sensitivity of Different Land Uses***

Noise compatibility standards, such as those summarized at the beginning of Chapter 3, typically place primary emphasis on residential areas. Residential development is one of the most noise-sensitive land uses, and often covers the greatest proportion of urban land. Several factors contribute to this sensitivity:

- ◆ Normal residential construction usually provides less sound attenuation than typical commercial construction and windows are more likely to be open;
- ◆ Outdoor activity is a significant aspect of residential land use; and
- ◆ People are particularly sensitive to noise at night when they are trying to sleep.

The three CNEL values commonly used as the limit for acceptable residential noise exposure are: 65 dB, 60 dB, or 55 dB. The choices and rationale for each are listed in Table 4B, while Figure 4A depicts typical noise levels in a variety of community types.

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*For purposes of airport land use compatibility planning, Caltrans advises that 65 dB CNEL is not an appropriate criterion for new noise-sensitive development around most airports. At a minimum, communities should assess the suitability and feasibility of setting a lower standard for new residential and other noise-sensitive development.*

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**TABLE 4B: NOISE COMPATIBILITY CRITERIA ALTERNATIVES  
(NEW RESIDENTIAL LAND USES)**

CNEL	Criteria	Suggested Applicability
<b>65 dB</b>	<p>Set by the FAA and other federal agencies as the level above which residential land uses may be incompatible if not acoustically treated.</p> <p>Established by California state regulations as the maximum normally acceptable noise level for residential and certain other land uses at county-designated noise-problem airports.</p>	<p>Generally not appropriate for most new development.</p> <p>May be acceptable in noisy urban locations and/or in hot climates where most buildings are air conditioned.</p>
<b>60 dB</b>	<p>The contour within which California Building Code (Section 1207.11) requires an acoustical analysis of proposed residential structures, other than detached single-family dwellings.</p> <p>Suggested by the California Governor's Office of Planning and Research <i>General Plan Guidelines</i> as the maximum "normally acceptable" noise exposure for residential areas.</p> <p>[Note: Individual noise events will occasionally cause significant interference with residential land use activities, particularly outdoor activities, in quiet suburban/rural communities.]</p>	<p>Suitable for new development around most airports.</p> <p>Particularly appropriate in mild climates where windows are often open.</p>
<b>55 dB</b>	<p>Identified by the EPA as the level below which "undue interference with activity and annoyance" will not occur.</p> <p>[Note: Individual noise events will seldom significantly interfere with residential land use activities (e.g., interference with speech). In urban areas, aircraft contribution to this noise level may be less than that of other noise sources.]</p>	<p>Suitable for airports in quiet, rural locations.</p>

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Note: When setting criteria for a specific airport, other characteristics of the airport and its environs also need to be considered.

See Table 4A for normalization factors.

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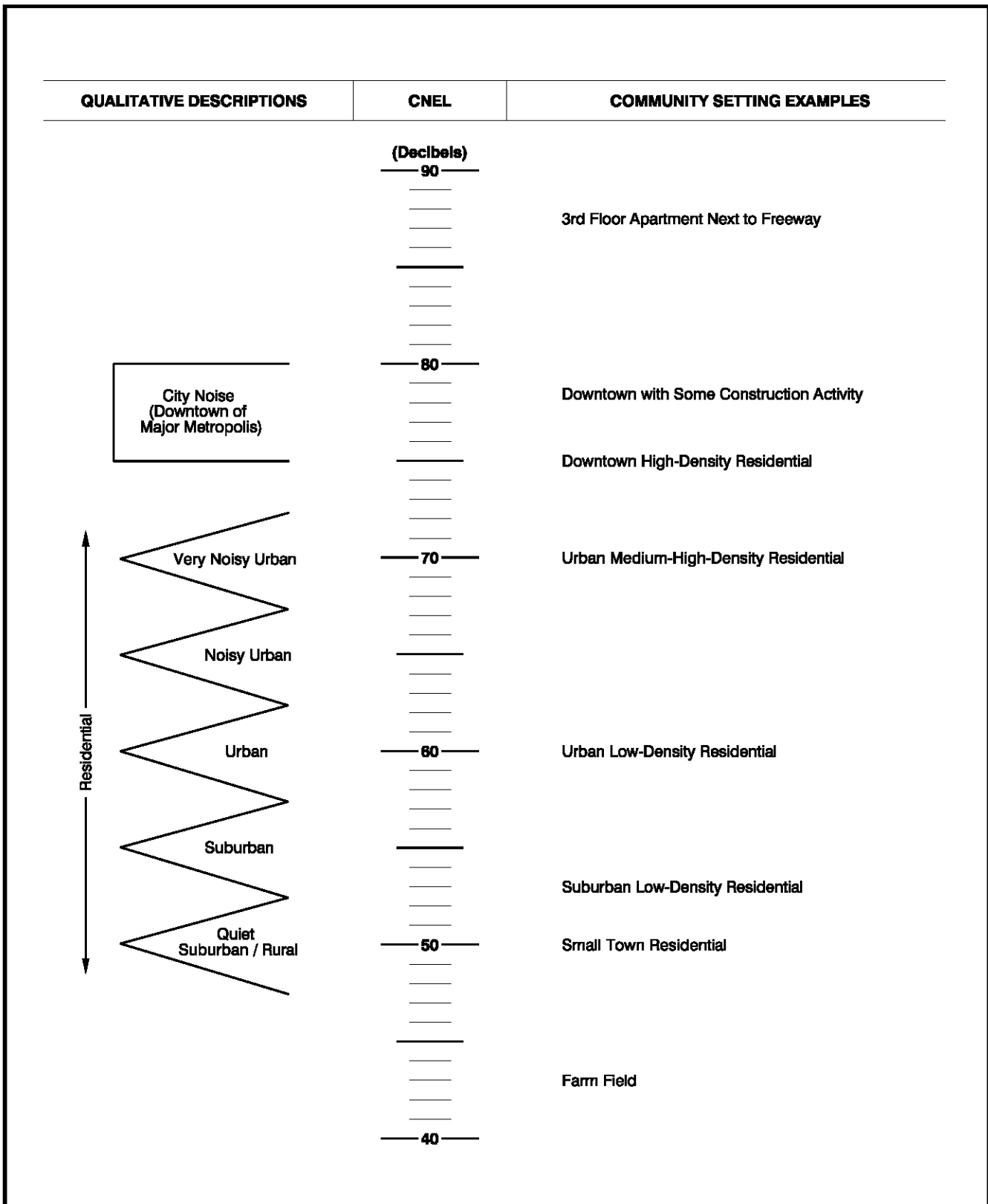


FIGURE 4A

## Typical Noise Levels in Various Communities



Data on acceptable noise exposure for other land uses is not as extensive as for residential uses. Some guidelines exist in the various regulations and documents cited in Chapter 3. In general, once a criterion has been set for residential uses, the criteria for other land uses can be established by considering the comparative extent to which human activities associated with that land use would be disrupted by noise, as well as the degree of structural sound attenuation that typically is provided.

### ***Differences Between High- and Low-Activity Airports***

Although cumulative noise exposure metrics have been shown to correlate closely with public annoyance over a wide range of noise exposure levels, there probably are limits beyond which these metrics do not adequately describe potential public reaction. For communities near larger airports with relatively many operations (like air carrier airports), CNEL is well suited to describing anticipated public reaction to aircraft noise. However, at the extreme conditions, where there are either very many relatively quiet events or a small number of very loud events, public reaction is probably more difficult to gauge, and may not be well described.

To illustrate this point, consider two situations in which the CNEL is the same, but the circumstances are quite different. A CNEL of 65 dB due to a single Boeing 727 departure at 2 a.m. would probably have a different effect on people than a CNEL of 65 dB produced by one hundred small aircraft operations during daytime hours. In the first instance, sleep disturbance would be the primary issue; while, in the second case, the issue could well be speech interference. Additionally, the first example would yield one very intrusive event, with quiet prevailing for the rest of the day. The second case would result in a nearly continuously noisy situation, with an aircraft in the air every few minutes. Whether these situations would be equivalent in terms of annoyance is uncertain.

## **4.2.4 Other Noise Compatibility Measures**

Although not applicable as the primary basis for formulation of noise compatibility policies, certain other noise compatibility measures can play important secondary roles in the determination of noise level acceptability.

### ***Interior Noise Levels***

For many land uses, interior noise levels resulting from exterior noise sources are equally, if not more, important than exterior noise levels as a determinant of acceptability. Furthermore, interior noise level criteria together with data and assumptions regarding the noise level reduction (NLR) provided by the structure can be combined to indirectly indicate a maximum acceptable level of exterior noise.

### ***Factors Affecting Interior Noise Level Criteria***

Various human factors play a part in determining acceptable interior noise levels. For residences, the most important are usually considered to be speech interference and sleep disruption. Speech interference begins to become a problem when steady noise levels reach approximately 60 to 65 dBA. For sleep disruption, the threshold of significance is less absolute in that there is more variability from one person to another. Nevertheless, the

indication from several studies is that the noise threshold for significant occurrence of sleep disruption is higher than for speech interference.

One of the choices involved with setting interior noise level criteria is deciding the appropriate noise metric to apply. As apparent from the preceding paragraph, speech interference and sleep disruption are usually measured in terms of either constant or single-event noise metrics. However, for the purposes of land use or building design criteria, cumulative noise exposure metrics are the easiest to implement in that exterior noise is most often measured in these terms. Additionally, once any two of the variables— interior noise level, exterior noise level, or the NLR value of the structure—are known, the third can be directly calculated through simple addition or subtraction. The problem which arises is that, although there is a general relationship between single-event and cumulative noise metrics, it is not constant from one airport to another.

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*Some ALUCs have adopted peak noise level criteria for intermittent noises. However, as with any single-event metrics, application of these criteria poses questions in defining the number of events considered to be significant.*

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Regardless of these issues, cumulative noise exposure metrics are the most commonly used for interior noise level standards, at least for residential uses. In particular, an interior noise level standard of 45 dB CNEL is typical; though it does not guarantee that aircraft noise will not be heard indoors (loud single events may still be audible). Allowing for at least 20 dB of noise level reduction from the structure with windows closed, this standard equates to an exterior noise level of 65 dB CNEL. Of particular significance within California, the California Building Code sets a CNEL of 45 dB as the maximum acceptable interior noise level for residential uses (other than detached single-family dwellings). Although guidelines for other uses exist, there are no other federal or state interior noise level regulations.

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*Given the noise level reduction provided by standard residential construction, interior noise level standards can generally be satisfied without the need for special sound insulation measures in locations where the exterior noise exposure is less than 60-65 dB CNEL.*

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Problems arise with developing interior standards for other building uses because some are used only occasionally and others (such as concert halls) are especially sensitive to peak noises. Once again, the issue is whether a cumulative noise exposure metric is the most appropriate basis for compatibility standards.

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*As noted previously, one such guideline for the classroom environment is an aircraft Leq of 45 dB during normal schools hours, which the FAA considers as the “usual design objective” for sound insulation of schools. (FAA Order 5100.38C)*

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The objectives of sound insulation programs are to provide a meaningful reduction in aircraft noise inside homes and schools and to satisfy the interior noise standard of 45 dB CNEL. For schools, the interior noise standard is usually assumed to be an hourly Leq of 45 dB during the

peak period of aircraft operations during school hours. Schools are encouraged to meet the American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools (ANSI/ASA S12.60-2010), published by the American National Standard Institute and Acoustical Society of America.

### ***Interior Noise Level Criteria in Land Use Compatibility Planning***

Installation of special sound insulation in structures is often thought to be broadly suitable as a land use compatibility measure for highly noise-impacted locations. It should not be viewed that way, however.

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*Rather than accepting the use of sound insulation as a mitigation action, ALUCs' primary objective should be to prevent development of land uses that are basically incompatible with the noise conditions.*

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The most appropriate application for structural sound insulation is for existing land uses. It is a method of improving existing incompatible conditions when changing the land use to something less noise sensitive is not practical. Even then, though, there are limitations. Sound insulation is not effective for land uses in which noise-sensitive activities take place outdoors. Unlike the case with ground-based noise sources, sound walls and other such devices do nothing to block noise from aircraft while they are in the air.

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*Installation of sound insulation—whether funded by airports as mitigation for noise impacts or set by ALUCs as a condition for approval of new development—should be accompanied by dedication of an aviation easement for aircraft noise to the airport.*

*Also important to remember is that, even where sound insulation may make a high level of noise exposure acceptable, high-intensity land uses may be unacceptable because of safety factors. This topic is addressed further below.*

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*With regard to new development, sound insulation should be regarded as a measure of last resort. It is not a substitute for good land use compatibility planning in the first place.* Exterior noise levels should generally be the primary consideration in evaluation of proposed land uses, especially residential development and other land uses where noise-sensitive outdoor activities are normal and important features.

For those airports where noise exposure levels and the demands for land use development dictate the use of sound insulation, ALUCs have the authority to establish definitive policies. Public Utilities Code (PUC) Section 21675(a) specifically notes that ALUCs may “determine building standards, including soundproofing” when developing ALUCPs. ALUCs have mostly steered clear of setting detailed building standards, however.

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*The California requirements for, and FAA funding of, sound insulation programs apply only to civilian airports. Although similar measures might be appropriate with respect to military airfields, the U.S. military does not have legal authority to insulate civilian structures.*

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Those that deal with the question of acceptable indoor noise levels typically use one of two approaches. One method is to indicate the noise level standards for various indoor building uses and

require project proponents to show how those standards will be met. Another common approach is for the ALUC to establish criteria specifying the amount of NLR a building in a particular noise environment must provide. Again, the details of how the criterion is met are left to the proponent.

In light of these factors, ALUCs contemplating establishment of interior noise level criteria are advised to:

- ◆ Consider whether such criteria are necessary (in general, standard construction will provide adequate noise level reduction in areas where exterior noise levels are below 60 to 65 dB CNEL and when doors and windows will remain closed);
- ◆ Limit the applicability to residences, schools, and other noise-sensitive land uses; and
- ◆ Base the criteria on the CNEL metric unless data to support other measures can be documented.

### 4.2.5 Summary

Table 4C summarizes the concepts and issues involved with establishing noise compatibility criteria, and present sample policies based on the concepts discussed above. The sample policies are intended as *examples only*, and should be tailored to fit the needs of a specific airport or community.

**TABLE 4C: NOISE COMPATIBILITY SUMMARY**

<b>Objective:</b>	Minimize the number of people exposed to frequent and/or high levels of aircraft noise capable of disrupting noise-sensitive activities.
<b>Measurement:</b>	Noise generated by the operation of aircraft is primarily measured in terms of the cumulative noise levels of all aircraft operations to, from, and around an airport. In California, the cumulative noise level metric established by state regulations is the CNEL (see Chapter 3, pg.3-3).
<b>Strategies:</b>	Limit development of land uses which are particularly sensitive to noise.
<b>Basis:</b>	The basic state guidance sets a CNEL of 65 dB as the maximum noise level normally compatible with urban residential land uses. For airports not located in an urban environment, 65 dB CNEL may be too high, and adjustments to noise compatibility criteria may be guided by local standards or an adjustment that reflects ambient sound levels around the airport (e.g., “normalization”).
<b>Sample Policies:</b>	<p>Policy 1: New land use development shall be restricted in accordance with the following criteria.</p> <ul style="list-style-type: none"> <li>a. New residential uses shall be considered incompatible within the CNEL contour determined by the ALUC.</li> <li>b. New nonresidential uses shall be considered incompatible in locations where the airport-related noise exposure would be highly disruptive to the specific land use.</li> </ul> <p>Policy 2: Land uses for which interior activities may be easily disrupted by noise shall be required to comply with the following interior noise level criteria.</p> <ul style="list-style-type: none"> <li>a. For residential uses, 45 dB CNEL in any habitable room of single- or multi-family residences.</li> <li>b. For nonresidential uses, 50 dB in: <ul style="list-style-type: none"> <li>1. Offices;</li> <li>2. Restaurants; and</li> <li>3. Retail stores.</li> </ul> </li> </ul>

## 4.3 OVERFLIGHT

In a pure sense, the acceptability of a given noise level with respect to a particular type of land use should solely be a function of the noise level and the land use. In practice, however, judgments of acceptability are easier to make at high noise exposure levels than at lower ones. At high noise levels, clear evidence exists that human activities associated with certain land uses will be disrupted and many people will be highly annoyed. Accordingly, community policies can be adopted to preclude these land uses under most circumstances.

At lower noise levels, the variability in how people react becomes more of a factor. In these lower noise environments—whether the threshold is at 65, 60, or even 55 dB CNEL—relatively few people are expected to be highly annoyed and the majority will probably not be even moderately annoyed. More important is to give people who may be annoyed by airport noise timely information with which to assess how living in the vicinity of an airport would affect them. In this respect, developing overflight compatibility policies becomes less about restricting land uses, and more focused on informing prospective property owners of the presence of an airport and making them aware of the potential for noise impacts associated with overflying aircraft.

**See Chapter 3 for methods on developing overflight zones.**

### 4.3.1 Buyer Awareness Measures

Some aspects of airport land use compatibility go beyond direct restrictions on the manner in which airport area property is developed and used. Particularly with respect to aircraft overflight annoyance concerns, compatibility between airports and surrounding land uses also can be improved through actions intended to enhance the public's knowledge and understanding of airport impacts. These actions focus on informing prospective buyers of property within the vicinity of an airport about the airport's impact on the property. Collectively, they are referred to as buyer awareness measures.

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*A LUCs are encouraged to adopt policies regarding the use of recorded deed notices and real estate disclosure statements where appropriate within the influence area of each airport.*

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Although variations are sometimes created, measures designed specifically for the purpose of promoting buyer awareness fit mostly into two categories:

- ◆ Recorded deed notices; and
- ◆ Real estate disclosure statements.

#### **Recorded Deed Notices**

A deed notice is an official statement that is recorded in county records as part of a tentative or final subdivision map prepared at the time a parcel is subdivided. As a form of buyer awareness measure, recorded deed notices have broad applicability within an AIA. They can be used to disclose that the property is subject to routine overflights, associated noise, and other impacts by aircraft operating at a nearby airport. Because this information becomes part of the deed to each

**An example of a deed notice is included in Appendix H.**

property in the subdivision, it should show up in a title report prepared when individual parcels are sold.

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***A**LUCs should require recordation of deed notices describing airport impacts as a condition for development approval anywhere in the AIA where avigation easements are not obtained. Avigation easements are not appropriate where buyer awareness is the sole objective.*

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In one sense, deed notices are similar to avigation easements in that they become part of the title to a property and thus are a permanent form of buyer awareness. The distinguishing difference between deed notices and avigation easements is that deed notices only serve as a disclosure of potential overflights (and the fact that the property is located within an AIA), whereas avigation easements convey an identified set of property rights. In locations where height limitations or other land use restrictions are unnecessary, deed notices have the advantage of being less cumbersome to define and establish. Also, they give less appearance of having a negative effect on the value of the property. An ideal application of deed notices is as a condition of approval for development of residential land uses in proximity to an airport where neither noise nor safety are major concerns, but frequent aircraft overflights might be annoying to some people.

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***A** potential shortcoming of deed notices as a buyer awareness measure is that some county recorders reportedly will not record them because they do not affect title to the land. In such cases, the information would be given to the initial purchaser of a new development, but may not be passed along to subsequent buyers (by comparison, avigation easements can always be recorded). According to the State Department of Real Estate, this problem can be overcome if the county board of supervisors adopts an ordinance indicating that such notices should be recorded.*

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### **Real Estate Disclosure Statements**

Another important form of buyer awareness measures represented in ALUC policies is a real estate disclosure statement.

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***A**irport proprietors also can carry out a real estate disclosure program on their own.*

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As discussed in Chapter 3 (pg. 3-10), Business and Professions Code Section 11010(a) and (b)(13) requires that any person intending to sell or lease subdivided land within the influence area of an airport shall include with their notice of intention (filed with the Department of Real Estate) a notice that their property is located in the vicinity of an airport. (Also see Civil Code, Sections 1102.6, 1103.4, and 1353.)

By establishing an AIA, ALUCs create the boundary within which disclosure is deemed appropriate. ALUCs are encouraged to work cooperatively with the local real estate community, including brokers and title companies, to disseminate information regarding these disclosure requirements.

The sole purpose for ALUC adoption of a policy such as this is to help to ensure that information regarding airport impacts will be disclosed as a normal part of real estate transactions. ALUCs have no authority to mandate disclosure of airport-related information. This status applies not only to individual sellers of real property, but to local land use jurisdictions.

Although achievement of buyer awareness objectives are less certain with real estate disclosure policies than with recorded deed notices, an advantage of disclosure is that it is more all-encompassing. Real estate disclosure policies are the only form of buyer awareness measure available to ALUCs that apply to previously existing land uses as well as to new development.

Summary Table 4D summarizes the concepts and issues involved with establishing overflight compatibility criteria, and present sample policies based on the concepts discussed above. The sample policies are intended as *examples only*, and should be tailored to fit the needs of a specific airport or community.

**TABLE 4D: OVERFLIGHT COMPATIBILITY SUMMARY**

<b>Objective:</b>	Notify people near airports of the presence of overflights in order to minimize or avoid annoyance associated with these conditions.
<b>Measurement:</b>	Recorded flight tracks; information on standard operations and traffic patterns of the airport (see Chapter 3, pg.3-12).
<b>Strategies:</b>	Buyer awareness measures.
<b>Basis:</b>	Experience and information from airport proprietors and ALUCs on the noise concerns of the community; state law.
<b>Sample Policies:</b>	<p>Policy 1: California state statutes require that, as part of many residential real estate transactions, information be disclosed regarding whether the property is situated within an AIA. When disclosure is required, state law dictates that the following statement be provided:</p> <p>NOTICE OF AIRPORT IN VICINITY: This property is presently located in the vicinity of an airport, within what is known as the airport influence area. For that reason, the property may be subject to some of the annoyances or inconveniences associated with proximity to airport operations (for example: noise, vibration, or odors). Individual sensitivities to those annoyances can vary from person to person. You may wish to consider what airport annoyances, if any, are associated with the property before you complete your purchase and determine whether they are acceptable to you.</p> <p>Policy 2: As a condition for agency approval of residential land use development, an overflight notification shall be recorded.</p> <ol style="list-style-type: none"> <li>The notification shall contain language as dictated by state law with regard to real estate transfer disclosure (see Policy 1).</li> <li>The notification shall be evident to prospective buyers or renters of a property.</li> <li>A separate recorded overflight notification is not required where an avigation easement is required.</li> <li>An overflight notification is not required for nonresidential development.</li> </ol>

## 4.4 SAFETY

Ideally, to minimize the risk that aircraft accidents pose to people and property on the ground near airports, no development would be allowed in the airport vicinity. For most airports, however, this is clearly not a practical approach to land use compatibility planning. The question thus becomes one of deciding which land uses are acceptable and which are unacceptable in

various portions of airport environs. The resulting policies are normally portrayed in the form of a set of compatibility criteria applicable within each of the previously defined safety zones.

A point to again emphasize is that delineation of safety compatibility zones and definition of criteria applicable within those zones are closely intertwined. The process is usually an iterative one: initial zones and criteria are drafted and then each is fine tuned as necessary in recognition of the peculiarities of the specific airport and its environs. (This process is particularly applicable when compatibility zones and criteria are formulated to take into account a combination of noise and safety compatibility concerns.)

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*While the material presented here is intended to represent Caltrans guidance, it is not the intent or expectation that the methodologies or examples constitute the only acceptable approaches to the issue of airport land use safety compatibility. In development of policies for a specific airport, careful attention must be made to the characteristics of that airport's design and use. Characteristics of the airport environs are potentially factors as well. The safety zones and/or compatibility criteria appropriate at one airport may be inappropriate at a different airport. This process is no different from that necessary in calculation of noise contours and establishment of noise compatibility policies.*

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### 4.4.1 General Approach

Three components of physical risks—spatial distribution, potential consequences, and frequency—provide the conceptual basis for setting safety compatibility policies. Each of these components needs to be considered either in the delineation of safety compatibility zones or in the definition of the criteria applicable within the zones.

- ◆ The spatial distribution component is accounted for by the shape and size of safety compatibility zones.
- ◆ Potential consequences are addressed through the compatibility criteria—the limitations on usage intensity and other land use characteristics that affect the potential severity of an accident.
- ◆ The frequency component can be accounted for either way—through adjustment of zone sizes or the criteria applicable within each zone. Frequency is primarily a factor at airports (or on runways) with very low activity. For most airports, the potential consequences component dominates the overall risk.

The choice of safety criteria appropriate for a particular zone is largely a function of risk acceptability. Land uses that result in intolerable risks usually must be prohibited. Where the risks of a particular land use are considered significant but tolerable, establishment of restrictions may reduce the risk to an acceptable level. Uses that are intrinsically acceptable generally require no limitations.

One of the important goals of an ALUC is to try to minimize the exposure of persons to the potential risk of aviation accidents. The most common way of doing this is to encourage low density development in critical safety zones, namely zones 1, 2, 3 and 4. When reviewing local actions, ALUCs consider if the proposed numbers of persons living or working in critical safety zones is reasonable for a given airport's operation. ALUCs consider the appropriateness of



high-density residential, as well as industrial and commercial developments using higher number of people, in relation to the safety zones.

Finally, to reiterate the point, it is the potentially severe consequences of aircraft accidents that are the driving concern in setting safety compatibility policies. Only where the likelihood of an accident occurrence is so infrequent as to be considered extraordinary does the acceptability of potentially severe consequences reach a level that usually does not warrant some type of compatibility action.

#### 4.4.2 Basic Safety Compatibility Criteria

By emphasizing adjustments to the shape and size of safety zones as necessary to reflect the geographic pattern of aircraft accident risks, the compatibility criteria applicable to each zone can be held relatively constant among most airports within an ALUC's jurisdiction. The types of variables not fully accounted for in the safety zones, though, are ones involving existing land use characteristics of the airport environs. These variables are best addressed via the safety compatibility criteria.

Several factors make it reasonable and even appropriate to set safety compatibility criteria differently for urban areas than for rural locations.

- ◆ A basic distinction is that urban areas are, by definition, more heavily developed than rural communities. Because ALUCs do not have authority over existing land uses, the opportunity to achieve an ideal level of safety compatibility is less in urban locations.
- ◆ The comparatively higher land values in urban areas are also worthy of recognition in setting safety compatibility criteria. Allowing only agricultural or other very-low-intensity uses near airports may be quite feasible in rural areas, but not in urban areas.
- ◆ The established character of land uses in urban places may limit the options for future development. Sometimes all that can be achieved is to hold new development to intensities similar to those that exist. This concept falls under the heading of “infill” (see page 4-44).
- ◆ From the perspective of potential risk consequences, rural areas may be less equipped to deal with an aircraft accident than urban places. Compared to city units, rural emergency response units probably have farther to travel and would have a longer response time to reach an accident site. Treating injuries or fighting fires would be delayed.
- ◆ Finally, a greater societal tolerance for risks—or at least different types of risks—seems to accompany the typically faster pace and higher intensity of life in urban places compared to that of outlying locations.

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*Note that this urban versus rural distinction is not limited just to differences between one airport and another, it may also be true between various portions of individual airport's environs. Consequently, it may be reasonable for compatibility criteria to allow comparatively intensive development and/or infill development in one part of an airport's vicinity, but not in another. If an ALUC chooses to take this approach, however, sufficient reasoning should be provided.*

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Figures 4B through 4G outline some of the qualitative differences in compatibility criteria suitable for each safety zone that was identified in Chapter 3. The basic compatibility criteria for each safety zone are delineated in the following ways:

- ◆ Normally Allow—Typical examples of the use are acceptable.
- ◆ Limit—Use is acceptable with limitations on density or intensity.
- ◆ Avoid—Use generally should be permitted only if an alternative site outside the zone would not serve intended public function.
- ◆ Prohibit—Use should not be permitted under any circumstances.

As discussed above, the suitability of certain densities and intensities may vary by the level of development. The following development characteristics are used in Figures 4B through 4G:

- ◆ Rural—Areas where the predominant land uses are natural or agricultural; buildings are widely scattered.
- ◆ Suburban—Areas characterized by low-rise (1-2 story) development and surface parking lots.
- ◆ Urban—Areas characterized by mid-rise (up to 5 stories) development; generally surface vehicle parking, but potentially some parking structures.
- ◆ Dense Urban—City core areas characterized by extensive mid- and high-rise buildings, often with 100 percent lot coverage and limited surface parking.

Recommended intensities for each zone are minimum standards that are not intended to take precedence over specific criteria in currently adopted ALUCPs.

Other terms used in Figures 4B through 4G are defined as follows:

- ◆ Children’s Schools—Kindergarten through Grade 12. It should be remembered that school districts and community college districts are local agencies subject to Article 3.5 of the State Aeronautics Act.
- ◆ Large Day Care Centers—A facility licensed by the State of California to provide non-medical care and supervision for infant to school age children. Family Child Care Homes are allowed residential uses and do not fall under this category.
- ◆ Aboveground Bulk Fuel Storage—Tank size greater than 6,000 gallons (this suggested criterion is based on Uniform Fire Code criteria).

### ***Relationship of Compatibility Policies to Local Zoning***

While the *Handbook* categorizes land use uses into four compatibility headings (discussed on the previous page and used in Figures 4b through 4G), local zoning usually relies on only three categories: allowed (or allowed by right), conditionally allowed (through a conditional use permit), and not allowed. “Normally Allow” corresponds with uses allowed by right in a particular zoning district, while “prohibit” includes those uses not allowed in a particular zoning district.

“Limit” and “Avoid” are more nuanced than “allowed” and “prohibited” in terms of potential zoning consistency. “Limit” refers to density and intensity, and may be allowed by right if they

fall within a particular range, or may be controlled by conditional use permit. Two examples: (1) for a given safety zone, the *Handbook* recommends a range of 1 unit per 1 to 2 acres, and the local zoning is rural residential, 1-acre minimum lot, therefore the zoning would be consistent with the compatibility criteria; (2) the *Handbook* recommends low-intensity light industrial with a range of 25 to 40, the local zoning allows all industrial uses except hazardous or explosive materials by right, therefore the zoning is potentially inconsistent as there is no way to control the intensity of the allowed use.

Uses identified as “avoid” should either be identified as conditional in a zoning district (with very strict criteria identified), or identified as not allowed (if the local agency has identified suitable alternative sites and is willing to prohibit such uses within that area).

The issue of local plan and zoning consistency is explored further in Chapter 5.

### ***Establishing Nonresidential Compatibility Standards***

*The primary focus when establishing nonresidential compatibility criteria should be on determining the types of land uses that are and are not acceptable within each safety zone.* Among planners and others involved with airport land use compatibility, there is general agreement as to certain types of land uses that are or are not compatible with airports from a safety standpoint: a school near the end of a runway is incompatible, but a typical single-story office or light industrial use is normally fine. It is among the myriad of uses that lie between these two ends of the spectrum that a judgment of compatibility or incompatibility may be less obvious. To set the line between compatible and incompatible, planners have turned to the concept of usage intensity—the number of people per acre—as the best common denominator by which to compare the safety compatibility of most land use types.

Table 4E indicates typical ranges of intensities for a variety of nonresidential uses. The numbers are based upon a relatively small survey sample and thus may differ from community to community. A major factor is the manner in which parking is accommodated: surface lots; multi-level garage; or underground or off-site.

Note that these numbers represent typical busy period usage, not necessarily the absolute maximum. For compatibility planning purposes, this is typically the measure used. Also, it is consistent with the way requirements for numbers of automobile parking spaces are normally set. However, the resulting numbers are generally lower than are produced by using the occupancy level standards found in building and fire codes, which are based upon the absolute peak usage.

**TABLE 4E: AVERAGE INTENSITIES FOR NONRESIDENTIAL USES**

<b>Type of Use</b>	<b>Typical Intensity (people/acre)</b>
Small retail shops (not shopping center)	20 – 30
Local retail centers (grocery/drug store anchor)	65 – 85
“Big Box” centers (single story, surface parking)	90 – 120
Major retail centers / malls (1-2 stories)	150 – 250
Fast food dining	120 – 150
Restaurants	90 – 120
Offices / banks (1-2 stories)	60 – 120
Motels	40 – 60
Light Industrial	20 – 50
Warehouses	10 – 20

Note: Numbers here assume surface parking.

### Nature of Risk

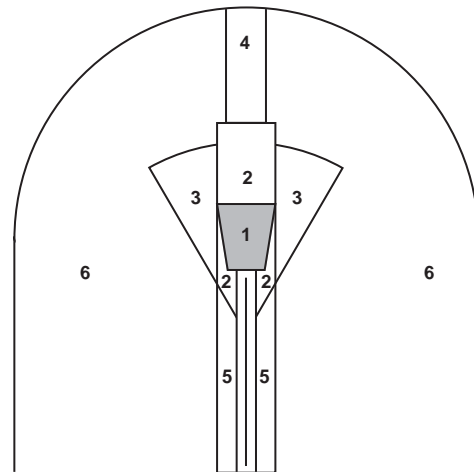
- Normal Maneuvers:
  - Aircraft on very close final approach or departure – very high risk
- Altitude
  - Less than 200 feet above runway
- Common Accident Types
  - Arrival: Downdrafts and wind gusts. Low glide paths
  - Departure: Runway overruns, aborted takeoffs and engine failures
- Risk Level
  - Very high
- Percentage of near-runway accidents in this zone: 20% - 21%



SHORT FINAL

### Basic Compatibility Policies

- Normally Allow
  - None
- Limit
  - None
- Avoid
  - Nonresidential uses except if very low intensity in character and confined to the outer sides
  - Parking lots, streets, roads
- Prohibit
  - All new structures and residential land uses
- Other Factors
  - Airport ownership of property encouraged
  - Uses on airport property subject to FAA standards



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	2x the Average number of people per gross acre
Rural	0	0 – See Note A	0
Suburban	0	0 – See Note A	0
Urban	0	0 – See Note A	0
Dense Urban	0	0 – See Note A	0

Note A: Exceptions can be permitted for agricultural activities, roads, and automobile parking provided that FAA criteria are satisfied.

FIGURE 4B

## Safety Zone 1 – Runway Protection Zone

**Nature of Risk**

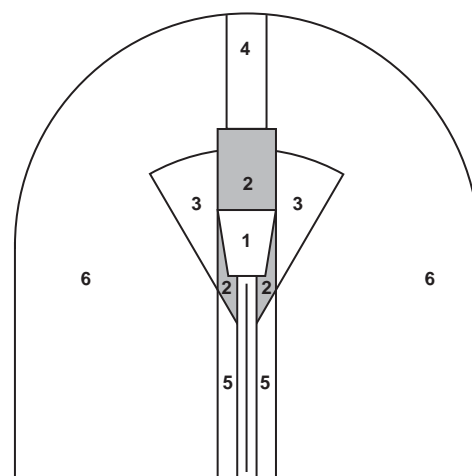
- Normal Maneuvers
  - Aircraft overflying at low altitudes on final approach and straight-out departures
- Altitude
  - Between 200 and 400 feet above runway
- Common Accident Types
  - Arrival: Similar to Zone 1, aircraft under-shooting approaches, forced short landings
  - Departure: Similar to Zone 1, emergency landing on straight-out departure
- Risk Level
  - High
  - Percentage of near-runway accidents in this zone: 8% - 22%



FINAL APPROACH

**Basic Compatibility Policies**

- Normally Allow
  - Agriculture; non-group recreational uses
  - Low-hazard materials storage, warehouses
  - Low-intensity light industrial uses; auto, aircraft, marine repair services
- Limit
  - Single-story office buildings
  - Nonresidential uses to activities that attract few people
- Avoid
  - All residential uses except as infill in developed areas
  - Multi-story uses; uses with high density or intensity
  - Shopping centers, most eating establishments
- Prohibit
  - Theaters, meeting halls and other assembly uses
  - Office buildings greater than 3 stories
  - Labor-intensive industrial uses
  - Children's schools, large daycare centers, hospitals, nursing homes
  - Stadiums, group recreational uses
  - Hazardous uses (e.g. aboveground bulk fuel storage)



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	2x the Average number of people per gross acre
Rural	See Note A	10 – 40	50 – 80
Suburban	1 per 10 - 20 ac.	40 – 60	80 – 120
Urban	0	60 – 80	120 – 160
Dense Urban	0	See Note B	See Note B

Note A: Maintain current zoning if less than density criteria for suburban setting.

Note B: Allow infill at up to average intensity of comparable surrounding uses.

FIGURE 4C

**Safety Zone 2 – Inner Approach/Departure Zone**

### Nature of Risk

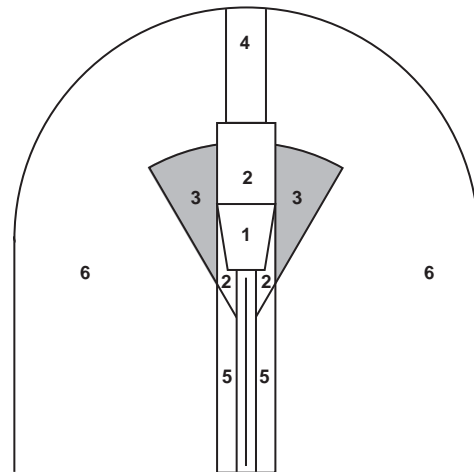
- Normal Maneuvers
  - Aircraft—especially smaller, piston-powered aircraft— turning base to final on landing approach or initiating turn to en route direction on departure
- Altitude
  - Less than 500 feet above runway, particularly on landing
- Common Accident Types
  - Arrival: Pilot overshoots turn to final and inappropriately cross controls the airplane rudder and ailerons while attempting to return to the runway alignment causing stall, spin, and uncontrolled crash
  - Departure: Mechanical failure on takeoff; low altitude gives pilot few options on emergency landing site; or, pilot attempts to return to airport and loses control during tight turn
- Risk Level
  - Moderate to high
  - Percentage of near-runway accidents in this zone: 4% - 8%



TURNING TO FINAL

### Basic Compatibility Policies

- Normally Allow
  - Uses allowed in Zone 2
  - Greenhouses, low-hazard materials storage, mini-storage, warehouses
  - Light industrial, vehicle repair services
- Limit
  - Residential uses to very low densities
  - Office and other commercial uses to low intensities
- Avoid
  - Commercial and other nonresidential uses having higher usage intensities
  - Building with more than 3 aboveground habitable floors
  - Hazardous uses (e.g., aboveground bulk fuel storage)
- Prohibit
  - Major shopping centers, theaters, meeting halls and other assembly facilities
  - Children's schools, large daycare centers, hospitals, nursing homes
  - Stadiums, group recreational uses



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	3x the Average number of people per gross acre
Rural	See Note A	50 – 70	150 – 210
Suburban	1 per 2 - 5 ac.	70 – 100	210 – 300
Urban	See Note B	100 – 150	300 – 450
Dense Urban	See Note B	See Note B	See Note B

Note A: Maintain current zoning if less than density criteria for suburban setting.

Note B: Allow infill at up the average of surrounding residential area.

FIGURE 4D

## Safety Zone 3 – Inner Turning Zone

**Nature of Risk**

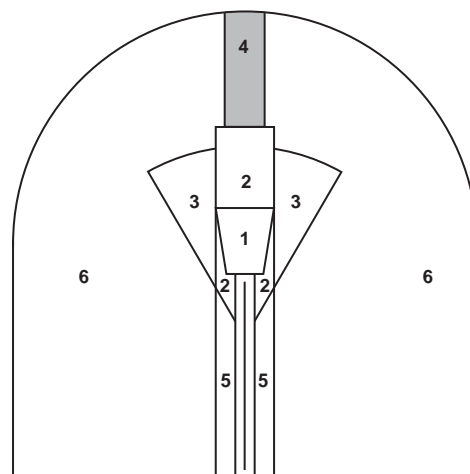
- Normal Maneuvers
  - Approaching aircraft usually at less than traffic pattern altitude. Particularly applicable for busy general aviation runways (because of elongated traffic pattern), runways with straight-in instrument approach procedures, and other runways where straight-in or straight-out flight paths are common
- Altitude
  - Less than 1,000 feet above runway
- Common Accident Types
  - Arrival: Pilot undershoots runway during an instrument approach, aircraft loses engine on approach, forced landing
  - Departure: Mechanical failure on takeoff
- Risk Level
  - Moderate
  - Percentage of near-runway accidents in this zone: 2% - 6%



LONG FINAL

**Basic Compatibility Policies**

- Normally Allow
  - Uses allowed in Zone 3
  - Restaurants, retail, industrial
- Limit
  - Residential uses to low density
- Avoid
  - High-intensity retail or office buildings
- Prohibit
  - Children's schools, large daycare centers, hospitals, nursing homes
  - Stadiums, group recreational uses
- Other Factors
  - Most low to moderate intensity uses are acceptable. Restrict assemblages of people
  - Consider potential airspace protection hazards of certain energy/industrial projects



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	3x the Average number of people per gross acre
Rural	See Note A	70 – 100	210 – 300
Suburban	1 per 2 - 5 ac.	100 – 150	300 – 450
Urban	See Note B	150 – 200	450 – 600
Dense Urban	See Note B	See Note B	See Note B

Note A: Maintain current zoning if less than density criteria for suburban setting.

Note B: Allow infill at up average density/intensity of comparable surrounding users.

FIGURE 4E

**Safety Zone 4 – Outer Approach/Departure Zone**

### Nature of Risk

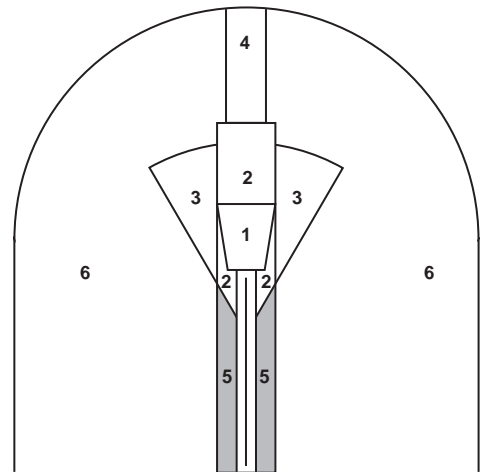
- Normal Maneuvers
  - Area not normally overflown; primary risk is with aircraft (especially twins) losing directional control on takeoff, excessive crosswind gusts or engine torque
- Altitude
  - Runway elevation
- Common accident types
  - Arrival and Departure: Aircraft losing directional control and veering off the side of the runway
- Risk Level
  - Low to moderate
  - Percentage of near-runway accidents in this zone: 3% - 5%



INITIAL LIFT-OFF OR LANDING  
TOUCHDOWN

### Basic Compatibility Policies

- Normally Allow
  - Uses allowed in Zone 4 (subject to height limitations for airspace protection)
  - All common aviation-related activities provided that FAA height-limit criteria are met
- Limit
  - Nonresidential uses similarly to Zone 3
- Avoid
  - Residential uses unless airport related (noise usually also a factor)
  - High-intensity nonresidential uses
- Prohibit
  - Stadiums, group recreational uses
  - Children's schools, large daycare centers, hospitals, nursing homes



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	3x the Average number of people per gross acre
Rural	See Note A	50 – 70	150 – 210
Suburban	1 per 1 - 2 ac.	70 – 100	210 – 300
Urban	See Note B	100 – 150	300 – 450
Dense Urban	See Note B	See Note B	See Note B

Note A: Maintain current zoning if less than density criteria for suburban setting.

Note B: Allow infill at up the average of surrounding residential area.

FIGURE 4F

## Safety Zone 5 – Sideline Zone



### Nature of Risk

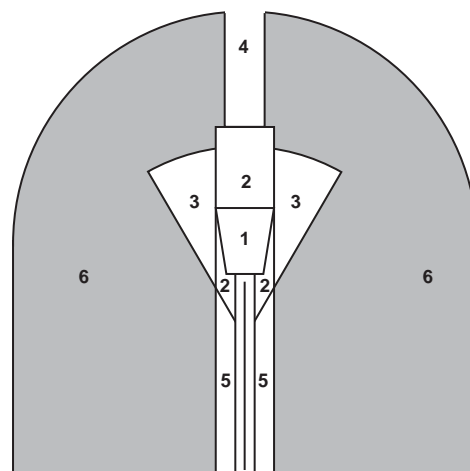
- Normal Maneuvers
  - Aircraft within a regular traffic pattern and pattern entry routes
- Altitude
  - Ranging from 1,000 to 1,500 feet above runway
- Common Accident Types
  - Arrival: Pattern accidents in proximity of airport
  - Departure: Emergency landings
- Risk Level
  - Low
  - Percentage of near-runway accidents in this zone: 18% - 29% (percentage is high because of large area encompassed)



IN TRAFFIC PATTERN

### Basic Compatibility Policies

- Normally Allow
  - Residential uses (however, noise and overflight impacts should be considered where ambient noise levels are low)
- Limit
  - Children's schools, large day care centers, hospitals, and nursing homes
  - Processing and storage of bulk quantities of highly hazardous materials
- Avoid
  - Outdoor stadiums and similar uses with very high intensities
- Prohibit
  - None



Refer to Chapter 3 for dimensions.

	Maximum Residential Densities	Maximum Nonresidential Intensities	Maximum Single Acre
	Average number of dwelling units per gross acre	Average number of people per gross acre	4x the Average number of people per gross acre
Rural	No Limit – See Note A	150 – 200	600 – 800
Suburban	No Limit – See Note A	200 – 300	800 – 1,200
Urban	No Limit – See Note A	No Limit – See Note B	No Limit – See Note B
Dense Urban	No Limit – See Note A	No Limit – See Note B	No Limit – See Note B

Note A: Noise and overflight should be considered.

Note B: Large stadiums and similar uses should be avoided.

FIGURE 4G

## Safety Zone 6 – Traffic Pattern Zone

When picking a specific intensity limit, it is important to look back to the qualitative evaluations of whether a particular use is or is not compatible in a given part of the airport environs. For example, if single-story offices are judged to be an acceptable use in a certain safety zone, but Big Box and major retail is not, then the intensity limit should be set at approximately 80 to 90 people per acre.

### ***Determining Usage Intensities for Specific Land Uses***

Table 4E serves as a general guide regarding the usage intensities that can be expected to be found with these common land uses. They are presented here as an aid in setting the safety criteria within an ALUCP. As individual projects come forward for ALUC review, more exact numbers may be required for a thorough consistency analysis. There are several methods by which intensity numbers can be calculated. These methods are briefly described below and discussed in more detail in Appendix G. The appendix also includes specific numbers related to each calculation method and various land use types.

- ◆ **Building and Fire Codes:** These sources indicate the number of square feet per person (occupancy level) that each person in a building will occupy when the space is filled to its maximum capacity. Except for uses having fixed seating, the occupancy levels used for code purposes do not represent what would be considered a comfortable or normal amount of space per person. Even doubling the square footage (halving the intensity) results in intensities somewhat higher than typical. Nevertheless, reviewing a proposed project relative to this data source is worthwhile for determining the upper limit of expected intensities.
- ◆ **Facility Management Industry:** More realistic numbers for building occupancy levels can be found in various facility management industry sources. These are the numbers used when a particular business is looking for building space and needs an estimate of how much total space will be required given the type of business and staff size.
- ◆ **Local Parking Standards:** Most communities have a fairly comprehensive list of land use types and the number of parking spaces that need to be provided for each type of development. By coupling these numbers with estimates of the number of persons per vehicle for each use, the total number of occupants and the usage intensity can be calculated. In using this method, consideration needs to be given to urban areas and other uses where many persons arrive by means other than personal automobile (i.e., transit, drop-off, bicycle, and walk). The resulting intensity numbers are usually lower than found by using building and fire codes, even when the latter numbers are cut in half, but they represent a good estimate for compatibility planning purposes.
- ◆ **Survey of Comparable Uses:** This method is similar to and effectively underlies the facility management industry data. However, by conducting surveys of similar uses in the same or nearby community, more refined numbers can be derived for use in safety compatibility evaluations.

### **4.4.3 Other Intensity Calculation Issues**

Beyond the matter of setting basic intensity criteria numbers and determining how to measure compliance, several nuances often arise with respect to both processes. The discussion below provides some guidance on these topics.

### ***Gross versus Net Acreage***

The basic difference between these two terms is that gross acreage includes roadway and other public facilities, while net acreage does not. For calculating the density of proposed development projects, gross acreage is commonly used in the planning field, and is appropriate for airport compatibility planning purposes. Local jurisdictions may differ in how gross acreage is applied (for example, are schools and parks subtracted from the gross acreage to determine the net acreage). For developed or partially developed areas, particularly smaller parcels, net acreage may be a more useful number. This is because parcel size is the data readily available and adding a portion of adjacent public streets may cause confusion. Whatever method an ALUC uses, they should apply it consistently in their plan and in subsequent project reviews.

### ***Roads***

Except in the case of major thoroughfares running through runway protection zones and inner safety zones, the number of people in vehicles can generally be ignored in usage intensity calculations. Roads where traffic is frequently stopped in locations immediately beyond runway ends deserve attention. Note, however, that current FAA stance with regard to runway protection zones is that new roads should not run through these areas and any changes to the runway configuration should be designed so that existing roads do not remain. Regardless of these considerations, unless the road is newly planned, ALUCs are unlikely to have the opportunity to review these conditions.

### ***Average versus Peak Usage Intensities***

Limitations on the numbers of people per acre sometimes are stated as a never-to-exceed maximum and sometimes as an average measured over an indicated period (typically 2, 8, or even 24 hours). A combination of the two also is possible (e.g., an average of “x” people per acre over an 8-hour period, not to exceed two times at any time).

It is recommended that usage intensities be calculated based upon the normal maximum use of a site or building. This concept recognizes that higher occupancies may occasionally occur, but not under normal circumstances. This differs from the building and fire code methodology and is more parallel to how parking space standards are set. Nevertheless, if a particular use has a high occupancy during a shift change for example and this activity occurs every day, then the intensities should be calculated on this basis. Averaging the occupancy numbers over an 8 or 24-hour period is not recommended.

### ***Clustering Versus Spreading of Development***

Rarely is the usage intensity of a development spread equally throughout the site. Buildings, for example, normally will have more occupants than the adjacent parking lots. Also, for large developments, most of the buildings and other facilities are sometimes concentrated in one portion of the site, leaving other areas as open space because of terrain, environmental, or other considerations. The latter practice is often referred to as clustering. The issues for ALUCs are whether to place limits on clustering or to encourage the practice. Some of the tradeoffs between clustered and spread-out development are as follows.

- ◆ **Clustered Development**—The premise behind the concept of clustering is that, in a significant percentage of off-airport mishaps, the aircraft are under some degree of control when forced to land. (The reference here to mishaps is intentional—if a forced landing succeeds with no serious injuries or major damage to the aircraft, it would be categorized as an incident and thus not appear in accident records.) If the area remaining undeveloped is relatively level and free of large obstacles, clustering potentially allows a greater amount of open land toward which a pilot can aim. In situations where a parcel is split by two or more safety zones, clustering development can also be an effective means by which to avoid development in a higher risk safety zone. The disadvantage of clustering is that it allows an increased number of people to be in the potential impact area of an uncontrolled crash.
- ◆ **Spread-Out Development**—By comparison, a uniform spreading of development may provide fewer emergency landing spots and increase the chance of someone on the ground being injured. On the plus side, a uniform distribution of development limits the maximum number of people who could possibly be in an impact area.

A compromise between these two strategies represents the optimum approach in most cases. This approach entails limiting the maximum occupancy level of a small area, but otherwise clustering development so as to provide the greatest amount of large open areas. For a small area (one acre is a good guideline), a limitation of two or three times the overall criterion is typical with the lower number applying in safety zones closest to the runway ends.

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*The nonresidential intensity criteria listed in Figures 4B through 4G indicate maximums both averaged over an entire site and for any single acre.*

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### **Uses in Structures versus Uses Not in Structures**

Some ALUCPs make a distinction between the acceptable number of people per acre in land uses where people are outdoors versus those where the people are in a building or other enclosed area.

- ◆ **Outdoor Uses**—One theory is that people outdoors have more of a chance to see a plane coming as well as more directions in which they can move to vacate the impact area. A greater concentration of people thus is sometimes considered acceptable for such land uses. An important exception, however, is for open stadiums and other similar uses where a large number of people are confined in a small area with limited exits. Such facilities can represent equal or higher risks than similar uses in buildings.

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*Taking both of these factors into account, the suggested strategy is to set the acceptable number of people in a given area equal for uses either outdoors or in structures. Additionally, restrictions on stadiums and other open facilities occupied by large numbers of people are appropriate.*

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- ◆ **Uses in Buildings**—Buildings provide substantial protection from the crash of a small airplane, particularly when the aircraft is still under control as it descends. If a building fire subsequently ensues—historically, a relatively infrequent occurrence—it is unlikely to engulf the entire building instantly.

#### 4.4.4 Safety Criteria for Other Types of Land Uses

While usage intensity (people per acre) measures provide the best overall criteria by which to evaluate the safety compatibility of various land uses, certain uses involve risks which either cannot be measured on this scale or it would be inappropriate to do so. Different criteria need to be established for these types of uses. Primary examples are outlined here.

##### ***Residential Uses***

Among land uses for which intensity is not a valid measure of safety compatibility, residential land uses are no doubt the most important. The usage intensity of residential uses clearly can be calculated if data on the number of occupants per dwelling is available or an estimate can be made. Potentially, some allowance can even be made for guests. The resulting numbers, though, would almost always be much lower than for most nonresidential uses, especially if the residential uses are single-family dwellings.

Disregarding noise factors for the moment, this sort of analysis would suggest that residential uses should be considered more acceptable than nonresidential uses in areas at most risk of aircraft accidents. However, society does not generally look at residential uses in this manner. We generally want our homes to be safer than other places. The usage intensities of residential uses thus cannot be directly equated to those of nonresidential uses. Significantly greater protection should be afforded to residential uses with a preference towards low density structures near airports. To clearly reflect these differences, residential uses should be evaluated on a dwelling-unit-per-acre (density) basis. This methodology has the added advantage of being consistent with how residential uses are normally measured. For a discussion of mixed-use development, and calculating density/intensity, see Section 4.6, later in this Chapter.

##### ***Uses with Vulnerable Occupants***

Other types of land uses also tend to be given special deference by the community. These are uses for which risk acceptability cannot be measured simply in terms of the number of occupants. The vulnerability of the occupants to the risks of aircraft accidents must also be considered. In many instances, the appropriate policy may be outright prohibition of new instances of these uses and expansion of existing facilities.

Perhaps the most significant uses on this list are schools. This status is reflected in building codes and other regulations that set higher standards for school buildings. Even with respect to aviation-related impacts, the California Education Code (Section 17215(a)) requires special attention be given to new school sites, dictating that Caltrans review and approve sites within two miles of an airport runway. In general, the community gives special attention to protection of children. Similarly, special consideration should also be given, when formulating safety policies, to other facilities that cater to children such as recreation/after-school centers and sports facilities.

Two other segments of the population whom are often afforded special consideration and protection are the elderly and disabled. As with children, both groups include individuals who may not know how to respond to an emergency or maybe physically unable to do so.

Hospitals, nursing homes, assisted living facilities, and other such uses are ones that usually should be avoided in locations near runways.

### **Other High-Risk Uses**

Two other categories of high-risk uses may not have many occupants, but the consequences of an aircraft accident at the site could nonetheless be elevated. Of particular concern is that these consequences may extend beyond the immediate location of the accident.

Manufacturing, storage, or use of hazardous materials may warrant special consideration depending upon the specific materials and quantities. The concern is whether an aircraft accident could cause an explosion or release of toxic materials, thus posing dangers to the nearby population. Uses that involve the storage of hazardous materials (e.g., gas stations) should be avoided in locations where aircraft may be operating at low altitudes, or where data has shown the risk of accidents to be greater. Specifically, locations where the manufacturing or bulk storage of hazardous materials should be avoided include safety zones one through five.

Public infrastructure represents the other category of uses for which the consequences of damage may extend beyond an accident location. Loss or disruption of facilities, such as power plants, fire or police stations, and emergency communications facilities, can effect wide areas and put many people in jeopardy. Avoiding these uses near runways, providing redundancy at other locations, or designing the facilities to reduce their vulnerability are all appropriate compatibility measures.

### **4.4.5 Minimizing Injury to Aircraft Occupants**

The preceding discussion primarily addresses risks that aircraft accidents pose for people and property on the ground. Obviously, aircraft accidents also put the occupants of aircraft at risk. To some extent, especially for small aircraft, the characteristics of the terrain and land uses into which an aircraft descends can play a part in the survivability of an accident for those on board. This is particularly true when the aircraft is under the pilot's control while descending—in other words, gliding downward without power. Small aircraft can glide a considerable distance under these circumstances—as much as 10 feet per foot of altitude when going straight ahead, but much less if turning. When their aircraft is in distress, pilots will naturally aim for a relatively flat, open piece of land if such areas are available. This tendency also benefits people and property on the ground by reducing the likelihood that occupied buildings will be struck.

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*Although terrain is a critical factor in the survivability of emergency landings, it is not a factor over which ALUCs have any influence. At airports in mountainous or densely forested locations, little open land useful for an emergency landing may exist even if no development is present. For such airports, policies to preserve open land may be pointless. Similarly, open space policies for airports located in densely urbanized locations might be less helpful for compatibility planning purposes. The discussion here is thus directed at airports in less developed, flat, or moderately hilly environs.*

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### ***Characteristics of Open Land***

Ideal emergency landing sites are ones which are long, level, and free of obstacles, much like a runway. Certainly, the closer that open land areas around airports can fit these criteria the better. For small aircraft, however, successful (meaning survivable irrespective of the damage to the aircraft) emergency landings can be accomplished in much less space. Data from the general aviation aircraft accident database indicates that the median swath length for accidents in which the aircraft was under at least some control is less than 150 feet.

As a general guideline, open land sites should be at least 300 feet long by 75 feet wide (about 0.5 acre or the size of a football field) to be considered useful. This is a minimum size and presumes that tall objects do not exist along the approach to the site, thus precluding an aircraft from reaching it. Open land sites should be relatively level and free of objects such as structures, overhead lines, and large trees and poles that can send the plane out of control at the last moment. Parking lots or recreation areas, while not ideal, also can be considered as acceptable open lands in urbanized settings.

### ***Guidelines for Extent of Open Land Near Airports***

Determining the desirable number of open land sites or the percentage of open land in an airport's vicinity is a complex proposition. To assist in this decision, the following three observations are offered:

- ◆ The accident location patterns illustrated in Appendix E reveal that accidents in which aircraft are under control are bunched relatively close to the runway ends—mostly within about 3,000 feet—both for arrivals and departures.
- ◆ The number of takeoff accident sites located a short distance laterally from the departure (climb-out) end of the runway may indicate that pilots have either headed for an open spot in that location or have attempted to turn around and land on the runway from the opposite direction, but not quite succeeded.
- ◆ A pilot's discretion in selecting an emergency landing site is reduced when the aircraft is at low altitude. Particularly at low altitude, the chance of a pilot seeing and successfully landing in a small open area is increased if there are more such spots from which to choose. At traffic pattern altitude (800 to 1,000 feet above the runway), a small airplane should, in the event of engine failure, normally be able to reach the runway from anywhere within the pattern. On takeoff, a small plane generally must have reached an altitude of at least 400 to 500 feet above the runway for a return to the runway to be narrowly possible following engine failure.

Each of these observations speaks to the need for preserving more and preferably larger open areas in locations near runways than in other portions of airport environs. On this basis, the following guidelines are suggested.

- ◆ Runway Protection Zones—Maintain all undeveloped land clear of objects in accordance with FAA standards.

- ◆ Inner Approach/Departure Zones—Seek to preserve 25% to 30% of the overall zone as usable open land. Particular emphasis should be given to preserving as much open land as possible in locations close to the extended runway centerline.
- ◆ Inner Turning Zone—At least 15% to 20% of the zone should remain as open land.
- ◆ Outer Approach/Departure Zones—Maintain approximately 15% to 20% open land within the overall zone, again with emphasis on areas along the extended runway centerline.
- ◆ Sideline Zone—Adjacent to the runway ends and runway protection zones, 25% to 30% usable open land is a desirable objective.
- ◆ Traffic Pattern Zone—Elsewhere within the airport environment, approximately 10% usable open land or an open area approximately every 1/4 to 1/2 mile should be provided.

Open land areas need to meet minimum size criteria to be of value. Therefore, the above guidelines are only practical when applied with respect to land use patterns proposed in general plans, specific plans, or large developments (generally 20 acres or more), not to individual smaller parcels. Both public and private lands should be counted. If the indicated amount of open land can be provided totally on public property, individual private parcels may not need to have any.

See the discussion of inverse condemnation in Chapter 3 on page 3-57.

4.4.6 Summary

Table 4F summarizes the concepts and issues involved with establishing safety compatibility criteria, and presents sample policies based on the concepts discussed above. The sample policies are intended as *examples only*, and should be tailored to fit the needs of a specific airport or community.

TABLE 4F: SAFETY COMPATIBILITY SUMMARY

Objective:	Minimize the risks associated with potential aircraft accidents by providing for the safety of people and property on the ground and enhancing the chances of survival of the occupants of aircraft involved in an accident.
Measurement:	<p>Measuring the degree of safety concerns around an airport involves determining the potential for an accident to occur. To do this, the variables of <i>where</i> and <i>when</i> must be considered.</p> <p><i>Spatial Element:</i> The spatial element describes <i>where</i> aircraft accidents can be expected to occur. Of all the accidents which occur in the vicinity of airports, what percentage occurs in any given area?</p> <p><i>Time Element:</i> the time element adds a <i>when</i> variable to the assessment of accident frequency. In any given location around a particular airport, what is the chance that an accident will occur in a specified period of time?</p>
Strategies:	<p>Safety compatibility strategies focus on the consequences of risk assessment. In essence, land use planning measures should be utilized to try and reduce the severity of an aircraft accident for both people on the ground and in an aircraft. The primary strategy to achieve this goal is to limit the intensity of the use (the number of people concentrated on a site) in locations most susceptible to an off-airport aircraft accident. This can be accomplished by:</p> <p><i>Density and Intensity Limitations:</i> Establishment of criteria limiting the maximum number of dwellings or people in areas close to the airport is the most direct method of reducing the potential severity of an aircraft accident.</p> <p><i>Highly Risk-Sensitive Uses:</i> Certain critical types of land uses—particularly schools, hospitals, and other uses in which the mobility of occupants is effectively limited—should be avoided near the ends of runways regardless of the number of people involved. Critical public infrastructure should be avoided. Aboveground storage of large quantities of highly flammable or hazardous materials also should be avoided near airports.</p>



**TABLE 4F: SAFETY COMPATIBILITY SUMMARY**

*Open Land Requirements:* Creation of requirements for open land near an airport addresses the objective of enhancing safety for the occupants of an aircraft forced to make an emergency landing away from a runway.

Basis:	<p>Setting safety compatibility criteria presents the fundamental question of “what is safe.” Expressed in another way: what is an <i>acceptable risk</i>? In one respect, it may seem ideal to reduce risks to a minimum by prohibiting most types of land use development from areas near airports. However, there are usually costs associated with such high degrees of restrictiveness. In practice, safety criteria are set on a progressive scale with the greatest restrictions established in locations with the greatest potential for aircraft accidents.</p> <p><i>Established Guidance:</i> Little established guidance is available to ALUCs regarding how restrictive to make safety criteria for various parts of an airport’s environs. Unlike the case with noise, there are no formal federal or state laws or regulations which set safety criteria for airport area land uses for civilian airports except within <i>runway protection zones</i> (and with regard to airspace obstructions as described in the next section). FAA safety criteria primarily are focused on the runway and its immediate environment. Runway protection zones—then called clear zones—were originally established mostly for the purpose of protecting the occupants of aircraft which overrun or land short of a runway. Now, they are defined by the FAA as intended to enhance the protection of people and property on the ground.</p> <p><i>Research:</i> Extensive research into the distribution of general aviation aircraft accident locations was conducted in conjunction with the 2002 edition of this <i>Handbook</i>. Research was performed in preparation of this edition to determine if the conclusions reached in the research for the 2002 <i>Handbook</i> is still valid. The results of the 2002 analysis, and the conclusions for the research associated with this edition are contained in Appendix E.</p>
Sample Policies:	<p>Policy 1: Mixed-Use Development – For projects involving a mix of residential and nonresidential uses, the following should apply.</p> <ol style="list-style-type: none"> <li>a. In cases where residential and nonresidential uses are proposed to be situated on separate parts of the same project site, the project should be evaluated as separate developments. The residential density should be calculated with respect to the area(s) to be devoted to this type of land use, and the nonresidential intensity calculated with respect to the area(s) proposed for nonresidential use. If multiple nonresidential uses are proposed, each shall be calculated as occupying a proportion of the total project, with respective allowed intensities. As such, the residential density cannot be averaged over the entire project site when nonresidential uses will occupy some of the area. The same limitation applies to nonresidential uses as well.</li> <li>b. Development in which residential uses are proposed to be located in conjunction with nonresidential uses in the same or nearby buildings on the same site must meet both residential density and nonresidential intensity criteria. The number of dwelling units shall not exceed the density limits established for each safety zone. Furthermore, the normal occupancy of the residential portion shall be added to the nonresidential portion, and the total shall be evaluated with respect to the nonresidential usage intensity criteria for this airport.</li> </ol> <p>Policy 2: Clustering – For clustering (concentrating development into a portion of a project site), the following should act as a guide.</p> <ol style="list-style-type: none"> <li>a. Clustering of new residential uses in the airport’s AIA is limited as follows: <ol style="list-style-type: none"> <li>1. Clustering is not allowed in zones where new residential uses are usually prohibited—typically zones 1, 2, or 5.</li> <li>2. In zones where the risk of an aircraft accident is considered high—typically zones 2 or 3—the density of clustered new residential uses should be kept low, relative to the jurisdiction (e.g., 1 dwelling unit per 1 to 5 acres).</li> <li>3. In zone 4, where the risk of an aircraft accident is lessened but still substantial given its location relative to the runway centerline, the density of clustered new residential uses should be in the mid to mid-low range, relative to the jurisdiction (e.g., 3 to 5 dwelling units per acre).</li> <li>4. Zone 6 typically has no limitations on site wide or single-acre new residential development density.</li> </ol> </li> <li>b. Clustering of nonresidential uses on a single 1.0-acre site should not exceed single-acre intensity limits defined for the particular safety zone the development would be located in. Clustering is discouraged in zones 1, 2, and 3.</li> </ol> <p>Policy 3: Parcels Located Within Two or More Safety Zones – shall be considered as if it were multiple parcels divided at the safety zone boundary line.</p> <ol style="list-style-type: none"> <li>a. If no part of the building(s) proposed on the parcel fall within the more restrictive safety zone, the criteria for the safety zone where the proposed building(s) are located shall apply</li> </ol>

TABLE 4F: SAFETY COMPATIBILITY SUMMARY

for the purposes of evaluation.	
b. If the building(s) proposed on the parcel fall within multiple safety zones, the criteria for the most restrictive safety zone where the building(s) proposed are located shall apply for the purposes of evaluation.	
Policy 4: Infill – Where land uses not in conformance with the criteria set forth in the ALUCP exist at the time of the plan's adoption, infill of similar land uses may be allowed to occur in that area even if the proposed new land use is otherwise incompatible with respect to the compatibility criteria for that location.	
a. Infill development should not be allowed in the following locations:	
1. Any safety zone where residential development has been deemed incompatible (e.g., Safety Zone 1 – Runway Protection Zone).	
2. Residential infill should not be allowed where the dwelling units would be exposed to noise levels higher than the 65 dB CNEL associated with the airport.	
b. In other locations within the AIA, a site can be considered for infill development as long as it is located in an area identified by the local agency as suitable for infill development, and the area meets the following conditions.	
1. Identify the appropriate maximum size of the project site considered for infill—relative to jurisdiction (e.g., no larger than 5, 10, 15, or 20 acres).	
2. At least 65% of the infill area, together with lands lying within 1,000 feet of the perimeter of the infill area, was developed prior to adoption of the ALUCP with uses not in conformance with the plan.	
3. Development of the infill area would not extend the perimeter of the area defined by the existing, incompatible land uses.	
4. Land uses proposed for the infill area are consistent with the local agency general plan and zoning regulations.	
c. A not-to-exceed limit should be established for residential or nonresidential infill projects. Development of the site should not exceed the lesser of:	
1. The median density/intensity represented by all existing residential/nonresidential lots that lie within 1,000 feet from the boundary of the infill area; or	
2. Double the density/intensity permitted within the safety zone in which the proposed infill project is located.	

4.5 AIRSPACE PROTECTION

Compatibility strategies for the protection of airport airspace are relatively simple and are directly associated with the individual types of hazards:

- ◆ Airspace Obstructions: Buildings, antennas, other types of structures, and trees should be limited in height so as not to pose a potential hazard to flight.
- ◆ Wildlife and other Hazards to Flight: Land uses that may create other types of hazards to flight near an airport should be avoided or modified so as not to include the offending characteristic.

4.5.1 Hazards to Flight

Unlike the preceding discussion, which addressed how different land use characteristics can affect the severity of an aircraft accident (for better or worse), hazards to flight can be the cause of an accident. Hazards to flight fall into three basic categories:

See Chapter 3 for a summary of established federal regulations regarding these types of hazards.

- ◆ Obstructions to the airspace required for flight to, from, and around an airport;
- ◆ Wildlife hazards, particularly bird strikes; and
- ◆ Other forms of interference with safe flight, navigation, or communication.

### **Airspace Obstructions**

Limiting the heights of structures to the heights indicated by the FAR Part 77 surfaces provides an ample margin of safety for normal aircraft operations. The guidance provided by FAR Part 77 is not absolute, however. Moreover, deviation from FAR Part 77 standards does not necessarily mean that a hazard to flight exists; instead, deviation requires that the offending objects be evaluated by the FAA and that mitigation, such as marking or lighting, be applied if appropriate.

In some locations, such as adjacent to a runway, objects exceeding the FAR Part 77 height limits may not be regarded as a hazard. On the other hand, tall objects in the approach corridors—especially along instrument approach routes—may pose risks even though they do not penetrate the defined FAR Part 77 surfaces. Such objects also can adversely affect the minimum instrument approach altitudes allowed in accordance with the U.S. Standard for Terminal Instrument Procedures (TERPS). TERPS is particularly likely to be more restrictive than FAR Part 77 when:

- ◆ The approach is not aligned with a runway;
- ◆ The procedure includes a circle-to-land option with low minimums;
- ◆ The missed approach segment has a low minimum altitude and requires a turning movement; and/or
- ◆ High terrain is present beneath portions of the approach procedure which lie beyond the limits of the FAR Part 77 surfaces.

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*The airspace surfaces defined by TERPS are typically complex and not easily mapped. Nevertheless, ALUCPs would benefit by including this information if possible. At a minimum, the plans should note the general locations where TERPS surfaces may be critical. ALUCs should request FAA analysis of tall objects proposed for construction in these areas.*

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### **Wildlife Hazards**

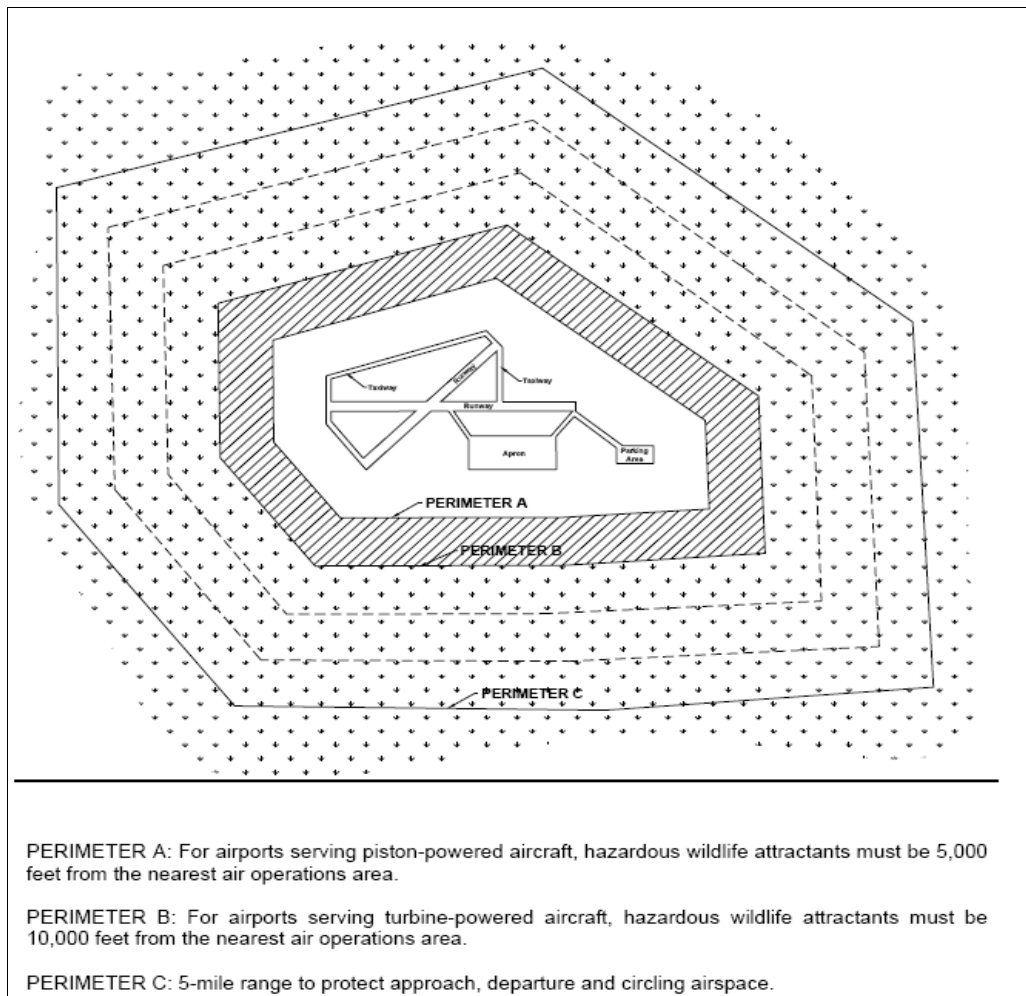
A variety of land uses, facilities, and structures on and near airports can create wildlife hazard attractants that pose a threat to aircraft operations. Examples of these include; sanitary landfills, water management facilities (e.g., drinking water intake and treatment facilities, storm water and wastewater treatment facilities, and ponds built for recreational use), wetlands, agricultural areas, natural areas, and landscaping. Airport owners are encouraged by the FAA to assess potential wildlife hazard attractants on and near airports and to work with local land use planners to avoid the establishment of non-compatible land uses.

The FAA provides guidance on separation criteria for potential wildlife hazard attractants (non-compatible land uses and facilities) within FAA Advisory Circular 150/5200-33B, “Wildlife Hazard

Attractants on and near Airports.” This guidance provides a graphic that identifies a 5,000-foot separation distance from an airport operation area serving piston-powered aircraft, a 10,000-foot separation distance from an airport operation area servicing turbine-powered aircraft, and a 5-mile radius for approach, departure, and aircraft operating in a standard traffic pattern (see Figure 4H).

Though the separation criteria described above in Figure 4H is recommended by the FAA, it may be infeasible for many ALUCs to adopt such far-reaching review boundaries (particularly Perimeter C) in their ALUCPs. However, airport operators, and local land use planners and decision makers should build into their ALUCPs, considerations for the review of land uses, development plans, and conservation plans proposed within an airport’s AIA, on a case-by-case basis to determine their potential for attracting hazardous wildlife. The following sections provide examples of land uses that typically possess features that act as attractants for hazardous wildlife.

**Figure 4H. Separation distances within which hazardous wildlife attractants should be avoided, eliminated, or mitigated.**



Source: FAA AC 150/5200-33B (2007)

### ***Sanitary Landfills***

Sanitary landfills can create wildlife hazard attractants. Federal regulations and guidance apply to locating and/or expanding these types of facilities near airports.

- ◆ Code of Federal Regulation (CFR), Title 40, Part 258, Subpart 10 – These regulations provide criteria for the location of existing, new, and laterally expanding municipal solid waste landfills (MSWLF) within 10,000 feet of a public-use runway end that services jet aircraft and 5,000 feet of a public-use runway end that services piston aircraft. MSWLF facilities within these separation distances must show that they do not create a wildlife attractant that create a hazard to aircraft. This section also states that new MSWLF facilities or proposed lateral expansion of existing facilities within a 5-mile radius of a public-use airport must notify the airport and the FAA.
- ◆ FAA Advisory Circular 150/5200-34-A, Construction or Establishment of Landfills near Public Airports – Provides FAA guidance on compliance with federal statutes regarding construction or establishment of a new municipal solid waste landfill (MSWLF) near a public airport.

### ***Sanitary Sewer Systems***

Open water sanitary sewer systems may create a wildlife hazard attractant due to the aquatic environment that is created with such facilities. New open sanitary sewer systems should be strongly discouraged within the separation distances described in Figure 4H above. If new facilities are proposed within the separation distances, the airport operator should be notified prior to approval.

### ***Stormwater Management Facilities***

A variety of stormwater management facilities are utilized to retain and treat stormwater run-off. Aboveground stormwater facilities may consist of open water features, canal or water conveyance structures, marsh areas, dry detention, and littoral zone areas. Due to the aquatic and vegetative environments associated with these structures, jurisdictions should avoid placement of these features within airport operations area as a minimum measure to decrease potential wildlife hazard attractants. However, it may not be practical to avoid the use of stormwater facilities within the separation criteria described in Figure 4H.

If an airport operator or other land owner within the separation criteria proposes to develop new stormwater management facilities or they have existing stormwater facilities, best management practices be put in place to decrease the potential for wildlife hazard attractants should a stormwater management facility be proposed within the AIA. Potential best management measures could include steep-slope, rip-rapped lined stormwater detention areas (littoral zone planting is strongly discouraged), and vegetation management to control emergent plants in canals, conveyance systems, dry detention areas, and side slopes of detention areas.

Local land use planners, decision makers, and agencies involved in regulating stormwater management in the State of California should be active participants in developing solutions to meet water quantity and quality regulations in conjunction with preventing the development of wildlife hazard attractants on and near airports.

### ***Wetlands***

Wetlands are often used as forms of mitigation for projects on or near airports. However, wetlands are typically considered wildlife hazard attractants. According to FAA AC 150/5200-33B, wetland conservation, preservation, or mitigation is strongly discouraged on airport property and is recommended to remain outside the separation areas identified in Figure 4H for property owners within an AIA. Local land use planners, decision makers, and agencies involved in regulating wetlands in California should be active participants in developing solutions to meet wetland regulation requirements in conjunction with preventing the development of wildlife hazard attractants on and near airports. Consideration should be given to developing off-site wetland mitigation strategies where applicable and the possibility of utilizing wetland mitigation banks that are, at the very least located outside the approach/departure paths of runways, if not the entire AIA.

### ***Agricultural Areas***

Many types of agricultural areas are considered wildlife hazard attractants due to the presence of livestock and an available food source for wildlife. According to AC 150/5200-33B, the FAA discourages agricultural activities, including hay crops, on airport property. If an agricultural area off airport property is determined to create a wildlife hazard attractant, airport operators, land owners, and local land use planners should work collaboratively to develop a strategy to decrease the potential risk to aircraft safety.

### ***Parks, Golf Courses, Natural Resources, and Natural Areas***

According to AC 150/5200-33B, parks, golf courses, natural resources, and natural areas have the potential to create wildlife hazard attractants on or near airports. These areas may provide wildlife corridors, roost sites, rookeries, migratory flyway stop over sites or numerous other functions that may benefit wildlife but, due to their location, may create situations where wildlife are crossing airspace for approach, departing, or training aircraft. These activities may occur well above ground level and out of reach for airport operators to deter the activity.

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**S***afety related guidance on restricting wildlife and birds in the airport environs and on the location of landfills is contained in the following publications:*

- *FAA Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports*
  - *FAA Advisory Circular 150/5200-34-A, Construction or Establishment of Landfills near Public Airports*
  - *Wildlife Hazard Management at Airports: A Manual for Airport Personnel, 2nd Edition, July 2005, prepared by the FAA and USDA*
  - *FAA CertAlert No. 98-05: Grasses Attractive To Hazardous Wildlife*
  - *FAA CertAlert No. 04-16: Deer Hazard to Aircraft and Deer Fencing*
  - *FAA CertAlert No. 06-07: Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports*
  - *FAA provides a web-site with information on management, regulations, and guidance related to wildlife hazards at airports: [http://wildlife-mitigation.tc.faa.gov/public\\_html/index.html](http://wildlife-mitigation.tc.faa.gov/public_html/index.html)*
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ALUCs should work with local land use planners, decision makers, and regulatory agencies to discourage the location of new protected or conservation lands that have the potential to create wildlife hazard attractants within an AIA. An ALUC should be notified prior to the approval of any conservation or protected natural areas being proposed within the airport influence area of an airport. Furthermore, parks or golf courses, which often possess features that act as attractants to hazardous wildlife (e.g., open sources of garbage, water features, etc.), should be avoided in the approach/departure paths of an airport; particularly in close proximity to the runway ends.

Alternatively, parks, golf courses, and certain types of natural areas are, in most cases, preferable to intensive development in the vicinity of airports. In order to prevent the creation of hazardous wildlife attractants, it is recommended that ALUCs build into their ALUCPs provisions requiring the creation of wildlife hazard management plans, if a land use of this type is proposed within an AIA.

### ***Landscaping***

Certain types of landscaping materials and designs may create wildlife hazard attractants on and near airports. Though it is not required, ALUCPs could include guidance on appropriate plants to be used for landscaping of new land uses within an AIA in order to prevent or limit the attraction of hazardous wildlife. This landscape palette could be used to provide guidance to new developments proposed within an AIA.

### ***Other Flight Hazards***

In addition to the physical hazards to flight posed by tall objects and wildlife, other land use characteristics can present visual or electronic hazards.

- ◆ Visual Hazards—Visual hazards include distracting lights (particularly lights which can be confused with airfield lights), glare, and sources of smoke.
- ◆ Electronic Hazards—Electronic hazards include any uses that interfere with aircraft instruments or radio communication. Additionally, wind-turbine farms have been known to interfere with air traffic control (ATC) or military air defense radar.
- ◆ Thermal Hazards—Thermal plumes, including steam, from cooling towers, even when not a visual hazard, may be a hazard to flight by causing air turbulence.

There are no specific FAA standards for these hazards. Potential hazards are evaluated on a case-by-case basis. ALUCs can request an FAA evaluation of proposed development when certain features appear to be potentially hazardous. Also, ALUC policies should require that outdoor lights are shielded so that they do not aim above the horizon. Additionally, for projects near the airport, outdoor lighting should be flight checked at night to ensure that it does not blind pilots during landings and takeoffs.

### ***Energy Projects***

Energy projects that may otherwise be considered compatible uses (due to their low density and high noise tolerance) may require additional review to consider the issues presented above. It

should be kept in mind that California, as well as other states, has laws that encourage the development of alternative energy sources (including wind, solar, and geothermal) where appropriate. Airport land use compatibility should be one of the factors considered in the appropriate placement of these facilities.

### 4.5.2 Summary

Table 4G summarizes the concepts and issues involved with establishing airspace protection compatibility criteria, and present sample policies based on the concepts discussed above. The sample policies are intended as *examples only*, and should be tailored to fit the needs of a specific airport or community.

**TABLE 4G: AIRSPACE PROTECTION COMPATIBILITY SUMMARY**

<b>Objective:</b>	Avoid development of land use conditions which, by posing hazards to flight, can increase the risk of an accident occurring.
<b>Measurement:</b>	<p><i>Airspace Obstructions:</i> The acceptable height of objects near an airport is most commonly determined by application standards set forth in FAR Part 77 of the Federal Aviation Regulations (see Chapter 3, pg. 3-45).</p> <p><i>Wildlife and Other Hazards to Flight:</i> The significance of other potential hazards to flight is principally measured in terms of the hazards' specific characteristics and their distance from the airport and/or its normal traffic patterns (see Chapter 3, pg. 3-50).</p>
<b>Strategies:</b>	<p><i>Airspace Obstructions:</i> Buildings, antennas, other types of structures, and trees should be limited in height so as not to pose a potential hazard to flight.</p> <p><i>Wildlife and Other Hazards to Flight:</i> Land uses that may create other types of hazards to flight near an airport should be avoided or modified so as not to include the offending characteristic.</p>
<b>Basis:</b>	Criteria for determining airspace obstructions and other hazards to flight are established in FAR Part 77 and other FAA regulations and guidelines. California's regulation of obstructions under the State Aeronautics Act (PUC Section 21659) is also based on FAR Part 77 criteria. Guidelines on the avoidance of developing wildlife attractants near airports derives from Advisory Circular 150/5200-33B: Hazardous Wildlife Attractants on or Near Airports.
<b>Sample Policies:</b>	<p>Policy 1: Criteria for determining compatibility of a project as it relates to height shall be based on the standards set forth in FAR Part 77: <i>Objects Affecting Navigable Airspace</i> and applicable airport design standards published by FAA.</p> <ol style="list-style-type: none"> <li>Except as indicated in subpart (b) of this policy, no object shall have a height that would penetrate the airspace protection surface of the airport. Any object that penetrates one of these surfaces is, by FAA definition, considered an obstruction.</li> <li>A proposed object having a height that exceeds the airport's airspace protection surface shall be allowed only if all the following apply: <ol style="list-style-type: none"> <li>Upon conclusion of the FAA's 7460 review process, the FAA determines that the object would not be a hazard to air navigation.</li> <li>Marking and lighting of the object will be installed as directed by the FAA aeronautical study (or Caltrans Division of Aeronautics) in a manner consistent with FAA standards (Advisory Circular 70/7460-1J, <i>Obstruction Marking and Lighting</i>).</li> <li>It is determined that the proposed land use is consistent with the other compatibility standards applicable to the zone in which it is proposed.</li> </ol> </li> <li>An aviation easement shall be dedicated to the airport owner.</li> </ol> <p>Policy 2: Land uses that may cause visual, electronic or wildlife hazards to aircraft in flight or taking off or landing at the airport shall be considered compatible within the airport influence area only if the uses are consistent with FAA rules and regulations.</p> <ol style="list-style-type: none"> <li>Characteristics to be avoided: <ol style="list-style-type: none"> <li>Sources of glare (e.g. mirrored or highly reflective building features) or bright lights;</li> <li>Lights that could be mistaken for airport lights;</li> <li>Sources of steam, dust, or smoke that may impair a pilot's vision;</li> <li>Sources of steam or other emissions that cause thermal plumes or other forms of</li> </ol> </li> </ol>



**TABLE 4G: AIRSPACE PROTECTION COMPATIBILITY SUMMARY**

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- unstable air that is not visible to pilots;
  - 5. Sources of electrical interference with aircraft communications or navigation; and
  - 6. Any proposed use that creates an increased attraction for wildlife and that is inconsistent with FAA rules and regulations as set forth in, but not limited to, AC 150/5200-33B and FAA Order 5200.5A: *Waste Disposal Sites on or Near Airports*. Of particular concern are landfills and certain recreational uses or agricultural uses that attract flocks of birds which can pose as bird strike hazards to aircraft in flight.
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## 4.6 OTHER COMPATIBILITY POLICY CONSIDERATIONS

While policies establishing criteria for development densities and intensities, height limits, and so forth are the core elements of an ALUCP, policies addressing a variety of other issues also should be considered. Clear delineation of ALUC policies on these matters helps to minimize subsequent disputes regarding specific development proposals.

### 4.6.1 Policies for Special Situations

The following are situations which warrant special attention in determining the compatibility or incompatibility of a land use development.

#### ***Expansion, Conversion, or Redevelopment of Existing Uses***

The limitation on ALUC authority over existing land uses applies only to the extent that the use remains constant. Merely because a land use exists on a property does not entitle the owner to expand the use, convert it to a different use, or otherwise redevelop the property if new or increased compatibility conflicts would result. To the extent that such land use changes require ministerial or discretionary approval on the part of the county or city, they fall within the authority of the ALUC to review.

#### ***Infill Development***

Another special situation that ALUCs should consider when formulating compatibility policies is how to deal with infill development. By definition, infill areas are parcels that are vacant or underutilized. The areas thus are subject to ALUC review authority, provided that their development is a part of a general or specific plan amendment or zoning change. The chief issue with regard to infill occurs when the surrounding existing uses are, and proposed new development would be, inconsistent with the ALUC's compatibility criteria. The question which ALUCs need to address is whether it is realistic to attempt to prevent technically incompatible development of a small area surrounded by similar existing development.

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**A** LUCs are not obligated to allow infill development when such development would otherwise be considered incompatible. Nevertheless, infill is a topic that should be discussed with local jurisdictions when ALUCP policies are being drafted.

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ALUCs clearly can determine nonconforming infill uses to be inconsistent with their adopted ALUCP. However, local agencies are particularly likely to disagree with such determinations and potentially to overrule them. From a broader community planning perspective, creating

incompatibility with airport activities may be judged as less of a concern than causing incompatibility between adjacent land uses—for example, by placing commercial or industrial uses in the midst of a residential area.

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*As discussed in the next section, easement dedication and acoustical treatment of structures are particularly important factors with regard to infill and other conditionally compatible development.*

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In these circumstances, a pragmatic approach may be for ALUCs to allow infill in locations not highly critical to airport activities and require local plans to designate compatible uses in the most important areas closest to the runways. Criteria outlining the conditions qualifying a parcel for infill development should be established. These criteria should address such factors as:

The portions of the AIA within which infill is to be permitted (infill within the runway protection zone might be prohibited, for example):

- ◆ The maximum size of a parcel or parcels on which infill is to be allowed;
- ◆ The extent to which the site must be bounded by similar uses (and not extend the perimeter of incompatible uses);
- ◆ The density and/or intensity of development allowed relative to that of the surrounding uses and the otherwise applicable compatibility criteria; and
- ◆ Other applicable development conditions (such as easement dedication requirements or special structural noise level attenuation criteria) which must be met.

### **Mixed Use**

As compatibility is typically expressed in terms of allowable land uses, and associated density/intensity, mixed use development may create some difficulties for ALUCs. Mixed use is often associated with urban infill, and therefore the issues discussed above will also be factors in considering proposed mixed use development. While mixed use may mean any combination of uses separated in traditional zoning (such as commercial and industrial), the most common application of mixed use is housing in combination with commercial development. ALUCPs typically describe the allowable level of such development differently (residential density versus non-residential intensity). One recommendation is to convert residential densities into intensity levels (persons per acre). Such conversion can be done using “persons per household” data from state and regional planning agencies, or to analyze the capacity of the housing unit (such as number of bedrooms).

The applicability of noise criteria may also be different for mixed use. While mixed-use residential development is typically “attached” and thus afforded a certain level of protection from higher noise levels, there is also an assumption that residents of urban mixed-use development will have more tolerance for higher noise levels.

## **Reconstruction**

Reconstruction of existing nonconforming land uses destroyed by fire or other calamity can be treated in a manner similar to infill development. That is, areas where it is acceptable should be defined and appropriate conditions should be set. The conditions—such as limitations on the extent of destruction that can be rebuilt or time within which reconstruction must occur—could be based upon those followed by local agencies in their own plans and zoning. Policies also should indicate whether a reconstructed building must be limited to the same size and usage intensity as the original or can be slightly greater. Lastly, different policies on reconstruction may be appropriate for residential versus nonresidential land uses. Notably, state law allows for the reconstruction of multi-family dwellings involuntarily damaged or destroyed by fire or other catastrophic event (Government Code Section 65852.25). This right does not extend to situations where the health, safety, or general welfare of the neighborhood would be harmed (which could certainly be the case in certain airport compatibility zones).

### **4.6.2 Conditional Compatibility**

Under certain circumstances—such as with infill development as discussed above—ALUCs may find that a proposed land use is potentially consistent, but only under certain conditions. Two important examples where such conditions may be required prior to implementation of a project are avigation easement dedication and acoustical treatment of structures.

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*Requirements for avigation easement dedication and acoustical treatment of structures often go hand in hand. If special acoustical treatment is warranted, an avigation easement for aircraft noise should also be dedicated. Similarly, if noise impacts are a primary reason for requiring avigation easement dedication, then an acoustical analysis to determine the need for special construction measures should be required.*

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## **Avigation Easement Dedication**

As with any type of easement on real property, avigation easements convey certain enumerated property rights from the property owner to the holder of the easement. In this case, the easement holder is usually the airport owner. Easements continue in place as the underlying property is bought and sold (they “run with the land”). Moreover, their existence is documented during the title search conducted at the time of a property transfer. As commonly applied in the aviation industry, avigation easements convey the set of property rights listed in the sidebar below. Easements which establish only the first two of these rights, but do not restrict the height of objects, are often referred to as overflight easements.

Standard avigation easement provisions include the following:

- ◆ A right-of-way for free and unobstructed passage of aircraft through the airspace over the property at any altitude above an imaginary surface specified in the easement (usually set in accordance with FAR Part 77 criteria).
- ◆ A right to subject the property to noise, vibration, fumes, dust, and fuel particle emissions associated with normal airport activity.

- ◆ A right to prohibit the erection or growth of any structure, tree, or other object that would enter the acquired airspace.
- ◆ A right-of-entry onto the property, with appropriate advance notice, for the purpose of removing, marking or lighting any structure or other object that enters the acquired airspace.
- ◆ A right to prohibit electrical interference, glare, misleading lights, visual impairments, and other hazards to aircraft flight from being created on the property.

A sample avigation easement is included in Appendix H.

Historically, many airports have acquired avigation easements—often by purchasing them—on property where noise impacts are substantial or where limitations on the height of structures and trees is essential to protection of runway approaches. Airports also have obtained easements as a condition for airport-financed installation of noise insulation in structures. These continue to be highly appropriate functions for avigation easements.

Many ALUCs have taken the concept a step further by requiring property owners to dedicate an avigation or overflight easement as a condition for obtaining ALUC approval for proposed development. In locations where high noise levels and/or the need for significant restrictions on the height of objects are present, avigation easement dedication requirements are generally warranted and desirable. However, ALUCs should exercise caution in adopting policies which make dedication of an avigation or overflight easement a condition for development approval in less impacted portions of the AIA. In locations where easements would serve primarily as a buyer awareness tool, other mechanisms, as discussed below, are usually more suitable.

No precise standards are available by which ALUCs can decide where avigation easement dedication is or is not appropriate. Nevertheless, useful guidance can be found in both statutory and case law.

California Airport Noise Regulations (California Code of Regulations, Section 5000 et seq.), for example, explicitly support avigation easements as an important land use compatibility tool, albeit under a narrowly defined set of circumstances. Specifically, the regulations deem new development of residential and certain other sensitive uses within the 65 dB CNEL contour of a noise problem airport to be incompatible unless the airport obtains an avigation easement for aircraft noise. Within this noise environment, an increase in incompatible uses without attached avigation easements for aircraft noise would be contrary to two of the fundamental purposes of ALUCs, those being “to promote the overall goals and objectives of the California airport noise standards... and to prevent the creation of new noise and safety problems” (PUC Section 21670(a)(1)).

Although the state regulations explicitly apply only to those few airports deemed to have a noise problem under the regulatory definition of the term, a similar approach is appropriate for ALUCs to adopt in their own policies. That is, wherever ALUC policies indicate that residential land uses are normally incompatible—whether the standard is 65 dB CNEL or a lower level—approval for such development should reasonably be conditioned upon the developer’s dedication of an avigation easement for aircraft noise to the airport.

Another way to view the issue is to consider the circumstances under which the flight of an aircraft over private property—together with the noise and other impacts generated by that overflight—could be deemed a trespass on the land. If a trespass would take place, then an avigation easement should be obtained. Federal law on the limits of air navigation is not clearly delineated, however. Navigable airspace is defined as the airspace above the minimum altitudes of flight prescribed by federal regulations, including airspace needed to ensure safety in the takeoff and landing of aircraft (U.S. Code, Title 49, Section 40102). The best, although not very precise, summary of when an aircraft overflight would be a trespass is outlined in the Restatement of Torts, a document heavily relied upon by lawyers and judges as a synopsis of law. Section 159(2) reads:

“Flight by aircraft in the airspace above land of another is trespass if, but only if, (a) it enters into the immediate reaches of the airspace next to the land, and (b) it interferes substantially with the other’s use and enjoyment of his land.”

Applying these rules, a requirement for dedication of an avigation easement may be reasonable where any of the following conditions exist:

- ♦ Aircraft are expected to be relatively low to the ground (such as where they are below traffic pattern altitude); or
- ♦ Zoning does not adequately restrict the heights of objects in the airport’s environs; or
- ♦ Aircraft noise exceeds the level established as being of local significance.

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*Requirements for avigation easement dedication which go beyond these conditions risk being deemed inverse condemnation—a violation of the U.S. Constitution’s prohibition on taking of private property for public use without just compensation. See Chapter 3 for a discussion on inverse condemnation.*

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Beyond these issues, two practical matters regarding avigation easement dedication need to be recognized. First is the fundamental fact that *avigation easements do not change the noise environment*. They are legal instruments which document that a property is subject to aircraft noise, as well as other impacts. Consequently, ALUCs should not use avigation easement dedication as a principal factor in determining whether a proposed land use is compatible with airport activity. *Unless no feasible alternatives exist, noise-sensitive land uses should be prohibited in high-noise locations regardless of whether an easement is dedicated.*

A second practical consideration is one which arises in more limited circumstances concerning privately owned and military airports. For private airports, the normal arrangement in which the airport owner is the holder of the easement means that a government entity is requiring a transfer of property rights from one private party to another. Even for privately owned airports which are public-use facilities, the legitimacy of this outcome is open to question. For military airports, the problem is more explicit: federal law prohibits federal acceptance of dedicated avigation easements. In both of these circumstances, an alternative which may be feasible is for the county or city in which the airport is situated to be the easement holder.

### ***Acoustical Treatment of Structures***

Another requirement which ALUCs should establish as a condition for development in special circumstances is acoustical treatment of structures. State law requires that “interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room” (California Building Code, Section 1207.11.2). The code applies this standard only to new hotels, motels, dormitories, apartment houses, and dwellings other than single-family residential. However, many local jurisdictions—usually as a policy in the noise element of their general plan—have extended the requirement to single-family residences. ALUCs should do likewise.

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*Any time an ALUC requires special acoustical treatment of a structure as a condition for development approval, dedication of an aviation easement for aircraft noise should also be required.*

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The code indicates that an acoustical analysis is necessary anywhere the annual CNEL exceeds 60 dB. However, given the normal noise level reduction provided by present-day construction standards, special measures are usually not necessary unless the noise level exceeds 65 dB CNEL.

## CHAPTER 5

### RESPONSIBILITIES OF LOCAL AGENCIES







# Responsibilities of Local Agencies

## 5.1 OVERVIEW

Effective airport land use compatibility planning is not and cannot be solely a function of airport land use commissions (ALUCs). Ideally, airport land use compatibility planning recognizes the objectives of the local municipal agency which has ultimate authority for land use planning and regulation, the airport operator which has responsibility for airport operations planning, and the ALUC which has statutory authority for preparation of airport land use compatibility plans (ALUCPs) and review of local land use plans and actions. Indeed, as outlined in Chapter 1 (pg. 1-2), state law specifically limits ALUC authority over various actions that directly affect compatibility. Much of the responsibility for airport land use compatibility clearly remains with local agencies whether in the role of controlling land use or operating an airport.

Local agency responsibility for airport land use compatibility planning is particularly critical in counties that have chosen to utilize the designated agency. As indicated in Chapter 1, establishment of the designated agency in a county only eliminates the requirement for formation of an airport land use commission, not the obligation to plan for and achieve compatible land uses surrounding airports. The obligation for preparation, adoption, and implementation of an ALUCP remains and rests directly and more fully upon local jurisdictions when an ALUC does not exist than when it does.

**Topics in this chapter include:**

- **Consistency of local plans and ordinances with ALUC plans;**
- **Submitting land use actions for ALUC review;**
- **Compatibility planning in counties that do not have an ALUC;**
- **Overruling an ALUC action;**
- **The role of airport proprietors in airport land use compatibility planning.**

## 5.2 LOCAL PLANS CONSISTENCY WITH ALUCP

### 5.2.1 Requirements

State statutes require that, once an airport land use commission has adopted or amended an ALUCP, general plans and any applicable specific plans be amended, as necessary, in order to be consistent with the ALUCP (Government Code [Gov. Code] Section 65302.3(a)-(b)). Alternatively, local agencies have the option of taking the special steps necessary to overrule all or part of the ALUCP (*id.* at (c)). If a local agency fails to take either action (i.e., amend local plans to be consistent with the ALUCP *or* overrule), then it is required to submit all land use development actions involving property within the airport influence area to the ALUC for review (Public Utilities Code [PUC] Section 21676.5(a)).

Counties, cities, special districts, school districts, and community college districts are collectively referred to in this Chapter as "local agencies." Additionally, all plans adopted or implemented by any of the referenced local agencies are collectively referred to in this Chapter as "local plans."

This section addresses the options available to local agencies when revising their plans to be consistent with the ALUCP. The latter two topics—requirements for overruling of the ALUC and submitting actions for ALUC review—are examined later in this chapter.

### 5.2.2 General Plan Review and Amendment Process

Two key facets of the process by which a local agency modifies its general plan and any specific plans for consistency with the ALUCP are important to highlight.

#### *Preliminary Review by ALUC*

In conjunction with an action to prepare or amend an ALUCP, ALUCs may conduct a preliminary review of affected local plans. The review should focus on identifying any obvious direct conflicts between the plans, to the extent feasible. Equally important to note are significant omissions from the local plans with respect to compatibility criteria and review procedures. These preliminary reviews are necessary when completing an initial study or environmental impact report during the CEQA process. With this information in hand, local agencies can better understand the implications of a proposed ALUCP with respect to their own plans. Furthermore, the preliminary review may enable local agencies to be more focused in their efforts to modify their plans. The process of making the necessary changes to general plans and specific plans can thus be eased.

It is important for all parties to recognize, however, that any such reviews are preliminary. Ultimately, the onus for revising a local plan to be consistent with an ALUCP plan rests with the local agency. And, local agencies still must go through the steps of submitting the specific policy language, maps, and other plan components to the ALUC for formal review and approval.

#### *180-Day Time Limit*

State law provides that a local agency must either modify its local plan(s) or to take the steps necessary to overrule the ALUC within 180 days of when an ALUC adopts or amends its ALUCP (Gov. Code Section 65302.3(b)-(c)). As a practical matter, this time limit can be difficult to accomplish. Unless the necessary changes to the local plan(s) are minor, the time required to draft, circulate, and adopt the modifications together with essential environmental review can easily exceed 180 days. This fact notwithstanding, it is incumbent upon local agencies to move forward as expeditiously as possible to meet the deadline.

The chief consequence of not meeting this deadline is that the ALUC can begin requiring—if it is not already doing so—that all of the jurisdiction's land use actions, regulations, and permits be submitted to the commission for review (PUC Section 21676.5(a)). This requirement can continue until such time as the local agency amends its plan(s) or overrules the ALUC, which may cost more time and money on the part of applicants and local jurisdictions.

### 5.2.3 Means of Achieving Consistency

Making a local plan consistent with the ALUCP involves more than elimination of direct conflicts. Other aspects of compatibility planning also must be addressed. In particular, local

agencies must establish procedures that implement and ensure compliance with compatibility policies. To do this, local plans and/or policies must:

- ◆ Delineate the compatibility criteria to be applied to individual development actions;
- ◆ Identify the mechanisms to be used to ensure that applicable compatibility criteria are incorporated into site specific development projects; and
- ◆ Indicate the procedures to be followed in review and approval of development actions affecting lands within the airport influence area, recognizing that certain types of land uses are not subject to discretionary approvals (but can be subject to appropriate ministerial development standards).

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*As widely applied in airport land use planning, “consistency” does not require being identical. It means only that the concepts, standards, physical characteristics, and resulting consequences of a proposed action must not conflict with the intent of the law or the ALUCP to which the comparison is being made.*

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An expanded list of the various factors to be considered by local agencies when modifying their plans and policies is included in Table 5A. This checklist is not necessarily all-encompassing. Depending upon the nature of the policies adopted by the ALUC, other factors may need to be addressed and some of those listed may not be applicable.

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*The primary purpose of the checklist provided in Table 5A is to assist local agencies with necessary modifications and additions to their plans and policies. The checklist is also designed to facilitate ALUC reviews of local plans. The list will need to be modified to reflect the policies of each individual ALUC and is not intended as a state requirement.*

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Local plans can be made consistent with an ALUCP through various methods. The method that is most suitable to a particular local agency depends in part upon the manner in which the ALUCP criteria and maps are formatted, but even more upon choices to be made by each individual local agency as to the structure of its planning programs, policies, development regulations and review processes. As discussed in Chapter 3 (pg. 3-42), some ALUCPs rely primarily upon composite, performance-type criteria, while others use list-oriented criteria. The first key decision to be made by each affected local agency is whether to fully incorporate compatibility criteria and procedures into their land use plans, ordinances, and regulations and thus mostly internalize the project review process or to defer review of major land use actions to the ALUC. Next, the local agency needs to decide whether to incorporate compatibility criteria into its plans and ordinances in the same format (e.g., performance criteria, prescriptive regulations, or mapping) as the airport land use plan, or to adapt the format of the airport plan’s compatibility criteria to better fit with the format of the local agency’s plans, ordinances, and development review processes.

**TABLE 5A: GENERAL PLAN CONSISTENCY CHECKLIST**

For additional guidance see:	COMPATIBILITY CRITERIA
<p>This checklist is intended to assist local agencies with modifications necessary to make their local plans and other local policies consistent with the ALUCP. It is also designed to facilitate ALUC reviews of these local plans and policies. The list will need to be modified to reflect the policies of each individual ALUC and is not intended as a state requirement.</p>	
	<p><b>General Plan Document</b></p> <p>The following items typically appear directly in a general plan document. Amendment of the general plan will be required if there are any conflicts with the ALUCP</p>
Page 6-17	<ul style="list-style-type: none"> <li>• <b>Land Use Map</b>—No direct conflicts should exist between proposed new land uses indicated on a general plan land use map and the ALUC land use compatibility criteria. <ul style="list-style-type: none"> <li>– Residential densities (dwelling units per acre) should not exceed the set limits.</li> <li>– Proposed nonresidential development needs to be assessed with respect to applicable intensity limits (see below).</li> <li>– No new land uses of a type listed as specifically prohibited should be shown within affected areas.</li> </ul> </li> </ul>
Pages 3-8	<ul style="list-style-type: none"> <li>• <b>Noise Element</b>—General plan noise elements typically include criteria indicating the maximum noise exposure for which residential development is normally acceptable. This limit must be made consistent with the equivalent ALUCP criteria. Note, however, that a general plan may establish a different limit with respect to aviation-related noise than for noise from other sources (this may be appropriate in that aviation-related noise is sometimes judged to be more objectionable than other types of equally loud noises).</li> </ul>
	<p><b>Zoning or Other Policy Documents</b></p> <p>The following items need to be reflected either in the general plan or in a separate policy document such as a combining zone ordinance. If a separate policy document is adopted, modification of the general plan to achieve consistency with the ALUCP may not be required. Modifications would normally be needed only to eliminate any conflicting language which may be present and to make reference to the separate policy document.</p>
Page 4-26, Appendix G	<ul style="list-style-type: none"> <li>• <b>Intensity Limitations on Nonresidential Uses</b>—ALUCPs may establish limits on the usage intensities of commercial, industrial, and other nonresidential land uses. This can be done by duplication of the performance-oriented criteria—specifically, the number of people per acre—indicated in the ALUCP. Alternatively, ALUCs may create a detailed list of land uses which are allowable and/or not allowable within each compatibility zone. For certain land uses, such a list may need to include limits on building sizes, floor area ratios, habitable floors, and/or other design parameters which are equivalent to the usage intensity criteria.</li> </ul>
Pages 3-11, 4-29, Figures 4B - G	<ul style="list-style-type: none"> <li>• <b>Identification of Prohibited Uses</b>—ALUCPs may prohibit schools, day care centers, assisted living centers, hospitals, and other uses within a majority of an airport's influence area. The facilities often are permitted or conditionally permitted uses within many commercial or industrial land use designations.</li> </ul>
Page 4-31	<ul style="list-style-type: none"> <li>• <b>Open Land Requirements</b>—ALUCP requirements, if any, for assuring that a minimum amount of open land is preserved in the airport vicinity must be reflected in local policies. Normally, the locations which are intended to be maintained as open land would be identified on a map with the total acreage within each compatibility zone indicated. If some of the area included as open land is private property, then policies must be established which assure that the open land will continue to exist as the property develops. Policies specifying the required characteristics of eligible open land should also be established.</li> </ul>
Page 3-56, 4-18, 4-42	<ul style="list-style-type: none"> <li>• <b>Infill Development</b>—If an ALUCP contains infill policies and a jurisdiction wishes to take advantage of them, the lands that meet the qualifications must be shown on a map.</li> </ul>
Pages 3-29, 4-35	<ul style="list-style-type: none"> <li>• <b>Height Limitations and Other Hazards to Flight</b>—To protect the airport airspace, limitations must be set on the height of structures and other objects near airports. These limitations are to be based upon FAR Part 77. Restrictions also must be established on other land use characteristics which can cause hazards to flight (specifically, visual or electronic interference with navigation and uses which attract birds). Note that many jurisdictions have already adopted an airport-related hazard and height limit zoning ordinance which, if up to date, will satisfy this consistency requirement.</li> </ul>

TABLE 5A: GENERAL PLAN CONSISTENCY CHECKLIST

For additional guidance see:	COMPATIBILITY CRITERIA
Pages 3-9, 4-14	<ul style="list-style-type: none"> <li>• <b>Buyer Awareness Measures</b>—Besides disclosure rules already required by state law, as a condition for approval of development within certain compatibility zones, some ALUCPs require either dedication of an aviation easement to the airport proprietor or placement on deeds of a notice regarding airport impacts. If so, local agency policies must contain similar requirements.</li> </ul>
Page 4-42	<ul style="list-style-type: none"> <li>• <b>Nonconforming Uses and Reconstruction</b>—Local agency policies regarding nonconforming uses and reconstruction must be equivalent to or more restrictive than those in the ALUCP, if any.</li> </ul>
	<b>REVIEW PROCEDURES</b> In addition to incorporation of ALUC compatibility criteria, local agency implementing documents must specify the manner in which development proposals will be reviewed for consistency with the compatibility criteria.
Page 6-1	<ul style="list-style-type: none"> <li>• <b>Actions Always Required to be Submitted for ALUC Review</b>—PUC Section 21676 identifies the types of actions that must be submitted for airport land use commission review. Local policies should either list these actions or, at a minimum, note the local agency's intent to comply with the state statute.</li> </ul>
Page 6-5	<ul style="list-style-type: none"> <li>• <b>Other Land Use Actions Potentially Subject to ALUC Review</b>—In addition to the above actions, ALUCPs may identify certain major land use actions for which referral to the ALUC is dependent upon agreement between the local agency and ALUC. If the local agency fully complies with all of the items in this general plan consistency check list or has taken the necessary steps to overrule the ALUC, then referral of the additional actions is voluntary. On the other hand, a local agency may elect not to incorporate all of the necessary compatibility criteria and review procedures into its own policies. In this case, referral of major land use actions to the ALUC is mandatory. Local policies should indicate the local agency's intentions in this regard.</li> </ul>
Pages 5-10, 6-13	<ul style="list-style-type: none"> <li>• <b>Process for Compatibility Reviews by Local Agencies</b>—If a local agency chooses to submit only the mandatory actions for ALUC review, then it must establish a policy indicating the procedures which will be used to assure that airport compatibility criteria are addressed during review of other projects. Possibilities include: a standard review procedure checklist which includes reference to compatibility criteria; use of a geographic information system to identify all parcels within the airport influence area; etc.</li> </ul>
Page 6-9	<ul style="list-style-type: none"> <li>• <b>Variance Procedures</b>—Local procedures for granting of variances to the zoning ordinance must make certain that any such variances do not result in a conflict with the compatibility criteria. Any variance that involves issues of noise, safety, airspace protection, or overflight compatibility as addressed in the ALUCP must be referred to the ALUC for review.</li> </ul>
Page 5-10	<ul style="list-style-type: none"> <li>• <b>Enforcement</b>—Policies must be established to assure compliance with compatibility criteria during the lifetime of the development. Enforcement procedures are especially necessary with regard to limitations on usage intensities and the heights of trees. An airport combining district zoning ordinance is one means of implementing enforcement requirements.</li> </ul>

Four general strategies for fully achieving consistency are outlined below.

- ◆ Incorporate policies into one or more existing general plan elements—One method of achieving the necessary planning consistency is to modify existing general plan elements. For example, (1) airport land use compatibility policies could be inserted into the land use element or (2) noise policies could be inserted into the noise element, safety policies could be placed into a safety element, and the primary compatibility criteria and associated maps plus the procedural policies might fit into the land use element. With this approach, direct conflicts would be eliminated and the majority of mechanisms and procedures to ensure compliance with compatibility criteria could be fully incorporated into a local agency's general plan.<sup>1</sup> The primary limitation with this approach is that ministerial development project approvals might not be specifically reviewed for consistency with the agency's General Plan, relying instead on the presumption that a ministerial project that meets the development standards set forth in its development code is consistent with the General Plan. Thus, using this approach needs to be followed up with ordinance requirements that would ensure implementation of applicable policies for ministerial development approvals.

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*Local agencies cannot simply ignore the need to respond to an ALUC's adoption of an ALUCP. If a local agency neither amends its plans as necessary nor overrules the ALUC, it must cooperate with any commission request that all or selected land use actions, regulations, and permits affecting the airport influence area be submitted for review.*

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- ◆ Adopt a General Plan Airport Element—Another approach is to prepare a separate airport element of the general plan. Such a format may be advantageous when a community's general plan also needs to address on-airport development and operational issues. Modification of other plan elements to provide cross-referencing and eliminate conflicts would still be necessary.<sup>2</sup> As with incorporating airport compatibility policies into existing General Plan elements, care should be taken to ensure that the policies are applied to both discretionary and ministerial development reviews.
- ◆ Adopt ALUCP as Stand-Alone Document—Local agencies selecting this option could simply adopt as a local policy document the relevant portions of the ALUCP. Changes to the community's existing plan(s) would be minimal. Policy reference to the separate ALUCP document would need to be added and any direct land use or other conflicts with compatibility planning criteria would have to be removed from local plan(s). Limited discussion of compatibility planning issues could be included in the local plan(s), but the substance of most compatibility policies would appear only in the stand-alone ALUCP. The key to this method lies in ensuring that the provisions of the stand-alone document carry over to discretionary and ministerial development project approvals.
- ◆ Adopt Airport Combining District or Overlay Zoning Ordinance—Local agency adoption of an airport combining district or overlay zoning ordinance is a way to codify airport compatibility criteria identified only in concept in the local plan(s). Other than where direct conflicts need to be eliminated from the local plans, implementation of the compatibility policies would essentially be accomplished solely through the zoning ordinance. Policy reference to airport compatibility in the local plan(s) could be as simple as mentioning support for the airport land use commission and its ALUCP, stating that policy implementation is by means of the combining zone.

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<sup>1</sup> This approach could equally apply to a specific plan, area plan, community plan or other similar land use planning document.

<sup>2</sup> This approach could equally apply to a specific plan, area plan, community plan or other similar land use planning document.

### 5.2.4 Land Use Compatibility Strategies

Beyond the issue of achieving mandated consistency between local plans and an ALUCP is the broader question of what local agencies can do to preserve and enhance compatibility between airport activities and the land uses around the airport. Several strategies are available to help attain this objective. If the local agency takes land use actions such as the ones discussed here, any inconsistencies between its local plan(s) and the ALUCP are likely to be few. These strategies also are appropriate for jurisdictions in counties using the alternative compatibility planning process.

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*If airport land use compatibility objectives are to be obtained, local agencies must take direct actions such as those described here.*

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#### **Land Use Designations**

If compatibility between an airport and its surroundings is to be achieved, designation of appropriate land uses in local plans is essential. This is particularly true in developing areas—good planning today can avoid significant conflicts later. The value of designating compatible land uses in built-up areas should not be overlooked, however. Appropriate designations can serve to identify already incompatible uses as nonconforming and thus limit the potential for expansion or modification of the uses to worsen the incompatibility. Designating compatible uses also can facilitate redevelopment and economic development activities and encourage eventual change of currently incompatible uses to ones that are better suited to the environs of an airport.

#### **Overlay Zones or Combining Districts**

For purposes of airport land use compatibility planning, land use plan and zoning designations as commonly adopted by local agencies have a notable shortcoming. Specifically, such plans and designations are generally intended to identify types of permitted land use and development intensities in terms of numbers of units or building area, as well as set general purpose development standards. Seldom do such plans and designations have an aviation orientation or address the specific issue of compatibility with aviation activities (i.e., noise and safety). The Table 5A checklist of factors is essential to making a local plan consistent with an ALUCP and highlights many of the reasons why consistency is seldom achieved without explicit consideration of aviation issues.

One way local agencies can address the need for an aviation orientation in basic land use designations within airport influence areas is to adopt an airport compatibility overlay zone or combining district ordinance. A combining district can supplement local land use designations by adding specific noise and, often more importantly, safety criteria (e.g., maximum number of people permitted on the site, site design and open space criteria, height restrictions, etc.) applicable to future development in the airport vicinity. Project review procedures and other implementation mechanisms specific to airport area development proposals can also be defined. Geographically, the combining district should cover at least the entire airport influence area as defined by the ALUC in its ALUCP.

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*Possible components of an airport compatibility combining zoning ordinance are listed in Table 5B. The compatibility concerns which form the basis for these components are described as well.*

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An airport overlay zoning ordinance has several important benefits. Most importantly, it permits the continued utilization of the majority of the design and use guidelines contained in the existing local plan and zoning ordinance. At the same time, it provides a mechanism for implementation of airport area related restrictions and conditions that may apply to only a few types of land uses within a given land use category or zoning district. This avoids the need for a large number of discrete zoning districts. It also enables local plans to attain consistency with an ALUCP through reference to basic compatibility criteria rather than through redefinition of existing land use designations.

### **Buyer Awareness Measures**

Buyer awareness measures serve to alert prospective airport vicinity residents about the airport and its impacts. Three basic forms of buyer awareness measures are most common in airport land use compatibility practice:

- ◆ Recorded deed notices;
- ◆ Real estate disclosure statements; and
- ◆ Avigation easements (not recommended if intended *only* as a buyer awareness measure).

While ALUCs may define policies establishing how and where each of these measures should be used, the effectiveness of each is enhanced by actions that local agencies can take. Chapter 3 contains a discussion of the applicability of each of these measures to accomplishment of airport land use compatibility planning objectives.

## **5.3 SUBMITTING PROJECTS FOR REVIEW**

### **5.3.1 Reviews by Airport Land Use Commissions**

In counties where an ALUC exists, the obligations of local agencies with regard to submitting land use projects and other actions for the commission's review are well defined in state law. If local agencies choose to ignore the legal requirement for such review, ALUCs can initiate the review process on their own and seek a writ of mandate to force the local agency to provide the necessary project information.

The types of land use projects to be submitted depend upon:

- ◆ Whether an ALUCP has been adopted by the ALUC;
- ◆ What action the local agency has taken with regard to making its local plan(s) consistent with the ALUCP;
- ◆ Whether the project requires an amendment to the local plan; and
- ◆ Whether voluntary agreements for the review of projects have been established.

**Note that local agencies that also are airport proprietors are obligated to submit certain airport plans for ALUC review.**



**TABLE 5B: POSSIBLE AIRPORT COMBINING ZONE COMPONENTS**

An airport compatibility combining zoning ordinance might include some or all of the following components:

**Airspace Protection**—A combining district can establish restrictions on the height of buildings, antennas, trees, and other objects as necessary to protect the airspace needed for operation of the airport. These restrictions should be based upon the current version of FAR Part 77, Objects Affecting Navigable Airspace, Subpart C. Additions or adjustment to take into account TERPS surfaces should be made as necessary. Provisions prohibiting smoke, glare, bird attractions, and other hazards to flight should also be included.

**FAA Notification Requirements**—Combining districts also can be used to ensure that project developers are informed about the need for compliance with the notification requirements of FAR Part 77. Subpart B of the regulations requires that the proponent of any project which exceeds a specified set of height criteria submit a Notice of Proposed Construction or Alteration (Form 7460-1) to the Federal Aviation Administration prior to commencement of construction. The height criteria associated with this notification requirement are lower than those spelled out in FAR Part 77, Subpart C, which define airspace obstructions. The purpose of the notification is to determine if the proposed construction would constitute a potential hazard or obstruction to flight. Notification is not required for proposed structures that would be shielded by existing structures or by natural terrain of equal or greater height, where it is obvious that the proposal would not adversely affect air safety.

**State Regulation of Obstructions**—State law prohibits anyone from constructing or altering a structure or permitting an object of natural growth to exceed the heights established by FAR Part 77, Subpart C, unless the FAA has determined the object would not or does not constitute a hazard to air navigation (PUC Section 21658 and 21659).

**Designation of High Noise-Impact Areas**—California state statutes require that multi-family residential structures in high-noise exposure areas be constructed so as to limit the interior noise to a Community Noise Equivalent Level of no more than 45 dB. A combining district could be used to indicate the locations where special construction techniques may be necessary in order to ensure compliance with this requirement. The combining district also could extend this criterion to single-family dwellings.

**Maximum Densities/Intensities**—Airport noise and safety compatibility criteria are frequently expressed in terms of dwelling units per acre for residential uses and people per acre for other land uses. While general plans typically use these measures of maximum density/intensity for land uses, zoning ordinances generally use minimum lot sizes and setbacks, along with building height restrictions. These standards often supplement, but do not translate directly into general plan density/intensity standards. Incorporation of airport area-related density/intensity standards measured in the same manner as a General Plan can either be directly included in a combining zone or used to modify the underlying land use designations. For residential land uses, the correlation between the compatibility criteria and land use designations is direct. For other land uses, the method of calculating the intensity limitations needs to be defined. Alternatively, a matrix can be established indicating whether each specific type of land use is compatible with each compatibility zone. To be useful, the land use categories need to be more detailed than typically provided by general plan or zoning ordinance land use designations.

**Open Areas for Emergency Landing of Aircraft**—In most circumstances in which an accident involving a small aircraft occurs near an airport, the aircraft is under control as it descends. When forced to make an off-airport emergency landing, pilots will usually attempt to do so in the most open area readily available. To enhance safety both for people on the ground and the occupants of aircraft, ALUCPs often contain criteria requiring a certain amount of open land near airports. These criteria are most effectively carried out by planning at the general or specific plan level, but may also need to be included in a combining district so that they will be applied to development of large parcels. Adequate open areas can often be provided by clustering of development on adjacent land.

**Areas of Special Compatibility Concern**—A significant drawback of standard general plan and zoning ordinance land use designations is that they can be changed. Uses that are currently compatible are not assured of staying that way in the future. Designation of areas of special compatibility concern would serve as a reminder that airport impacts should be carefully considered in any decision to change the existing land use designation. [A legal consideration that supports the value of this concept is that down-zoning of a property to a less intensive use is becoming more difficult. It is much better not to have inappropriately up-zoned the property in the first place.]

**Real Estate Disclosure Policies**—The geographic extent and specific language of recommended real estate disclosure statements can be described in an airport combining zone ordinance (Business and Professions Code Section 11010(a) and (b)(13) and Civil Code, Sections 1102.6, 1103.4, and 1353).

The requirements for project review can be summarized as follows:

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*Any environmental documents prepared in conjunction with these actions affecting lands inside the AIA also should be provided to the ALUC during public review periods and submitted concurrent with submittal of the project for ALUC review.*

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- ◆ Local Plans, including General Plans and Specific Plans—As discussed in the preceding chapter, local agencies must refer any proposal to adopt or amend a local plan to the ALUC for review if the proposal involves land within an airport influence area defined by the ALUC (PUC Section 21676(b)). This requirement applies regardless of whether the proposal has community-wide applicability or affects only a single parcel (unless the parcel is not in the airport influence area). It also applies both to actions initiated by the local agency or a property owner or other applicant, and to amendments proposed for the purpose of making a local plan consistent with an ALUCP.
- ◆ Ordinances and Regulations—Proposed zoning ordinances and building regulations also must be submitted for ALUC review before being acted upon by the local agency if they affect the compatibility of land uses located within an airport influence area (PUC Section 21676(b)).

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*For example, proposed ordinances or regulations involving allowable land uses, densities, building heights, or sound insulation must be submitted for ALUC review. Other matters that clearly do not have airport land use implications need not be submitted.*

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- ◆ Individual Development Projects—Once an ALUC has adopted an ALUCP, requirements for local agencies to submit individual development proposals for review depends upon whether the local agency either has made its plans consistent with the ALUCP or overruled the commission. Prior to when the local agency takes a consistency or overruling action, all individual development projects must be submitted for review (PUC Section 21676.5(a)). This requirement includes referral of actions that are ministerial unless the ALUC has indicated it does not want to receive them (see discussion in Chapter 6). Referral of all project proposals also continues to be mandatory if the local agency has opted not to fully incorporate essential compatibility criteria and procedures into local plans and policies, but has only eliminated the direct conflicts with the ALUCP.

Submittal of individual development projects becomes voluntary only when: (1) the local plans have been made fully consistent with the ALUC's plan or the local agency has overruled the ALUC; and (2) the action does not involve a general plan, specific plan, or zoning amendment previously reviewed by the ALUC. Even in these circumstances, however, local agencies are encouraged to form an agreement with the airport land use commission for review of major land use development project proposals—those which could have airport land use compatibility implications. A factor to be borne in mind with voluntary project-review agreements is that the ALUC's review is advisory only; the overrule procedures, which must be followed with respect to mandatory reviews, are not in effect.

- ◆ Airport Plans—Proposed airport master plans, expansion of an existing airport, and plans for construction of a new airport (or heliport) must be submitted to the ALUC for review in accordance with PUC Sections 21676(c), 21664.5, and 21661.5, respectively. This referral

requirement is independent of whether the ALUC has previously adopted an ALUCP or the local agency has taken action with regard to the consistency of its local plan(s).

A project requiring ALUC review must be submitted to the ALUC prior to approval by the local agency. Though the State Aeronautics Act does not specify when in the planning process this should occur, agencies should, at a minimum, submit projects 60 days prior to approval in order to allow the fully allotted amount of time for ALUC review (PUC Section 21675.2(a)).

### 5.3.2 Reviews by other Agencies

In addition to being reviewed by the airport land use commission, certain airport-vicinity development actions also must be submitted to other agencies for review. Local agencies should be aware of the extent to which these review requirements apply within their jurisdictions and inform project proponents accordingly.

#### ***Federal Aviation Administration***

The FAA's involvement in the review of local projects derives both from its authority over navigable airspace and its function as a funding agency for airport planning studies and airport improvement projects.

- ◆ Aeronautical Studies—FAR Part 77 requires that anyone proposing to construct an object that could affect the navigable airspace submit information about the proposed construction to the FAA. The FAA then conducts an aeronautical study, the outcome of which is a determination as to whether the object would be a potential hazard to air navigation. If the proposed object is concluded to pose a hazard, the FAA may object to its construction, examine possible revisions of the proposal to eliminate the problem, require that the object be appropriately marked and lighted as an airspace obstruction, and/or initiate changes to the aircraft flight procedures for the airport so as to account for the object.

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*The FAA's review does not consider the type of land use involved. Neither does the FAA approve or disapprove the proposal; it merely evaluates and recommends.*

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- ◆ Airport Improvement Program Grants—Through its Airport Improvement Program (AIP) grants, the FAA currently funds a vast majority of the cost of most planning studies and eligible improvement projects at airports in California. As a condition for receipt of a grant, an airport project sponsor must assure the FAA that it will take appropriate actions to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. The FAA also reviews airport layout plans and plans for federally funded construction to ensure compliance with Federal Aviation Regulations and airport design standards.

#### ***California Department of Transportation***

Through its Division of Aeronautics, the California Department of Transportation has review and, in certain cases, permitting authority with respect to several types of airport and airport-related land use actions. These include:

- ◆ **Airport Permits**—The Department of Transportation has authority under the State Aeronautics Act to issue permits for the approval of airport sites and the operation of airports (Section 21662). Moreover, other than for a few limited exceptions (a personal-use facility, for example), it is unlawful for any political subdivision or any person to operate an airport unless the airport has a valid state permit (Section 21663). The law spells out the conditions for issuance or amendment of an airport permit.
- ◆ **Regulation of Obstructions**—A state permit is also required for construction of objects that would affect the navigable airspace. These objects include:
  - Any structure taller than 500 feet above ground level, unless the height of the structure is required to be approved by the Federal Communications Commission or the Federal Aviation Administration (Section 21656).
  - Any structure or object of natural growth which would exceed the height limits specified in FAR Part 77, Subpart C, unless the FAA has determined that the object's construction, alteration, or growth would not constitute a hazard to air navigation or otherwise create conditions unsafe for air navigation (Sections 21658-21659).
- ◆ **School Site Reviews**—Two sections of the Education Code (17215 and 81033) require that the Department of Transportation investigate and make recommendations regarding acquisition of property for school and community college sites near airports. Specifically, before a district can acquire property for a school or community college site that would be within two miles of an airport runway or potential runway included in an airport master plan, the Department must investigate and submit a report of its findings regarding that acquisition. This requirement also applies to additions to an existing site. The primary factors considered in the analysis of a site by the Department's Division of Aeronautics are aircraft accident exposure and aircraft noise. Division staff will review the ALUCP, if one exists, and will ask for comments from the appropriate ALUC as a part of its investigation. Input from an ALUC and compatibility criteria established in an adopted plan weigh heavily in the Department's final report and recommendation about the suitability of the proposed acquisition for use as a school or community college.
- ◆ **State Building Site Reviews**—A review process similar to that for school sites is established by a section of the State Aeronautics Act (PUC Section 21655). This section requires that the Department of Transportation be notified of any state agency proposal to acquire a site for a state building (including state courthouses) if such site is within two miles of an airport runway. The Division of Aeronautics then investigates the site and reports its recommendations to the agency.
- ◆ **California Environmental Quality Act (CEQA) Reviews**—Another avenue through which the Division of Aeronautics becomes involved in local projects is through CEQA. As a responsible agency having permitting authority for airports, the Division of Aeronautics reviews and comments upon environmental impact documents prepared for airport master plans and airport improvement projects. The Division of Aeronautics also frequently comments upon environmental documents associated with local general plans, specific plans, and individual development projects near airports.

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**L**egislation enacted in 1994 requires lead agencies to use the *Airport Land Use Planning Handbook* as a "technical resource" when assessing the airport-related noise and safety impacts of projects in the vicinity of airports (Public Resources Code Section 21096).

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### **Regional Planning Agencies**

Some single- or multi-county regional planning agencies in the state have responsibilities for reviewing grant applications and setting regional priorities for the use of federal and state grant funds. These agencies also frequently review and comment upon airport master plans and environmental documents for airport plans and improvements.

### **Airport Proprietors**

No state laws require the participation of airport proprietors in the review of proposed land use development in the airport vicinity. These agencies are nevertheless often the most knowledgeable about the effects that nearby development would have upon the operation of their airports.

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*Proponents of major development projects and the local agencies that have land use jurisdiction over airport environs are urged to seek the input of airport management when preparing local plans and evaluating development proposals.*

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## **5.4 COMPATIBILITY PLANNING IN COUNTIES WITHOUT ALUCS**

### **5.4.1 Requirements**

As a result of either a special exemption or through establishment of a designated agency (alternative process), several counties in the state do not have an airport land use commission. As emphasized in Chapter 1, however, the lack of an ALUC does not eliminate, but increases the responsibilities of local agencies to engage in airport land use compatibility planning. The obligations of local agencies in a county without an ALUC extend both to preparation of ALUCPs and to the subsequent review of individual development proposals.

In accordance with state law (PUC Section 21670.1(c)(2)), establishment of this formation choice in a county requires the county and “the appropriate affected cities having jurisdiction over an airport” to designate an agency and adopt processes which provide for:

- ◆ Preparation, adoption, and amendment of an ALUCP for each public-use airport in the county and designation of an agency responsible for these actions;
- ◆ Public and agency notification regarding ALUCP preparation, adoption, or amendment;
- ◆ Mediation of disputes regarding preparation, adoption, or amendment of ALUCPs;
- ◆ Amendment of general plans and specific plans to be consistent with the ALUCPs.

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*Under the law, the Division of Aeronautics has the responsibility for reviewing and approving the processes by which a county and each affected city in the county establish and implement compatibility planning under the designated agency. To be acceptable, the process must, at a minimum, address all of the topics associated with making local plans consistent with an ALUCP.*

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### 5.4.2 Compatibility Policies

Jurisdictions within counties without ALUCs (other than counties that are exempt) still must adopt ALUCPs or policies for the portion of any public-use airport's environs which lies within their borders. Compatibility planning for airports not open to the general public is not required. Compatibility policies can be adopted as separate documents equivalent to ones adopted by ALUCs. Alternatively, compatibility planning policies can be folded into the general plan or other local policy documents as outlined earlier in this chapter with respect to making a general plan consistent with an ALUCP.

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*Irrespective of requirements of the State Aeronautics Act, state general plan requirements for noise and safety elements arguably require some level of airport compatibility planning by counties and cities through requirements for addressing noise compatible land use relationships and addressing hazard issues. The requirements for the noise element specifically identify airport operations and aircraft overflight (Gov. Code Section 65302(f)(4)).*

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Whichever option is chosen, the same concerns as would be found in an ALUCP adopted by an ALUC must be explicitly addressed. Compatibility criteria must be established and any internal conflicts between the criteria and land use designations or other elements of the local plan(s) must be resolved.

### 5.4.3 Project Reviews

In addition to adoption of compatibility criteria and designation of appropriate land uses for the environs of each airport, jurisdictions in counties without ALUCs must adopt project review procedures and mechanisms necessary for ensuring compliance with the compatibility criteria. Specific attention should be given to the following:

- ◆ **Special Review Process**—Proposals for major land use development within the airport influence area should specifically be reviewed for consistency with the airport land use compatibility criteria. A list of the types of projects subject to this review should be established. When action on the proposal involves discretionary approval by the local agency, specific findings should be made that either (1) the proposal is consistent with the compatibility criteria or (2) other overriding land use factors are of higher priority to the community.
- ◆ **Interagency Communication and Cooperation**—Among the functions provided by ALUCs, a particularly important one is to facilitate coordination of planning between agencies having land use jurisdiction around airports and agencies which own and operate the airports. This function still needs to be accomplished when an ALUC does not exist. Formal interagency agreements should be established between the affected entities for each airport. These agreements should refer to the ALUCP and the project review process, as well as to any adopted airport plans. Information on land use development in the vicinity of an airport should be provided to the agency (or private party) owning the airport for review and comment. Also, airport operators should consult with surrounding jurisdictions prior to making changes in airport development or operation which could affect surrounding land. Methods for resolving conflicts also must be identified.

## 5.5 OVERRULING ALUC DECISIONS

### 5.5.1 Procedure

Various sections of the airport land use commission statutes provide for local agencies to overrule ALUC decisions on land use matters and airport master plans. The overruling process involves four mandatory steps:

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*The State Aeronautics Act primarily refers to the term “overrule,” although “override” is used in some sections. In common practice, the two terms are often used interchangeably. The critical point is that any local agency overruling of an ALUC must include the four steps listed here.*

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- ◆ At least 45 days prior to any decision to overrule the commission, the local agency must provide the local ALUC and the Division a copy of the proposed decision and findings;<sup>3</sup>
- ◆ The holding of a public hearing (except when an ALUC disapproves a local agency action prior to having adopted an ALUCP);
- ◆ The making of specific findings that the action proposed is consistent with the State Aeronautics Act;
- ◆ Approval of the proposed action by a two-thirds vote of the agency’s governing body.

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*Note that a 1992 opinion of the State Attorney General concluded that a two-thirds vote of the entire membership of a city council or board of supervisors is not necessary for an overruling; a two-thirds vote of the members constituting a quorum is sufficient.*

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Two particular aspects of the overruling process warrant further examination. One is the issue of what constitutes valid findings under the provisions of the law. The other involves the subsequent implications of an overruling action.

### 5.5.2 Findings

A requirement for a local agency to make specific findings in conjunction with a decision to overrule an airport land use commission determination is included in several sections of the ALUC statutes. In each case, the law provides that the findings must show that the proposed local agency action “is consistent with the purposes of this article stated in Section 21670.” A local agency cannot simply overrule an ALUC determination without first documenting the basis for the overruling action and relating that basis directly to the purposes for which the ALUC statutes were adopted. The purpose of findings is to assure compliance with state law.

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<sup>3</sup> The local ALUC and Division of Aeronautics may provide comments in response within 30 days of receiving the proposed decision and findings. Any comments, while advisory, shall be included by the local agency in the public record of any final decision. However, if the local ALUC or Division of Aeronautics' comments are not available within 30-days time, the local agency may act without them. (PUC Section 21676.)

Requirements for a government entity to make findings of fact when taking certain actions appear in many parts of state law. Also, numerous court cases have dealt with the issues of findings and their adoption. The most important case regarding the use of findings in local land use decisions was *Topanga Association for a Scenic Community v. County of Los Angeles* (1974) 11 Cal.3d 506. In its ruling on this case, the court defined findings, explained their purposes, and outlined when findings are needed in making local land use decisions.

Findings were defined in the decision as legally relevant conclusions that explain the decision-making agency's method of analyzing facts, regulations, and policies and the rationale for making the decisions based on the facts involved. In other words, findings provide the connection between the evidence in the record, and the decision reached. The *Topanga* court also outlined five purposes for making findings. Findings should:

- ◆ Provide a framework for making principled decisions, enhancing the integrity of the administrative process;
- ◆ Help make analysis orderly and reduce the likelihood that the agency will randomly leap from evidence to the conclusions;
- ◆ Enable the parties to determine whether and on what basis they may seek judicial review and remedy;
- ◆ Apprise a reviewing court of the basis for the agency's action; and
- ◆ Serve a public relations function by helping to persuade the parties that administrative decision making is careful, reasoned, and equitable.

The necessity for adequate findings to accompany a local agency's overrule of an ALUC was affirmed in a 1992 court case, *California Aviation Council v. City of Ceres* (1992) 9 Cal.App.4th 1384. In this case the court found that the city council had merely referred to the ALUC statutes and then concluded that the proposed land uses minimized public exposure to excessive noise and safety hazards in the airport area. The findings did not document the critical links between the facts surrounding the proposal the relevant policies, and the decision.

In contrast, an unpublished decision<sup>4</sup> of California's Third District Court of Appeal, in the case of *California Pilots Association v. County of Butte* (2003 WL 1871085), held that sufficient evidence supported the county's findings in support of its decision to overrule the ALUC. When affirming that the county's findings were adequate under Public Utilities Code section 21676 (b), the court stated:

“The Board's findings were sufficient to explicate that the proposal was consistent with the purposes stated in section 21670. The Board issued 10 pages of detailed findings, divided into four areas of concern related to land use near public airports: safety, overflight, noise, and airspace protection. The findings demonstrated that noise and safety hazards affecting the development were

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<sup>4</sup> While This decision is not published and, therefore, cannot be relied upon by a court or a party in any other action, the decision does provide useful insight on the factors that may be considered by courts in reviewing the adequacy of overrule findings. (See Cal. Rules of Court, rules 8.1105, 8.1110 and 8.1115.)



minimal or had been mitigated by a development agreement with the property owners.

The findings also were supported by substantial evidence. Each finding referred to relevant data, information, and guidelines, much of it taken from two sources prepared by professionals with expertise in airport land use planning: a state-published airport planning handbook and a federally-financed noise plan for the Chico Airport.”

The *California Pilots Association* decision confirms the rule of law established by past precedent (e.g., the *California Aviation Council* decision), namely, that to overrule the ALUC, findings should be based on substantial evidence in the public record that the proposed project is consistent with the overall goal of the State Aeronautics Act to minimize incompatible land uses within the vicinity of airports. In order to demonstrate such consistency, the local planning jurisdiction should explicitly delineate the basis for its determination that the proposed project does not impact the public health, welfare and safety or airport operations.

Perhaps most basic in preparing appropriate findings is that *findings must be substantive*, not just bare conclusions or recitations of the law: Generally, findings must explain the reasoning behind conclusions and provide a bridge between raw data and ultimate conclusion and decision.

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*Findings must demonstrate that the proposed action “is consistent with the purposes...” of the statutes as set forth in the State Aeronautics Act (Section 21670). Examination of Section 21670(a) indicates that five separate purposes for the legislation are state:*

*“...to provide for the orderly development of each public use airport in this state...”*

*“...to provide for the orderly development of...the area surrounding these airports so as to promote the overall goals and objectives of the California airport noise standards...”*

*“...to provide for the orderly development of...the area surrounding these airports so as...to prevent the creation of new noise and safety problems.”*

*“...to protect the public health, safety, and welfare by ensuring the orderly expansion of airports...”*

*“...to protect the public health, safety, and welfare by...the adoption of land use measures that minimize the public’s exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses.”*

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### 5.5.3 Notifying an ALUC of an Action to Overrule

In 2003, Assembly Bill (AB) 332 was enacted amending those sections of the Public Utilities Code -- specifically Sections 21676, 21676.5 and 21677 -- dealing with the authority of local agencies to overrule ALUCs. The digest for the legislation provides, in part:

“The bill would require the local or public agency governing body to provide the [ALUC] and the division [i.e., the California Department of Transportation, Division of Aeronautics; Caltrans] with the proposed decision and findings at

least 45 days prior to the decision to overrule the [ALUC] and would authorize the [ALUC] or [Caltrans] to make advisory comments within 30 days of receiving the proposed decision and findings. The bill would require that the advisory comments from the [ALUC] or [Caltrans] be included in the final record of any final decision to overrule the [ALUC]."

As indicated above, AB 332 imposed new notification and recordkeeping requirements on local agencies. Specifically, local agencies are now required to:

- ◆ Provide the local ALUC and Division of Aeronautics with a copy of the proposed decision and findings at least 45 days in advance of any overrule decision; and
- ◆ Include any comments from the local ALUC and Division of Aeronautics in the final record of decision.

AB 332 also imposed new requirements on local ALUCs and Division of Aeronautics; specifically, these agencies may provide comments on any proposed overrule decision and findings within 30 days of receiving such documents from a local planning jurisdiction. If the local ALUC and Division of Aeronautics fail to act within that time frame, the local agency may proceed.

### 5.5.4 Implications of Local Agency Overruling an ALUC

The state law indicates several implications of a local agency's decision to overrule an ALUC determination:

- ◆ **Action Approved**—The most obvious outcome of a local agency's overruling is that the proposed action—approval of a plan, ordinance, project, or whatever—takes effect just as if the ALUC had approved it or found it consistent with the ALUCP.
- ◆ **Subsequent Reviews**—If a local agency adopts or amends a local plan for the airport area by overruling the ALUC, then subsequent ALUC review of individual development projects related to that overruling become voluntary (PUC Section 21676.5(b)).
- ◆ **Airport Proprietor's Immunity**—Two sections of the law establish that, if a local agency overrules an airport land use commission with respect to a publicly owned airport not operated by that local agency, the agency operating the airport "shall be immune from liability for damages to property or personal injury caused by or resulting directly or indirectly from the public agency's decision to override the commission's action or recommendation" (PUC Sections 21678 and, with slightly different wording, 21675.1(f)). The law does not indicate who will become liable under these circumstances.

## 5.6 ROLE OF AIRPORT PROPRIETORS

### 5.6.1 Introduction

Apart from their obligation to submit airport master plans, construction plans of new airports, and plans for airport expansion (when an amended airport permit is required) for airport land use commission review, airport proprietors also have a more basic role in airport land use compatibility matters. There are three facets to this role. One arises because of the relationship between the airport proprietor's actions and the substance of the ALUCP. A second is the

airport proprietor's direct responsibility for fostering compatibility between the airport and its environs. Lastly, airport proprietors have a community relations role which can have implications on land use compatibility issues.

### **5.6.2 Influence on ALUCP**

By law, an airport land use commission cannot establish policies governing the operation of any airport. Nevertheless, because an ALUCP for an airport must be based upon the long-range plans for that airport, the manner in which the airport is or will be constructed and operated clearly has a major bearing on the ALUCP. The airport's ability to affect the location and magnitude of airport impacts can make development compatible in places where it would otherwise not be acceptable or to make existing or planned land uses that are compatible with airport operations no longer compatible.

Some examples of this relationship are obvious. The configuration and length of the existing and proposed airport runways is a major determinant of noise and safety compatibility zone locations. Other influences on the ALUCP are usually more subtle and may or may not be taken into account in the ALUC's formulation of the ALUCP. For example, one airport operational procedure that can have an important influence on an ALUCP is the location of traffic patterns. If a traffic pattern exists only on one side of a runway, whether for compatibility purposes or other reasons, fewer restrictions on land uses may be necessary on the non-traffic pattern side.

### **5.6.3 Actions to Enhance Land Use Compatibility**

Most airport proprietors understand that they too have a responsibility for promoting airport land use compatibility. They cannot rely solely upon actions taken by the airport land use commission or the agency having jurisdiction over local land uses, nor should they undertake actions significantly affecting the compatibility of existing and future land uses surrounding the airport without consulting with the affected land use agency. In locations where the need for compatible land uses is particularly critical, airports should take direct action to prevent or mitigate problems.

Airports need direct control over lands critical to airport operations because of the limitations of land use planning and zoning measures for airport land use compatibility purposes. As essential as the designation of appropriate land uses is to airport land use compatibility, reliance on the normal form of these documents does not provide adequate long-term compatibility assurance. Among the important limitations which need to be recognized are:

- ◆ **Ease of Change**—Nothing permanently locks in a land use designation. Future local legislative bodies can change the established designations— by overruling the ALUC, if necessary. Such changes especially can occur if the land changes jurisdiction (e.g., as a result of annexation).
- ◆ **Restrictiveness**—Land use designations are limited as to how restrictive they can be. If they are deemed to eliminate all reasonable economic use of private property, they can be considered an unfair taking and result in inverse condemnation. Especially in areas near ends of runways, the restrictions may need to be more extensive or demanding than can be accomplished by land use designations.

- ◆ Not Retroactive—Designating an area for a different use than the one already existing may encourage change over the long run, but it does not directly eliminate existing incompatible uses<sup>5</sup>. The authority of the ALUCP addresses new development, not existing uses.

Given these limitations of land use planning and zoning measures, the only certain means available to airport proprietors for protecting against incompatible development in the airport vicinity is to directly control the property most critical to compatibility. In most instances, this means acquiring the property. The acquisition can be outright, fee simple title acquisition or the acquisition of an easement granting specified rights to the airport.

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*A*mong the assurances that an airport proprietor must give to the FAA before receiving a project grant is to take appropriate action to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations. When the agency owning the airport also has jurisdiction over surrounding land uses, zoning may suffice, especially for lands outside the runway protection zones. However, when the jurisdictions are different or where unprotected land is within a runway protection zone, direct acquisition may be the only effective means of carrying out the grant assurances.

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From the airport's perspective, the chief advantage of property acquisition is to provide long-term assurance of land use compatibility. If the airport owns the property or an easement, maintenance of compatibility is not dependent upon the success of ALUC actions or the understanding and cooperation of the local agency having land use powers. There are also disadvantages, however; cost being the major one.

Airport property ownership is most critical for the runway protection zones. These areas immediately beyond the runway ends should be clear of structures and be used only for agricultural or other low-intensity use. Airport land use commissions are limited as to how far they can go to restrict land uses without the restriction being legally deemed to be a taking. The zoning authority of local agencies is similarly constrained.

In noise- and/or safety-impacted locations beyond the runway protection zones, property or easement acquisition may also be the only effective means of land use control. This can be particularly true in situations where the local government having authority over land uses is not the same one that owns the airport. In such cases, the interests and objectives of the land use jurisdiction often differ from those of the airport agency.

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<sup>5</sup> While some local agencies maintain provisions to “amortize” and eventually remove non-compatible uses, such provisions generally provide for a several year amortization period during which the use may remain.

## CHAPTER 6

### ALUC REVIEW OF LOCAL ACTIONS





# ALUC Review of Local Actions

## 6.1 OVERVIEW

Review of local jurisdictions' land use plans and airport plans, and certain other land use projects and actions, is one of the two specific duties of airport land use commissions (ALUCs), preparation of airport land use compatibility plans (ALUCPs) being the other. The process that should be followed by the ALUC in this review depends upon three factors: (1) the type of local action involved; (2) whether the ALUC has adopted an ALUCP; and (3) what action, if any, the local jurisdiction has taken with respect to making its local planning policies consistent with the ALUCP.

**This chapter examines:**

- **Types of local actions subject to ALUC review;**
- **Process for compatibility reviews;**
- **Compatibility factors considered in the reviews; and**
- **Judicial remedies.**

## 6.2 ALUC REVIEW REQUIREMENTS

### 6.2.1 Introduction

One of the fundamental responsibilities assigned to ALUCs by the State Aeronautics Act (SAA) is to review particular types of local actions for compliance with the criteria and policies set forth in the commissions' adopted ALUCPs (Public Utilities [PUC] Section 21674 (d).) The question of how an ALUC should evaluate the consistency of local actions with compatibility criteria and policies is examined later in this chapter.

The law specifies that local jurisdictions must refer certain actions to the ALUC for review. Land use actions in this category include the proposed adoption or amendment of general plans, specific plans, zoning ordinances, and building regulations affecting land within an airport influence area. Several types of airport development plans also must be submitted for ALUC review. Referral of other local actions—primarily individual development projects—is required in some instances, but voluntary in others. The following discussion outlines the ALUC review requirements and options for each of these action types.

### 6.2.2 Actions for which ALUC Review is Mandatory

#### ***General Plans and Specific Plans***

Any proposal by a county or city to adopt a general plan and/or specific plan (collectively, local plan) must be referred to the ALUC for review if the boundaries of the local plan encompasses lands within an airport influence area as defined in an ALUCP. Amendments to such plans also must be

referred to the ALUC if the change affects locations within an airport influence area. Referral to the ALUC must take place prior to the local jurisdiction's action to adopt or amend the plan (PUC Section 21676(b)).

The impetus for referral of a local plan to the ALUC may arise from one of two situations:

- ◆ A proposal initiated by the local jurisdiction to adopt or amend an affected plan; or
- ◆ The requirement for the local jurisdiction's plans to be reviewed for consistency with an ALUC's newly adopted or amended ALUCP.

The requirement for submittal of local plans exists regardless of whether the ALUC has adopted an ALUCP for the airport. If an ALUCP has not been adopted, then the airport "vicinity" is defined to include "land that will be included or reasonably could be included within the ALUCP" *or*, if an airport influence area has not been designated, land within two miles of the airport boundary (PUC Section 21675.1(b)).

Where an ALUC's adoption or amendment of an ALUCP is the impetus for the local plan review, ALUC's are encouraged work with the local jurisdictions to identify where additions or changes to local plans may be required. There are several practical considerations for taking this step:

- ◆ Local jurisdictions may be less inclined to oppose an ALUCP if they understand the implications that its adoption will have on their plans and policies.
- ◆ Most ALUCs and their staff have the expertise with which to point out inconsistencies.
- ◆ The ALUC may have already started or even completed this analysis as part of the CEQA compliance process for the ALUCP.
- ◆ Proposed amendments to local plans are more likely to be complete in terms of meeting the requirements of being consistent with the ALUCP (i.e., conflicts will be eliminated and important procedural matters addressed).
- ◆ The amendment process can be accomplished more efficiently and quickly.

The last of the above factors is significant because state law not only requires that local jurisdictions either amend their plans to be consistent with the ALUC's plan or take the steps necessary to overrule the ALUC, but also that this action be taken within 180 days of when the ALUC adopted or amended its plan. (Government Code [Gov. Code] Section 65302.3.)

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*As a practical matter, many ALUCs consider the 180-day time limit to begin when printed copies of the final, adopted ALUCP or amendment thereto are formally distributed to the affected jurisdictions.*

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Preliminary ALUC review of the affected plans enables the 180-day time limit to more easily be met because part of the review process takes place before the clock begins running. Note, though, that even when the ALUC conducts a preliminary review, the specific county or city proposals for local plan modifications still must be submitted to the ALUC for formal review.

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*Additionally, as noted in Chapter 5, ALUCs should recognize that the 180-day schedule can be difficult for local jurisdictions to achieve, especially if extensive modifications to their plans are necessary. Although ALUCs do not*

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*have the authority to change the 180-day time limit, ALUCs can decline to bring a judicial action against a local government for taking extra time.*

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## **Ordinances and Regulations**

ALUC review of county or city proposals to adopt or amend zoning, building, and other land use ordinances and regulations is required in instances where those ordinances and regulations implicate compatibility criteria and policies.

The SAA explicitly requires ALUC review of these policy instruments during the period prior to when the local plan has been made consistent with the ALUCP or has been adopted by overruling the commission (PUC Section 21676(b)). Subsequent to when a county or city has taken action to amend its local plans, review of proposed new or revised zoning ordinances and building regulations remains mandatory because of their direct linkage to the local plans. Components of zoning ordinances and building regulations are normally essential to implementation of compatibility criteria and thus to the achievement of consistency between the local plans and the ALUCP. In effect, these instruments become extensions of the local plans and, with respect to ALUC review requirements, must be treated in the same manner.

**As discussed later in this chapter, careful ALUC review of the relevant ordinances and regulations in conjunction with the assessment of local plans for consistency with the ALUCP is essential.**

This review requirement especially applies when a proposed new or revised zoning ordinance or building regulation would have general applicability throughout the community or at least to lands within the airport influence area. ALUC reviews of parcel-specific changes to zoning or other regulations are also required when the parcels are within the airport influence area. This is true even when a local plan amendment is not involved. Again, the rationale for reviews being mandatory is that a determination that a local plan is consistent with the ALUCP almost always depends upon the details, including parcel-specific details, found in implementing zoning ordinances and building regulations.

## **Airport Plans**

ALUC review of three categories of airport plans is mandatory under state law: (1) adoption or amendment of an airport master plan (AMP); (2) proposed construction and establishment of a new airport; and (3) adoption or amendment of airport expansion plan. This review requirement is not affected by, and is independent of, any previous action by the local jurisdiction regarding its local plans.

- ◆ **Airport Master Plans**—PUC Section 21676(c) mandates that “each public agency owning any airport within the boundaries of an airport land use commission plan shall, prior to modification of its airport master plan, refer such proposed change to the airport land use commission.” The commission must then determine whether the proposed AMP is consistent or inconsistent with the adopted ALUCP for that airport.
- ◆ **Construction Plans for New Airports**—The requirement for review of construction plans for new airports arises not out of the airport land use commission portion of the SAA (Chapter 4, Article 3.5), but from the regulation of airports portion of the law (Chapter 4, Article 3). Section 21661.5 of this article states that no application for the construction of a new airport may be submitted to any local, regional, state, or federal agency unless that plan has been both:

**Also sometimes subject to ALUC review are proposals for non-aviation development of airport property, which is discussed in the following section.**

- Approved by the board of supervisors of the county, or the city council of the city, in which the airport is to be located; and
- Submitted to and acted upon by the appropriate airport land use commission.

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*As used in this section of the law and in the section (discussed below) applying to airport expansion, construction plans should be thought of as construction proposals. These sections are not intended to require ALUC review of the actual engineering construction drawings, but only the overall layout plan.*

*Also, in the context of aeronautics law, a heliport is considered to be a type of airport. Plans for the construction or expansion (as discussed below) of new heliports, including hospital heliports (a type of special-use facility), therefore, are subject to ALUC review.*

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- ◆ Airport Expansion Plans—PUC Section 21664.5 applies the above review requirements to any airport expansion project that entails amendment of an Airport Permit issued by the California Department of Transportation. Airport expansion is defined to include:
  - The construction of a new runway;
  - The extension or realignment of an existing runway; and
  - The acquisition of runway protection zones or any interest in land for the purpose of the above.

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*Of note, state-issued airport permits are required only for public-use or special-use facilities. Agricultural and certain other restricted-use airports are exempt from permitting requirements (see California Code of Regulations Section 3533) and, therefore, not subject to ALUC review.*

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### 6.2.3 Other Actions Potentially Subject to ALUC Review

#### ***Individual Land Use Development Projects***

Historically, state law required that all local plans, projects, and other actions affecting the vicinity of an airport be submitted to the responsible commission for review. For airports located in growing areas, this process proved to be burdensome. Therefore, the law was amended to place emphasis on general and specific plans as the levels of local planning at which compatibility between airports and their surroundings should primarily be addressed. The current law greatly limits the need for ALUC review of local actions once the ALUC has adopted an ALUCP and local plans have been made consistent with it.

Airport land use commissions can require the review of “all actions, regulations, and permits” involving the vicinity of a public airport under only two circumstances:

- ◆ Prior to ALUC adoption of an ALUCP for the airport (PUC Section 21675.1(b)); and
- ◆ When a local jurisdiction has neither revised its local plan(s) to be consistent with the ALUCP nor overruled the commission (PUC Section 21676.5(a)).

Beyond these two circumstances, the need for submittal of individual development proposals (assuming they do not involve amendment to local plans, or zoning changes) is subject to mutual agreement between the ALUC and the affected jurisdiction (PUC Section 21676.5(b)). Many ALUCs request that certain major land use actions continue to be submitted for review. Such actions might include very large developments where site design (the distribution and density of dwellings, areas of intensive use, open lands, etc.) and other factors, such as building height, have potential compatibility implications even when the overall development is basically acceptable. A full list of these types of development actions should be included in the ALUCP, local plans, or in some other policy document agreed upon by both entities.

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*Even when a local jurisdiction agrees to continue to submit major land use actions to the ALUC, project review is normally not necessary if related local plan amendments or zoning changes previously were reviewed. Exceptions to this limitation on subsequent reviews might apply if sufficient details regarding the project were not available when the first consistency determination was rendered, or if the project changes significantly.*

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Three very important points need to be emphasized with regard to the review of individual land use development proposals whether by the ALUC or the local jurisdiction.

- ◆ ALUC reviews are voluntary only if the applicable local planning policies *are fully consistent with the ALUCP*—The local plan or other supporting policies (e.g., zoning ordinance; development regulations), therefore, must contain sufficient detail regarding compatibility criteria and review procedures to assure compliance with policies set forth in the ALUC's compatibility plan. If this is not done, then the local planning policies are not fully consistent with the ALUCP and submittal of individual development projects for ALUC review would continue to be mandatory. In addition, if an individual development project requires a zoning variance or general plan/specific plan amendment, the review is not voluntary as changes in local plans and regulations require ALUC review.
- ◆ Local Jurisdiction Reviews Must Be Based on ALUCP Criteria—The failure of a local jurisdiction's local planning policies to restate or incorporate by reference ALUCP criteria and standards—even if that plan has been found consistent with the ALUCP—does not relieve the jurisdiction of the obligation to require individual development proposals to meet the ALUCP standards. Any exceptions require that the local jurisdiction take the special steps necessary to overrule the ALUC. A local jurisdiction's silence on these matters can be taken to indicate its acquiescence to the standards set by the ALUCP. If a land use development project were to be challenged under these circumstances, a court could be expected to hold the project to the ALUC's standards.
- ◆ Non-Mandatory ALUC Project Reviews Are Advisory—When local planning policies have been made fully consistent with the ALUCP, not only is submittal of most land use development proposals for ALUC review voluntary, but, when submitted, the reviews become advisory. Moreover, when ALUC review is advisory, the local jurisdiction does not need to take the special steps necessary to overrule the commission if it disagrees with the outcome of a review. (While the advisory nature of ALUC reviews under these circumstances is not spelled out in the SAA, it is clear that, if this were not the case, then the local jurisdiction could simply cancel the review agreement and proceed without any ALUC involvement.)

### ***Ministerial Actions***

A question which sometimes arises, primarily with regard to the review of individual development projects, concerns the appropriateness of ALUC review of projects for which local government approval is ministerial (administrative) as opposed to discretionary. In essence, the question is whether ALUC review of a project is appropriate or necessary if the local jurisdiction has no power to deny its approval in the first instance.

The important factor to remember in these cases is that, even though the local jurisdiction may not be able to deny the project, it can set design conditions. In terms of airport compatibility, such conditions might include site layout, height limits, noise insulation, etc. As such, ALUC review of ministerial actions is, at the very least, implicitly authorized and mandated by the SAA.

By way of example PUC Section 21675.1(g) implicitly indicates that ministerial permits are subject to ALUC review prior to the adoption of an ALUCP. This section allows ALUCs to exempt ministerial permits for single-family dwellings from review except where 25 percent or more of the parcels in a subdivision are undeveloped. After adopting an ALUCP, a commission has discretion to determine what type(s) of ministerial actions, if any, it wishes to review. Subsequent to local jurisdiction action that makes planning policies fully consistent with the ALUCP, ALUCs only review ministerial permitting actions if the local jurisdiction agrees to submit them.

### ***Subsequent Review of Related Projects***

When a local jurisdiction and the ALUC have agreed that selected land use actions will continue to be reviewed, efforts should be made to avoid duplicative reviews. For example, if a specific plan has been prepared to provide guidance for a major land use development proposal and the plan contains substantial detail regarding the development, subsequent review of the proposal itself likely would not be necessary. Similarly, if the ALUC reviews a proposed zone change related to a particular development project, then later review of the project itself can be avoided if site design and other significant information is provided with the initial review. The inverse of these scenarios is where sufficient design-level information is not available during the initial review, or where project design is modified following initial review in such a manner as to call into question the initial findings.

### ***CEQA Documents***

When a California Environmental Quality Act (CEQA) document, such as a negative declaration, mitigated negative declaration, or an environmental impact report, has been prepared in conjunction with an action submitted for ALUC review, a copy should be provided to the commission along with other information on the project. ALUC staff can then excerpt portions that might be relevant to a compatibility determination by the commission. CEQA specifies that a lead agency preparing an EIR for a project within the boundary of an ALUCP (or within two nautical miles of a public or public use airport if no such plan has been adopted) shall use this *Handbook* in consideration of airport-related safety hazards and noise problems (PUC Section 21096). Additionally, Appendix G of the CEQA Guidelines recommends that lead

agencies consider the following criterion when assessing the significance of a proposed project's environmental effects:

- ◆ For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
- ◆ For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Because the preparation of a CEQA document is often one of the first public steps in the project review process, ALUCs should ask to be placed on the CEQA notification lists of all local jurisdictions within the ALUCs' planning jurisdiction to ensure that they are notified of projects in the vicinity of airports.

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*ALUCs are encouraged to comment on projects that might raise compatibility implications even when the projects are not required to be referred to the ALUC for a compatibility determination.*

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CEQA documents circulated to ALUCs when a compatibility determination is not required should be considered the same as other voluntary referrals. They provide an opportunity for ALUCs to offer guidance to ensure the highest level of compatibility. In these circumstances, ALUCs may offer comments on the CEQA document as an agency with expertise, but have no authority to disapprove the project.

### **Non-Aviation Development of Airport Property**

State law does not specify whether ALUCs have authority to review projects involving non-aviation development on airport property (sometimes called “inside the fence” development). While the statutes give ALUCs the responsibility of reviewing AMPs and certain other airport development plans for consistency with the ALUCP, ALUCs are also explicitly precluded from having authority over operation of any airport. Most ALUCs maintain that they have the authority to review this type of development proposal (i.e., non-aviation development of airport property) because their review does not implicate the “operation” of the airport. For public relations purposes, if nothing else, airports probably should concede this point—it would be difficult to argue that certain non-aviation development should be allowed to occur on airport property when the same development in the same location would be judged incompatible if the property was privately owned.

The need for ALUC review of these projects should be treated much the same as with respect to individual development projects in the airport environs. That is, just as the focus for most off-airport development review is on local plans, reviews of on-airport projects should primarily take place at the time the AMP is reviewed. Only when important details regarding a proposed development have changes or were not available at the time of the initial review would subsequent review be necessary.

***Special Districts, School Districts, and Community College Districts***

Pursuant to PUC Section 21670(f), the State Legislature has clarified its intent that “special districts, school districts, and community college districts are included among the local agencies that are subject to airport land use laws and other requirements of this article.” Accordingly, ALUCs shall review land use plans, master plans, individual development projects, and other comparable actions proposed by the three types of districts identified above.

**For a discussion of review of school sites and state buildings, see Chapter 5, Section 5.3.2.**

As described in this chapter, the adoption and amendment of land use plans (general and specific plans) and development ordinances form a basis for cities and counties to engage in airport land use compatibility planning. Special districts, school districts, and community college districts do not, as a general rule, prepare such plans and ordinances. They do, however, acquire land and build or lease facilities, which would be actions subject to review within the AIA (or within two miles of an airport in the absence of an adopted AIA). It is therefore recommended that the districts and the ALUC establish a procedure to review such actions. Where such actions are within an area subject to a general plan, and that plan has been found consistent with the ALUCP, there are several procedures within the Gov. Code relating to special districts and school districts which could form the basis for compatibility planning:

- ◆ Major public works projects undertaken by special districts and school districts shall be submitted to the county or city planning agency for review as to conformity with the adopted general plan (Gov. Code Section 65401).
- ◆ The acquisition of land for public purposes, and the construction of a public building shall be submitted to the county or city planning agency for review as to conformity with the general plan (Gov. Code Section 65402).
- ◆ A special district or school district may prepare a five-year capital improvement program. This program shall be referred to the county or city planning agency for review as to conformity with the general plan (Gov. Code Section 65403).

***Other Government Actions***

Unlike local agency actions, ALUCs have no mandatory duty or authority to review land use actions located on federal, tribal or state lands, or proposed by federal or state agencies or Native American tribes within the AIA. However, should a federal or state agency, or Native American tribe, request ALUC input on the compatibility of a proposed project with aeronautical operations and concerns, the ALUC may provide advisory determinations for the agency's or tribe's consideration.

It should be noted that while ALUCs have no mandatory duty or authority to review state actions, in some instances, the state agency may have an independent obligation to submit the proposed project to Caltrans for review. The Division of Aeronautics is required to evaluate the acquisition or expansion of certain proposed K–12 school sites (Education Code Section 17215), Community College sites (Education Code Section 81033), and state buildings (PUC Section 21655) within two miles of an airport runway.

## 6.3 PROCEDURAL CONSIDERATIONS

### 6.3.1 Information Required for Project Reviews

Most county and city planning departments have a form and/or defined list of information that a project applicant must submit when requesting zoning variances or other types of local development approvals. ALUCs should have a similar form or list of information to be included when a project is submitted for commission review because, without adequate information, the commission cannot fully assess whether a proposed land use action will be consistent with the commission's ALUCP. Missing information also can result in the ALUC review being delayed if questions arise during a public meeting. And, in any event, the ALUC's 60-day response deadline is not triggered until the project information submittal is complete, as discussed further below. The importance of having complete project data is emphasized in the ALUC statutes (PUC Section 21675.2(c)):

“Failure of an applicant to submit complete or adequate information pursuant to Sections 65943 to 65946, inclusive, of the Government Code may constitute grounds for disapproval of actions, regulations, or permits.”

**The referenced sections of the Government Code are included in Appendix A.**

Although this particular section applies to ALUC review of actions prior to the adoption of an ALUCP, the results can be the same with regard to actions submitted for a consistency review.

ALUC staff should conduct a preliminary review of the information submitted on a project to assess whether the project is subject to ALUC review and, if so, whether the information is sufficiently complete to enable a consistency determination to be made. If additional information is needed, the project proponent should be so notified without undue delay. Staff also should determine whether the applicant has already requested reviews by other agencies (for example, an aeronautical hazard review conducted by the Federal Aviation Administration in accordance with Part 77 of the Federal Aviation Regulations). If at all possible, a situation to be avoided is a delay in ALUC action on a project because insufficient information is available at the time of the commission meeting.

**Many ALUCs encourage proponents of individual development projects to submit information on their proposals directly to the commission. These items are then placed on the commission agenda for “discussion purposes only.” This process allows many compatibility issues to be resolved before the project is even submitted to the county or city for processing.**

### 6.3.2 Time Factors

Time is a factor with regard to the project review process in two ways:

- ◆ **Timing of Project Submittal**—In order to avoid unnecessary delays in the overall processing of a plan or project, the timing of when a plan or project is submitted to an ALUC for review is an important consideration. In general, plans and projects should be referred to the ALUC at the earliest reasonable point in time so that the commission's review can be duly considered by the local jurisdiction prior to formalizing its actions. Depending upon the type of plan or project and the normal scheduling of meetings, ALUC review can be done before, after, or concurrently with review by the local planning commission and other advisory bodies, but must be accomplished before final action by the board of supervisors, city council, or, in the case of some airport projects, the airport district board.

**Of note, the statutes do not specify a response time limit for actions submitted to ALUCs on the basis of mutual agreement with affected jurisdictions. Such time limits should be indicated in the agreement, but 60 days is generally a reasonable duration.**

- ◆ **Response Time Requirement**—An airport land use commission must respond within 60 days of referral to a local jurisdiction’s request for a consistency determination on plans or projects for which submittal is mandatory. However, this response period does not begin until such time as all information necessary for accomplishment of the project review has been submitted to the commission. The 60-day response time is specified in PUC Sections 21675.2(a) and 21676(d) of the SAA.

The consequence of the commission not acting within the statutorily-mandated 60-day time limit depends upon whether the commission has adopted an ALUCP:

- ◆ If the commission *has not* adopted an ALUCP, the proponent of a land use action, regulation, or permit may petition the court to compel the commission to act on the proposal (PUC Section 21675.2(a)).
- ◆ If the commission *has* adopted an ALUCP and the land use proposal involves a general plan, specific plan, zoning ordinance, or building regulation or is a proposed AMP, then the proposal is deemed consistent with the commission’s plan (PUC Section 21676(d)).

### 6.3.3 Review Fees

A 1989 amendment to the SAA granted ALUCs the authority to charge fees for review of land use proposals and airport plans (PUC Section 21671.5(f)). However, a commission is only permitted to charge fees if it has adopted an ALUCP for the airport involved. The fees charged cannot exceed the estimated reasonable cost of providing the review.

Responses to a 2009 survey of ALUCs found that of the 26 respondents, only eleven ALUCs indicated that they charge fees. A majority of the respondents charge flat fees, depending on the type of project review, while three ALUCs charged by the hour (see Appendix H).

The fees charged for project reviews vary substantially from one ALUC to another. Some commissions charge small amounts that basically cover only the paperwork and other direct expenses. Other commissions base their fees on the typical number of staff hours involved in a project review and attempt to cover the full cost of the staff time.

### 6.3.4 ALUC Action Choices

#### ***Land Use Plans and Projects***

An ALUC’s choices of action on a land use plan or project submitted for review depends upon whether an ALUCP has or has not been adopted. In either case, the commission has just two basic choices of action available.

- ◆ **Prior to Adoption of an ALUCP**—If a commission has not yet adopted an ALUCP, the commission may *approve* or *disapprove* the matter submitted for review. This choice applies to any type of land use action, regulation, or permit, including general plans, specific plans, zoning ordinances, building regulations, and individual development projects. Absent having an adopted ALUCP, the commission’s authority to approve a land use action, regulation, or permit is limited by the law (PUC Section 21675.1(c)). Approval requires that the commission find, based on substantial evidence in the record, that all of the following criteria are met:



- “The commission is making substantial progress toward completion of the plan.”
- “There is a reasonable probability that the action, regulation, or permit will be consistent with the plan being prepared by the commission.”
- “There is little or no probability of substantial detriment to or interference with the future adopted plan if the action, regulation, or permit is ultimately inconsistent with the plan.”

If all of these criteria are not met, the commission legally cannot approve the proposal. However, only the first of these criteria is a significant procedural hurdle and very little is necessary to minimally satisfy it. ALUC adoption of a resolution setting an intended schedule for preparation of an ALUCP should suffice for this purpose. Adoption of preliminary compatibility criteria for the specific airport is not necessary, although the commission’s resolution should at least refer to any generalized criteria it may have adopted or to this *Handbook* as the interim basis for project review. Once this test has been met, the characteristics of the project will determine whether the proposed action could be found to be consistent or inconsistent with the ALUCP.

If the ALUC concludes that it cannot take action because it does not have an ALUCP and is not making progress toward preparation of one, then approval of the land use proposal would be subject only to action by the local jurisdiction unless court proceedings are initiated by an interested party (in accordance with PUC Section 21679), as discussed later in this chapter.

- ◆ After Adoption of an ALUCP—After the commission has adopted an ALUCP for an airport, the nature of its review of land use matters changes because the commission now has—or should have—a set of policies and criteria by which to evaluate the proposal. The question then becomes one of determining whether the proposal is *consistent* or *inconsistent* with the ALUCP.

The SAA (PUC Sections 21676(a) and 21676.5(a)) mentions only these two choices of action. However, the PUC does not prescribe or limit the type of tools or documents an ALUC may use to arrive at and memorialize the outcome of negotiations between a project applicant and the ALUC. Due to the limits of determination options, ALUCs are advised to first return a determination of consistent or inconsistent. Following this action, they may append any instrument used to arrive at and memorialize the terms of an agreement that helped reach a ‘consistent’ determination. When a finding of consistency is contingent upon certain conditions, the conditions should be limited in scope and described in a manner which allows compliance to be clearly assessed (e.g., the height of a structure).

As a point of clarification, it has become common for determinations to use the terms ‘compatible’ and ‘incompatible’ interchangeably with ‘consistent’ and ‘inconsistent’ to describe the results of local plan or project reviews. To maintain conformity with the PUC, and clarity throughout the State, the terms consistent and inconsistent should be used to avoid unnecessary confusion.

## **Airport Plans**

When an ALUC reviews an AMP, a plan for construction of a new airport (or heliport), or expansion of an existing airport, its basic choices of action are once again to determine whether

the proposal is consistent or inconsistent with the commission's plan. However, there are also associated actions that the commission may wish to take in conjunction with this determination.

- ◆ **Airport Master Plans**—When an inconsistency exists between a proposed AMP and an adopted ALUCP, the commission has the option of first modifying its plan to reflect the assumptions and proposals of the AMP. This is consistent with the concept that an ALUCP is based on a current AMP or ALP. Any such amendment to the ALUCP is limited to once per calendar year and must follow the procedures outlined in Chapter 2 of this *Handbook*.
- ◆ **Plans for New Airports**—Unless an AMP was previously prepared—which typically occurs only when the facility will be publicly owned, the ALUC will not have an adopted ALUCP for a proposed airport or heliport. As discussed later in this chapter, the consistency determination, therefore, must be based upon underlying noise, safety, airspace protection and overflight compatibility considerations.<sup>1</sup> If the commission concludes that the plan for the proposed facility is consistent with these compatibility factors, it should then decide whether to prepare an ALUCP for that facility to help protect it from incompatible land use development. If the proposed new airport or heliport will serve the general public (that is, if a State Airport Permit or Heliport Permit is required), then an ALUCP for the facility must be adopted.
- ◆ **Airport Expansion Plans**—Plans for expansion of the runway system at a publicly owned airport normally will be based upon a long-range AMP previously reviewed by the commission. Therefore, the consistency review may require little more than a comparison of the proposed expansion project with the AMP. In cases where an AMP does not exist or the expansion project is not included in it, the consistency determination should be based upon factors similar to those for review of plans for new airports.

## 6.4 SUBSTANCE OF REVIEWS

### 6.4.1 General Plan and Specific Plan Consistency Reviews

When ALUCs evaluate county and city general plans and specific plans for consistency, a thorough review is essential for two reasons. First, these local plans are often large and complex, and policies and other matters that may be relevant for purposes of airport compatibility are usually scattered throughout many sections of the plan—land use, housing, transportation, noise, safety, and open space elements, as well as the land use map, being among the likely candidates. Second, and perhaps most critical, once the ALUC has deemed the local plan consistent with the ALUCP, most subsequent land use actions and development proposals will not be reviewed by the commission unless the local jurisdiction agrees to submit them. Therefore, of all the types of land use actions subject to ALUC review, general plans and specific plans require the most careful scrutiny.

#### ***Concept of Consistency***

The Merriam-Webster dictionary defines *consistency* as “agreement or harmony of parts or features to one another or a whole.” Legal definitions of the term depend upon the context in which it is used and have been the subject of numerous court cases. It is not a purpose of this

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<sup>1</sup> If the ALUC has adopted a countywide plan, with sections focusing on individual airports (as described in Section 2.2.5 of this *Handbook*), the countywide policies may provide some guidance for new airports.

*Handbook* to attempt to establish a legal definition for the term. Rather the intent here is to describe what *consistency* generally means with respect to airport land use compatibility planning.

Most importantly, a local plan does not have to be *identical* to an ALUCP in order to be *consistent* with it. The fundamental objective is that these local plans, together with any implementing policies contained in ordinances or regulations, be capable of ensuring that future land use development will not conflict with ALUCP criteria. The two specific tests that need to be considered by ALUCs when assessing whether local planning policies are *fully* consistent with the ALUCP are:

- ◆ Whether any direct conflicts between the two plans have been eliminated; and
- ◆ Whether the local plan delineates a mechanism or process for ensuring that individual land use development proposals comply with the ALUC's adopted compatibility criteria.

### ***Elimination of Direct Conflicts***

Direct conflicts primarily involve local plan land use designations that do not meet the density (for residential uses) or intensity (for nonresidential uses) criteria specified in the ALUCP, although conflicts with regard to other policies (e.g., noise; airspace protection; overflight) also may exist. The elimination of direct conflicts may not be entirely straightforward where the ALUCP classifies *particular* land uses as compatible, conditionally compatible or incompatible because ALUCs and local jurisdictions do not always work from the same set of land use designations. Therefore, it is important for ALUC and local jurisdiction staff to discuss and reconcile potential definitional ambiguities when evaluating planning document consistency.

Note, however, that a local plan cannot be found inconsistent with the ALUCP because of land use designations that reflect existing land uses, even if those designations conflict with the ALUC's compatibility criteria. Because ALUCs have no authority over existing land uses, land use designations that merely reflect the existing uses for such parcels are, in effect, excluded from the consistency requirements.

### ***Assurance of Compliance with Compatibility Criteria***

Elimination of direct conflicts between a local plan and the ALUCP is not enough to guarantee that future land use development will adhere to the compatibility criteria. An implementation process must also be defined either directly in the local plan or by reference to a separately adopted ordinance, regulation, or other policy document. There are three facets to the process of ensuring compliance with airport land use compatibility criteria:

- ◆ **Delineation of Compatibility Criteria**—Airport land use compatibility criteria must be defined either in a policy document adopted by the county or city or through adoption of or reference to the ALUC's compatibility plan itself.
- ◆ **Identification of Mechanisms for Compliance**—The mechanisms by which applicable compatibility criteria will be tied to an individual development and continue to be enforced must be identified. Conditional use permits and development agreements are two

possibilities. For example, land uses that are potentially consistent, but only if limited in density/intensity, may be appropriately identified as conditional uses.

- ◆ **Indication of Review and Approval Procedures**—Lastly, the procedures for review and approval of individual development proposals must be defined. For example, at what level within a county or city are compatibility approvals made: staff, planning commission, or governing body? The types of actions that are to be submitted to the ALUC for review and the timing of such submittals relative to the internal review and approval process also must be indicated.

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*Before finding a local plan to be fully consistent with the ALUCP, ALUCs should check that all applicable topics listed in Table 5A are addressed either in the plan itself or in other implementing policy documents. Alternatively, as mentioned earlier in this chapter and further addressed in Chapter 5, local jurisdictions can elect to continue to refer all proposed land use actions within an airport influence area to the ALUC for review.*

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Further details regarding the essential steps to making local plans consistent with ALUCPs are discussed in Chapter 5. For example, a checklist of local plan consistency requirements is included in Table 5A. The list is not necessarily exhaustive, nor will every item be applicable to every ALUCP or every local plan. Rather, it is intended to provide basic guidance both to ALUCs in reviewing local plans and to counties and cities in preparing the necessary amendments and implementing actions.

### 6.4.2 Review of Zoning Ordinances and Building Regulations

ALUC review of zoning ordinances, building regulations, site design standards, and other implementing actions is particularly important because local plans often do not contain all of the policies necessary to be fully consistent with an ALUCP. Instead, zoning ordinances, building regulations, and other local policies become the mechanisms for specific implementation of airport land use compatibility policies and procedures.

When reviewing these policy instruments, the same topics outlined in Table 5A should be considered. The significant difference is that land use ordinances and regulations usually include criteria, standards, and other details that can be quantitatively compared with related criteria in the ALUCP. It is important, however, that the ALUC avoid becoming preoccupied with details that do not relate to airport compatibility concerns.

### Review of Individual Development Projects

As previously noted, with some exceptions, ALUCs review individual development proposals only when they involve local plan or zoning changes or when the local jurisdiction agrees to submit these projects for review. That being said, the type and scope of an individual development proposal significantly affects the nature of the review. Many small details play a part in the consistency determination. Among these are:

- ◆ **Residential Density**—The proposed number of dwelling units per acre should be assessed for compliance with ALUCP criteria. When using gross acreage as the basis for calculating densities, care must be taken that portions of roads or open space on the edges of the development are not also included in the density or intensity calculations for an adjacent

development. In these cases, it may be easiest to use the same site description as used by the local agency for the proposed project; however, in mixed-use projects, the same open space should not be counted to the benefit of both residential and non-residential areas.

- ◆ **Nonresidential Usage Intensity**—The potential number of people per acre who could occupy a nonresidential land use needs to be evaluated relative to the applicable limits. This number may not be clear from the proposal and can be particularly uncertain for speculative development projects (ones where the tenant has not been determined in advance of the construction). However, an estimate can usually be made using data such as: the number of parking spaces required for the use; maximum occupancy levels prescribed by building and fire codes; and surveys of similar existing uses. Assurance needs to be provided by means of the use permit, building permit, or other local approval that the intensity limits will not be exceeded if a different tenant and/or different use occupy the facility at a later date.
- ◆ **Site Plan**—The site plan for a proposed development is essential to review, particularly when a large project site straddles more than one compatibility zone. Whether variations in noise impacts and risk levels on different parts of a large site have been taken into account should be examined. Also, the size, location, and design of open land areas should be examined if ALUC policies require these features.
- ◆ **Height Limits**—The planned height of buildings, antennas, and other objects should be checked with respect to Federal Aviation Regulations Part 77 criteria if the development is close to the airport, situated within the runway approach corridors, or on land higher more than 150 feet above the airport elevation. The potential height of trees also may be a factor. Shielding provided by terrain or existing structures should be considered when determining acceptable heights, however.

### 6.4.3 Airport Plan Reviews

The substance of the review of airport plans—AMPs, construction plans for new airports (and heliports), and expansion plans for existing airports—differs depending upon whether the commission has already prepared an ALUCP for the facility. Consistency is easier to evaluate when a plan for the specific airport has already been created.

#### ***Plans for Existing or New Airports Having Adopted ALUCPs***

The review of an AMP, construction plan, or expansion plan for an airport for which an ALUCP has already been prepared should focus on differences between the plans. *Fundamentally, the question to be examined is whether any components of the airport plan would result in greater noise and safety impacts on surrounding land uses than are assumed in the adopted ALUCP.* This concept implies that the airport plan does not have to be identical with the ALUCP as long as the impacts are not increased or moved to previously less-impacted areas.

The airport plan review should focus on components of the plan that are associated with aircraft operations and have off-airport impact implications. These components and the questions that should be asked about them include:

- ◆ **Forecasts**—Are the activity forecasts substantially higher than those in the ALUCP or do they include a higher proportion of larger or noisier aircraft, including helicopters?

- ◆ Runway Layout—Are any new runways or helicopter takeoff and landing areas proposed? Are changes in runway length, landing threshold locations, or type of approach procedures planned? What effect do any of these changes have on height limits placed on nearby property for the purposes of airspace protection?
- ◆ Flight Tracks—Will new or modified facilities or aircraft operating procedures result in different aircraft traffic patterns or other changes in where or how high aircraft typically fly when approaching, departing, or flying near the airport?
- ◆ Noise Impacts—Will changes in any of the above items result in significantly increased noise impacts on surrounding lands?

Plans for any other airport facilities or activities associated with aircraft operations also can be considered in the ALUC review. Proposals for new taxiways or aircraft parking facilities near noise-sensitive land uses, for example, may warrant examination. In most cases, however, these facilities and their use pose no significant off-airport implications.

Noise associated with aircraft engine maintenance and testing is not an ALUC concern. These functions are not activities essential to the operation of aircraft at a particular airport. Rather, they are industrial activities and, as such, should be addressed by the local land use jurisdiction in the same manner as other industrial noise sources.

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*As noted earlier in this chapter, an additional component of airport plans that ALUCs should review is proposed non-aviation development of airport property. Such uses include office buildings, industrial facilities, hotels, and other such uses that do not have a direct aeronautical function (see Glossary for definition of aviation-related use). The criteria against which such uses should be evaluated are the same as if the use were located on adjacent private property.*

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### ***Construction or Expansion Plans for Airports without Previous ALUCPs***

When an ALUC reviews a plan for a new airport or heliport—or the expansion of an existing airport or heliport—in an existing land use setting, the basic issue is how will the airport fit into that setting. One way of looking at this issue is to ask: *Would the existing or planned land uses be considered compatible with the airport or heliport if the latter were already in existence?* If not, what features or mitigation measures are included in the airport or heliport proposal to mitigate the noise and safety impacts on surrounding land uses? Specific questions for ALUCs to consider might include:

- ◆ Runway Layout—Does the proposed layout of aircraft landing areas attempt to limit impacts on surrounding land uses to the extent practical?
- ◆ Flight Tracks—Will the aircraft traffic pattern be limited to a single side of the runway because of land use compatibility or other factors? Are any other flight track or operational restrictions proposed to minimize off-airport impacts?
- ◆ Aircraft Activity Characteristics—What type and volume of aircraft activity is projected for the facility over the next 20 years or more? Are these characteristics compatible with surrounding land uses?

- ◆ Property Acquisition—Will fee title and/or easements be acquired on highly impacted property?

When reviewing the plans for a new airport or airport expansion, it is important that ALUCs evaluate the adequacy of the facility design (in terms of federal and state standards) only to the extent that the design affects surrounding land use. Also, commissions must base their review on the proposed design. ALUCs do not have the authority to require alterations to the airport plan or to make different assumptions regarding the future airport role and airfield configuration than are indicated in the airport's plan.

## **6.5 JUDICIAL ACTION**

### **6.5.1 Provisions under Aeronautics Law**

The SAA (PUC Section 21679) explicitly provides for judicial action on ALUC matters only under very limited circumstances. Specifically, all of the following must apply:

- ◆ No ALUCP has been adopted for the airport by an ALUC (PUC Section 21679(a));
- ◆ The local general plan or any applicable specific plan does not accomplish the purposes of an ALUCP (PUC Section 21679(c));
  - The local jurisdiction action in question must be a zoning change, zoning variance, the issuance of a permit, or the adoption of regulation (PUC Section 21679(a));
  - The local action must affect the use of land within one mile of the boundary of a public airport in the county (PUC Section 21679(a));
  - The court proceedings must be initiated by an owner of land within two miles of the airport boundary or an organization with “a demonstrated interest in airport safety and efficiency” (PUC Section 21679(f)); and
  - The proceedings must be commenced within 30 days of the local jurisdiction action or as otherwise provided in state laws (PUC Section 21679(d)).

If all of these conditions prevail, the court may issue an injunction to postpone the effective date of the local action. The postponement remains in effect until the local jurisdiction does one of the following:

- ◆ Adopts a resolution finding that the action is consistent with the purposes of the ALUC statutes;
- ◆ Amends the action to make it consistent with the purposes of the article; or
- ◆ Rescinds the action.





## APPENDICES





## Appendix A

# State Laws Related to Airport Land Use Planning

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Note: The text of all California Codes used in this Handbook is from the Legislative Counsel of California, available at [www.leginfo.ca.gov](http://www.leginfo.ca.gov). The legislative history summary was prepared by the authors.

**AERONAUTICS LAW**  
**PUBLIC UTILITIES CODE**  
**Division 9—Aviation**  
**Part 1—State Aeronautics Act**  
**Chapter 4—Airports and Air Navigation Facilities**

*Article 3.5*  
*Airport Land Use Commission*

(As of January 2011)

**21670. Creation, Membership, Selection**

- (a) The Legislature hereby finds and declares that:
  - (1) It is in the public interest to provide for the orderly development of each public use airport in this state and the area surrounding these airports so as to promote the overall goals and objectives of the California airport noise standards adopted pursuant to Section 21669 and to prevent the creation of new noise and safety problems.
  - (2) It is the purpose of this article to protect public health, safety, and welfare by ensuring the orderly expansion of airports and the adoption of land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses.
- (b) In order to achieve the purposes of this article, every county in which there is located an airport which is served by a scheduled airline shall establish an airport land use commission. Every county, in which there is located an airport which is not served by a scheduled airline, but is operated for the benefit of the general public, shall establish an airport land use commission, except that the board of supervisors of the county may, after consultation with the appropriate airport operators and affected local entities and after a public hearing, adopt a resolution finding that there are no noise, public safety, or land use issues affecting any airport in the county which require the creation of a commission and declaring the county exempt from that requirement. The board shall, in this event, transmit a copy of the resolution to the Director of Transportation. For purposes of this section, "commission" means an airport land use commission. Each commission shall consist of seven members to be selected as follows:
  - (1) Two representing the cities in the county, appointed by a city selection committee comprised of the mayors of all the cities within that county, except that if there are any cities contiguous or adjacent to the qualifying airport, at least one representative shall be appointed therefrom. If there are no cities within a county, the number of representatives provided for by paragraphs (2) and (3) shall each be increased by one.
  - (2) Two representing the county, appointed by the board of supervisors.
  - (3) Two having expertise in aviation, appointed by a selection committee comprised of the managers of all of the public airports within that county.

- (4) One representing the general public, appointed by the other six members of the commission.
- (c) Public officers, whether elected or appointed, may be appointed and serve as members of the commission during their terms of public office.
- (d) Each member shall promptly appoint a single proxy to represent him or her in commission affairs and to vote on all matters when the member is not in attendance. The proxy shall be designated in a signed written instrument which shall be kept on file at the commission offices, and the proxy shall serve at the pleasure of the appointing member. A vacancy in the office of proxy shall be filled promptly by appointment of a new proxy.
- (e) A person having an "expertise in aviation" means a person who, by way of education, training, business, experience, vocation, or avocation has acquired and possesses particular knowledge of, and familiarity with, the function, operation, and role of airports, or is an elected official of a local agency which owns or operates an airport.
- (f) It is the intent of the Legislature to clarify that, for the purposes of this article, that special districts, school districts, and community college districts are included among the local agencies that are subject to airport land use laws and other requirements of this article.

**21670.1. Action by Designated Body Instead of Commission**

- (a) Notwithstanding any other provision of this article, if the board of supervisors and the city selection committee of mayors in the county each makes a determination by a majority vote that proper land use planning can be accomplished through the actions of an appropriately designated body, then the body so designated shall assume the planning responsibilities of an airport land use commission as provided for in this article, and a commission need not be formed in that county.
- (b) A body designated pursuant to subdivision (a) that does not include among its membership at least two members having expertise in aviation, as defined in subdivision (e) of Section 21670, shall, when acting in the capacity of an airport land use commission, be augmented so that body, as augmented, will have at least two members having that expertise. The commission shall be constituted pursuant to this section on and after March 1, 1988.
- (c)
  - (1) Notwithstanding subdivisions (a) and (b), and subdivision (b) of Section 21670, if the board of supervisors of a county and each affected city in that county each makes a determination that proper land use planning pursuant to this article can be accomplished pursuant to this subdivision, then a commission need not be formed in that county.
  - (2) If the board of supervisors of a county and each affected city makes a determination that proper land use planning may be accomplished and a commission is not formed pursuant to paragraph (1), that county and the appropriate affected cities having jurisdiction over an airport, subject to the review and approval by the Division of Aeronautics of the department, shall do all of the following:
    - (A) Adopt processes for the preparation, adoption, and amendment of the airport land use compatibility plan for each airport that is served by a scheduled airline or operated for the benefit of the general public.

- (B) Adopt processes for the notification of the general public, landowners, interested groups, and other public agencies regarding the preparation, adoption, and amendment of the airport land use compatibility plans.
  - (C) Adopt processes for the mediation of disputes arising from the preparation, adoption, and amendment of the airport land use compatibility plans.
  - (D) Adopt processes for the amendment of general and specific plans to be consistent with the airport land use compatibility plans.
  - (E) Designate the agency that shall be responsible for the preparation, adoption, and amendment of each airport land use compatibility plan.
- (3) The Division of Aeronautics of the department shall review the processes adopted pursuant to paragraph (2), and shall approve the processes if the division determines that the processes are consistent with the procedure required by this article and will do all of the following:
- (A) Result in the preparation, adoption, and implementation of plans within a reasonable amount of time.
  - (B) Rely on the height, use, noise, safety, and density criteria that are compatible with airport operations, as established by this article, and referred to as the Airport Land Use Planning Handbook, published by the division, and any applicable federal aviation regulations, including, but not limited to, Part 77 (commencing with Section 77.1) of Title 14 of the Code of Federal Regulations.
  - (C) Provide adequate opportunities for notice to, review of, and comment by the general public, landowners, interested groups, and other public agencies.
- (4) If the county does not comply with the requirements of paragraph (2) within 120 days, then the airport land use compatibility plan and amendments shall not be considered adopted pursuant to this article and a commission shall be established within 90 days of the determination of noncompliance by the division and an airport land use compatibility plan shall be adopted pursuant to this article within 90 days of the establishment of the commission.
- (d) A commission need not be formed in a county that has contracted for the preparation of airport land use compatibility plans with the Division of Aeronautics under the California Aid to Airports Program (Chapter 4 (commencing with Section 4050) of Title 21 of the California Code of Regulations), Project Ker-VAR 90-1, and that submits all of the following information to the Division of Aeronautics for review and comment that the county and the cities affected by the airports within the county, as defined by the airport land use compatibility plans:
- (1) Agree to adopt and implement the airport land use compatibility plans that have been developed under contract.
  - (2) Incorporated the height, use, noise, safety, and density criteria that are compatible with airport operations as established by this article, and referred to as the Airport Land Use Planning Handbook, published by the division, and any applicable federal aviation regulations, including, but not limited to, Part 77 (commencing with Section 77.1) of Title 14 of the Code of Federal Regulations, as part of the general and specific plans for the county and for each affected city.

- (3) If the county does not comply with this subdivision on or before May 1, 1995, then a commission shall be established in accordance with this article.

(e)

- (1) A commission need not be formed in a county if all of the following conditions are met:

- (A) The county has only one public use airport that is owned by a city.

- (i) The county and the affected city adopt the elements in paragraph (2) of subdivision (d), as part of their general and specific plans for the county and the affected city.

- (ii) The general and specific plans shall be submitted, upon adoption, to the Division of Aeronautics. If the county and the affected city do not submit the elements specified in paragraph (2) of subdivision (d), on or before May 1, 1996, then a commission shall be established in accordance with this article.

#### **21670.2. Los Angeles County Applicability to Counties Having over 4 Million Population**

- (a) Sections 21670 and 21670.1 do not apply to the County of Los Angeles. In that county, the county regional planning commission has the responsibility for coordinating the airport planning of public agencies within the county. In instances where impasses result relative to this planning, an appeal may be made to the county regional planning commission by any public agency involved. The action taken by the county regional planning commission on an appeal may be overruled by a four-fifths vote of the governing body of a public agency whose planning led to the appeal.
- (b) By January 1, 1992, the county regional planning commission shall adopt the airport land use compatibility plans required pursuant to Section 21675.
- (c) Sections 21675.1, 21675.2, and 21679.5 do not apply to the County of Los Angeles until January 1, 1992. If the airport land use compatibility plans required pursuant to Section 21675 are not adopted by the county regional planning commission by January 1, 1992, Sections 21675.1 and 21675.2 shall apply to the County of Los Angeles until the airport land use compatibility plans are adopted.

#### **21670.3. San Diego County**

- (a) Sections 21670 and 21670.1 do not apply to the County of San Diego. In that county, the San Diego County Regional Airport Authority, as established pursuant to Section 170002, shall be responsible for the preparation, adoption, and amendment of an airport land use compatibility plan for each airport in San Diego County.
- (b) The San Diego County Regional Airport Authority shall engage in a public collaborative planning process when preparing and updating an airport land use compatibility plan.

#### **21670.4. Intercounty Airports**

- (a) As used in this section, "intercounty airport" means any airport bisected by a county line through its runways, runway protection zones, inner safety zones, inner turning zones, outer safety zones, or sideline safety zones, as defined by the department's Airport Land Use Planning Handbook and referenced in the airport land use compatibility plan formulated under Section 21675.



- (b) It is the purpose of this section to provide the opportunity to establish a separate airport land use commission so that an intercounty airport may be served by a single airport land use planning agency, rather than having to look separately to the airport land use commissions of the affected counties.
- (c) In addition to the airport land use commissions created under Section 21670 or the alternatives established under Section 21670.1, for their respective counties, the boards of supervisors and city selection committees for the affected counties, by independent majority vote of each county's two delegations, for any intercounty airport, may do either of the following:
  - (1) Establish a single separate airport land use commission for that airport. That commission shall consist of seven members to be selected as follows:
    - (A) One representing the cities in each of the counties, appointed by that county's city selection committee.
    - (B) One representing each of the counties, appointed by the board of supervisors of each county.
    - (C) One from each county having expertise in aviation, appointed by a selection committee comprised of the managers of all the public airports within that county.
    - (D) One representing the general public, appointed by the other six members of the commission.
  - (2) In accordance with subdivision (a) or (b) of Section 21670.1, designate an existing appropriate entity as that airport's land use commission.

### **21671. Airport Owned by a City, District, or County**

In any county where there is an airport operated for the general public which is owned by a city or district in another county or by another county, one of the representatives provided by paragraph (1) of subdivision (b) of Section 21670 shall be appointed by the city selection committee of mayors of the cities of the county in which the owner of that airport is located, and one of the representatives provided by paragraph (2) of subdivision (b) of Section 21670 shall be appointed by the board of supervisors of the county in which the owner of that airport is located.

### **21671.5. Term of Office**

- (a) Except for the terms of office of the members of the first commission, the term of office of each member shall be four years and until the appointment and qualification of his or her successor. The members of the first commission shall classify themselves by lot so that the term of office of one member is one year, of two members is two years, of two members is three years, and of two members is four years. The body that originally appointed a member whose term has expired shall appoint his or her successor for a full term of four years. Any member may be removed at any time and without cause by the body appointing that member. The expiration date of the term of office of each member shall be the first Monday in May in the year in which that member's term is to expire. Any vacancy in the membership of the commission shall be filled for the unexpired term by appointment by the body which originally appointed the member whose office has become vacant. The chairperson of the commission shall be selected by the members thereof.

- (b) Compensation, if any, shall be determined by the board of supervisors.
- (c) Staff assistance, including the mailing of notices and the keeping of minutes and necessary quarters, equipment, and supplies shall be provided by the county. The usual and necessary operating expenses of the commission shall be a county charge.
- (d) Notwithstanding any other provisions of this article, the commission shall not employ any personnel either as employees or independent contractors without the prior approval of the board of supervisors.
- (e) The commission shall meet at the call of the commission chairperson or at the request of the majority of the commission members. A majority of the commission members shall constitute a quorum for the transaction of business. No action shall be taken by the commission except by the recorded vote of a majority of the full membership.
- (f) The commission may establish a schedule of fees necessary to comply with this article. Those fees shall be charged to the proponents of actions, regulations, or permits, shall not exceed the estimated reasonable cost of providing the service, and shall be imposed pursuant to Section 66016 of the Government Code. Except as provided in subdivision (g), after June 30, 1991, a commission that has not adopted the airport land use compatibility plan required by Section 21675 shall not charge fees pursuant to this subdivision until the commission adopts the plan.
- (g) In any county that has undertaken by contract or otherwise completed airport land use compatibility plans for at least one-half of all public use airports in the county, the commission may continue to charge fees necessary to comply with this article until June 30, 1992, and, if the airport land use compatibility plans are complete by that date, may continue charging fees after June 30, 1992. If the airport land use compatibility plans are not complete by June 30, 1992, the commission shall not charge fees pursuant to subdivision (f) until the commission adopts the land use plans.

**21672. Rules and Regulations**

Each commission shall adopt rules and regulations with respect to the temporary disqualification of its members from participating in the review or adoption of a proposal because of conflict of interest and with respect to appointment of substitute members in such cases.

**21673. Initiation of Proceedings for Creation by Owner of Airport**

In any county not having a commission or a body designated to carry out the responsibilities of a commission, any owner of a public airport may initiate proceedings for the creation of a commission by presenting a request to the board of supervisors that a commission be created and showing the need therefore to the satisfaction of the board of supervisors.

**21674. Powers and Duties**

The commission has the following powers and duties, subject to the limitations upon its jurisdiction set forth in Section 21676:

- (a) To assist local agencies in ensuring compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that the land in the vicinity of those airports is not already devoted to incompatible uses.
- (b) To coordinate planning at the state, regional, and local levels so as to provide for the orderly development of air transportation, while at the same time protecting the public health, safety, and welfare.

- (c) To prepare and adopt an airport land use compatibility plan pursuant to Section 21675.
- (d) To review the plans, regulations, and other actions of local agencies and airport operators pursuant to Section 21676.
- (e) The powers of the commission shall in no way be construed to give the commission jurisdiction over the operation of any airport.
- (f) In order to carry out its responsibilities, the commission may adopt rules and regulations consistent with this article.

#### **21674.5. Training of Airport Land Use Commission's Staff**

- (a) The Department of Transportation shall develop and implement a program or programs to assist in the training and development of the staff of airport land use commissions, after consulting with airport land use commissions, cities, counties, and other appropriate public entities.
- (b) The training and development program or programs are intended to assist the staff of airport land use commissions in addressing high priority needs, and may include, but need not be limited to, the following:
  - (1) The establishment of a process for the development and adoption of airport land use compatibility plans.
  - (2) The development of criteria for determining the airport influence area.
  - (3) The identification of essential elements that should be included in the airport land use compatibility plans.
  - (4) Appropriate criteria and procedures for reviewing proposed developments and determining whether proposed developments are compatible with the airport use.
  - (5) Any other organizational, operational, procedural, or technical responsibilities and functions that the department determines to be appropriate to provide to commission staff and for which it determines there is a need for staff training or development.
- (c) The department may provide training and development programs for airport land use commission staff pursuant to this section by any means it deems appropriate. Those programs may be presented in any of the following ways:
  - (1) By offering formal courses or training programs.
  - (2) By sponsoring or assisting in the organization and sponsorship of conferences, seminars, or other similar events.
  - (3) By producing and making available written information.
  - (4) Any other feasible method of providing information and assisting in the training and development of airport land use commission staff.

#### **21674.7. Airport Land Use Planning Handbook**

- (a) An airport land use commission that formulates, adopts, or amends an airport land use compatibility plan shall be guided by information prepared and updated pursuant to Section 21674.5 and referred to as the Airport Land Use Planning Handbook published by the Division of Aeronautics of the Department of Transportation.

- (b) It is the intent of the Legislature to discourage incompatible land uses near existing airports. Therefore, prior to granting permits for the renovation or remodeling of an existing building, structure, or facility, and before the construction of a new building, it is the intent of the Legislature that local agencies shall be guided by the height, use, noise, safety, and density criteria that are compatible with airport operations, as established by this article, and referred to as the Airport Land Use Planning Handbook, published by the division, and any applicable federal aviation regulations, including, but not limited to, Part 77 (commencing with Section 77.1) of Title 14 of the Code of Federal Regulations, to the extent that the criteria has been incorporated into the plan prepared by a commission pursuant to Section 21675. This subdivision does not limit the jurisdiction of a commission as established by this article. This subdivision does not limit the authority of local agencies to overrule commission actions or recommendations pursuant to Sections 21676, 21676.5, or 21677.

#### **21675. Land Use Plan**

- (a) Each commission shall formulate an airport land use compatibility plan that will provide for the orderly growth of each public airport and the area surrounding the airport within the jurisdiction of the commission, and will safeguard the general welfare of the inhabitants within the vicinity of the airport and the public in general. The commission's airport land use compatibility plan shall include and shall be based on a long-range master plan or an airport layout plan, as determined by the Division of Aeronautics of the Department of Transportation, that reflects the anticipated growth of the airport during at least the next 20 years. In formulating an airport land use compatibility plan, the commission may develop height restrictions on buildings, specify use of land, and determine building standards, including soundproofing adjacent to airports, within the airport influence area. The airport land use compatibility plan shall be reviewed as often as necessary in order to accomplish its purposes, but shall not be amended more than once in any calendar year.
- (b) The commission shall include, within its airport land use compatibility plan formulated pursuant to subdivision (a), the area within the jurisdiction of the commission surrounding any military airport for all of the purposes specified in subdivision (a). The airport land use compatibility plan shall be consistent with the safety and noise standards in the Air Installation Compatible Use Zone prepared for that military airport. This subdivision does not give the commission any jurisdiction or authority over the territory or operations of any military airport.
- (c) The airport influence area shall be established by the commission after hearing and consultation with the involved agencies.
- (d) The commission shall submit to the Division of Aeronautics of the department one copy of the airport land use compatibility plan and each amendment to the plan.
- (e) If an airport land use compatibility plan does not include the matters required to be included pursuant to this article, the Division of Aeronautics of the department shall notify the commission responsible for the plan.

#### **21675.1. Adoption of Land Use Plan**

- (a) By June 30, 1991, each commission shall adopt the airport land use compatibility plan required pursuant to Section 21675, except that any county that has undertaken by contract or otherwise completed airport land use compatibility plans for at least one-half of all public use airports in the county, shall adopt that airport land use compatibility plan on or before June 30, 1992.

- (b) Until a commission adopts an airport land use compatibility plan, a city or county shall first submit all actions, regulations, and permits within the vicinity of a public airport to the commission for review and approval. Before the commission approves or disapproves any actions, regulations, or permits, the commission shall give public notice in the same manner as the city or county is required to give for those actions, regulations, or permits. As used in this section, "vicinity" means land that will be included or reasonably could be included within the airport land use compatibility plan. If the commission has not designated an airport influence area for the airport land use compatibility plan, then "vicinity" means land within two miles of the boundary of a public airport.
- (c) The commission may approve an action, regulation, or permit if it finds, based on substantial evidence in the record, all of the following:
  - (1) The commission is making substantial progress toward the completion of the airport land use compatibility plan.
  - (2) There is a reasonable probability that the action, regulation, or permit will be consistent with the airport land use compatibility plan being prepared by the commission.
  - (3) There is little or no probability of substantial detriment to or interference with the future adopted airport land use compatibility plan if the action, regulation, or permit is ultimately inconsistent with the airport land use compatibility plan.
- (d) If the commission disapproves an action, regulation, or permit, the commission shall notify the city or county. The city or county may overrule the commission, by a two-thirds vote of its governing body, if it makes specific findings that the proposed action, regulation, or permit is consistent with the purposes of this article, as stated in Section 21670.
- (e) If a city or county overrules the commission pursuant to subdivision (d), that action shall not relieve the city or county from further compliance with this article after the commission adopts the airport land use compatibility plan.
- (f) If a city or county overrules the commission pursuant to subdivision (d) with respect to a publicly owned airport that the city or county does not operate, the operator of the airport is not liable for damages to property or personal injury resulting from the city's or county's decision to proceed with the action, regulation, or permit.
- (g) A commission may adopt rules and regulations that exempt any ministerial permit for single-family dwellings from the requirements of subdivision (b) if it makes the findings required pursuant to subdivision (c) for the proposed rules and regulations, except that the rules and regulations may not exempt either of the following:
  - (1) More than two single-family dwellings by the same applicant within a subdivision prior to June 30, 1991.
  - (2) Single-family dwellings in a subdivision where 25 percent or more of the parcels are undeveloped.

#### **21675.2. Approval or Disapproval of Actions, Regulations, or Permits**

- (a) If a commission fails to act to approve or disapprove any actions, regulations, or permits within 60 days of receiving the request pursuant to Section 21675.1, the applicant or his or her representative may file an action pursuant to Section 1094.5 of

the Code of Civil Procedure to compel the commission to act, and the court shall give the proceedings preference over all other actions or proceedings, except previously filed pending matters of the same character.

- (b) The action, regulation, or permit shall be deemed approved only if the public notice required by this subdivision has occurred. If the applicant has provided seven days advance notice to the commission of the intent to provide public notice pursuant to this subdivision, then, not earlier than the date of the expiration of the time limit established by Section 21675.1, an applicant may provide the required public notice. If the applicant chooses to provide public notice, that notice shall include a description of the proposed action, regulation, or permit substantially similar to the descriptions which are commonly used in public notices by the commission, the location of any proposed development, the application number, the name and address of the commission, and a statement that the action, regulation, or permit shall be deemed approved if the commission has not acted within 60 days. If the applicant has provided the public notice specified in this subdivision, the time limit for action by the commission shall be extended to 60 days after the public notice is provided. If the applicant provides notice pursuant to this section, the commission shall refund to the applicant any fees which were collected for providing notice and which were not used for that purpose.
- (c) Failure of an applicant to submit complete or adequate information pursuant to Sections 65943 to 65946, inclusive, of the Government Code, may constitute grounds for disapproval of actions, regulations, or permits.
- (d) Nothing in this section diminishes the commission's legal responsibility to provide, where applicable, public notice and hearing before acting on an action, regulation, or permit.

#### **21676. Review of Local General Plans**

- (a) Each local agency whose general plan includes areas covered by an airport land use compatibility plan shall, by July 1, 1983, submit a copy of its plan or specific plans to the airport land use commission. The commission shall determine by August 31, 1983, whether the plan or plans are consistent or inconsistent with the airport land use compatibility plan. If the plan or plans are inconsistent with the airport land use compatibility plan, the local agency shall be notified and that local agency shall have another hearing to reconsider its airport land use compatibility plans. The local agency may propose to overrule the commission after the hearing by a two-thirds vote of its governing body if it makes specific findings that the proposed action is consistent with the purposes of this article stated in Section 21670. At least 45 days prior to the decision to overrule the commission, the local agency governing body shall provide the commission and the division a copy of the proposed decision and findings. The commission and the division may provide comments to the local agency governing body within 30 days of receiving the proposed decision and findings. If the commission or the division's comments are not available within this time limit, the local agency governing body may act without them. The comments by the division or the commission are advisory to the local agency governing body. The local agency governing body shall include comments from the commission and the division in the final record of any final decision to overrule the commission, which may only be adopted by a two-thirds vote of the governing body.
- (b) Prior to the amendment of a general plan or specific plan, or the adoption or approval of a zoning ordinance or building regulation within the planning boundary established by the airport land use commission pursuant to Section 21675, the local agency shall first

refer the proposed action to the commission. If the commission determines that the proposed action is inconsistent with the commission's plan, the referring agency shall be notified. The local agency may, after a public hearing, propose to overrule the commission by a two-thirds vote of its governing body if it makes specific findings that the proposed action is consistent with the purposes of this article stated in Section 21670. At least 45 days prior to the decision to overrule the commission, the local agency governing body shall provide the commission and the division a copy of the proposed decision and findings. The commission and the division may provide comments to the local agency governing body within 30 days of receiving the proposed decision and findings. If the commission or the division's comments are not available within this time limit, the local agency governing body may act without them. The comments by the division or the commission are advisory to the local agency governing body. The local agency governing body shall include comments from the commission and the division in the public record of any final decision to overrule the commission, which may only be adopted by a two-thirds vote of the governing body.

- (c) Each public agency owning any airport within the boundaries of an airport land use compatibility plan shall, prior to modification of its airport master plan, refer any proposed change to the airport land use commission. If the commission determines that the proposed action is inconsistent with the commission's plan, the referring agency shall be notified. The public agency may, after a public hearing, propose to overrule the commission by a two-thirds vote of its governing body if it makes specific findings that the proposed action is consistent with the purposes of this article stated in Section 21670. At least 45 days prior to the decision to overrule the commission, the public agency governing body shall provide the commission and the division a copy of the proposed decision and findings. The commission and the division may provide comments to the public agency governing body within 30 days of receiving the proposed decision and findings. If the commission or the division's comments are not available within this time limit, the public agency governing body may act without them. The comments by the division or the commission are advisory to the public agency governing body. The public agency governing body shall include comments from the commission and the division in the final decision to overrule the commission, which may only be adopted by a two-thirds vote of the governing body.
- (d) Each commission determination pursuant to subdivision (b) or (c) shall be made within 60 days from the date of referral of the proposed action. If a commission fails to make the determination within that period, the proposed action shall be deemed consistent with the airport land use compatibility plan.

#### **21676.5. Review of Local Plans**

- (a) If the commission finds that a local agency has not revised its general plan or specific plan or overruled the commission by a two-thirds vote of its governing body after making specific findings that the proposed action is consistent with the purposes of this article as stated in Section 21670, the commission may require that the local agency submit all subsequent actions, regulations, and permits to the commission for review until its general plan or specific plan is revised or the specific findings are made. If, in the determination of the commission, an action, regulation, or permit of the local agency is inconsistent with the airport land use compatibility plan, the local agency shall be notified and that local agency shall hold a hearing to reconsider its plan. The local agency may propose to overrule the commission after the hearing by a two-thirds vote of its governing body if it makes specific findings that the proposed action is consistent with the purposes of this article as stated in Section 21670. At least 45 days

prior to the decision to overrule the commission, the local agency governing body shall provide the commission and the division a copy of the proposed decision and findings. The commission and the division may provide comments to the local agency governing body within 30 days of receiving the proposed decision and findings. If the commission or the division's comments are not available within this time limit, the local agency governing body may act without them. The comments by the division or the commission are advisory to the local agency governing body. The local agency governing body shall include comments from the commission and the division in the final decision to overrule the commission, which may only be adopted by a two-thirds vote of the governing body.

- (b) Whenever the local agency has revised its general plan or specific plan or has overruled the commission pursuant to subdivision (a), the proposed action of the local agency shall not be subject to further commission review, unless the commission and the local agency agree that individual projects shall be reviewed by the commission.

#### **21677. Marin County Override Provisions**

Notwithstanding the two-thirds vote required by Section 21676, any public agency in the County of Marin may overrule the Marin County Airport Land Use Commission by a majority vote of its governing body. At least 45 days prior to the decision to overrule the commission, the public agency governing body shall provide the commission and the division a copy of the proposed decision and findings. The commission and the division may provide comments to the public agency governing body within 30 days of receiving the proposed decision and findings. If the commission or the division's comments are not available within this time limit, the public agency governing body may act without them. The comments by the division or the commission are advisory to the public agency governing body. The public agency governing body shall include comments from the commission and the division in the public record of the final decision to overrule the commission, which may be adopted by a majority vote of the governing body.

#### **21678. Airport Owner's Immunity**

With respect to a publicly owned airport that a public agency does not operate, if the public agency pursuant to Section 21676, 21676.5, or 21677 overrules a commission's action or recommendation, the operator of the airport shall be immune from liability for damages to property or personal injury caused by or resulting directly or indirectly from the public agency's decision to overrule the commission's action or recommendation.

#### **21679. Court Review**

- (a) In any county in which there is no airport land use commission or other body designated to assume the responsibilities of an airport land use commission, or in which the commission or other designated body has not adopted an airport land use compatibility plan, an interested party may initiate proceedings in a court of competent jurisdiction to postpone the effective date of a zoning change, a zoning variance, the issuance of a permit, or the adoption of a regulation by a local agency, that directly affects the use of land within one mile of the boundary of a public airport within the county.
- (b) The court may issue an injunction that postpones the effective date of the zoning change, zoning variance, permit, or regulation until the governing body of the local agency that took the action does one of the following:



- (1) In the case of an action that is a legislative act, adopts a resolution declaring that the proposed action is consistent with the purposes of this article stated in Section 21670.
  - (2) In the case of an action that is not a legislative act, adopts a resolution making findings based on substantial evidence in the record that the proposed action is consistent with the purposes of this article stated in Section 21670.
  - (3) Rescinds the action.
  - (4) Amends its action to make it consistent with the purposes of this article stated in Section 21670, and complies with either paragraph (1) or (2), whichever is applicable.
- (c) The court shall not issue an injunction pursuant to subdivision (b) if the local agency that took the action demonstrates that the general plan and any applicable specific plan of the agency accomplishes the purposes of an airport land use compatibility plan as provided in Section 21675.
- (d) An action brought pursuant to subdivision (a) shall be commenced within 30 days of the decision or within the appropriate time periods set by Section 21167 of the Public Resources Code, whichever is longer.
- (e) If the governing body of the local agency adopts a resolution pursuant to subdivision (b) with respect to a publicly owned airport that the local agency does not operate, the operator of the airport shall be immune from liability for damages to property or personal injury from the local agency's decision to proceed with the zoning change, zoning variance, permit, or regulation.
- (f) As used in this section, "interested party" means any owner of land within two miles of the boundary of the airport or any organization with a demonstrated interest in airport safety and efficiency.

#### **21679.5. Deferral of Court Review**

- (a) Until June 30, 1991, no action pursuant to Section 21679 to postpone the effective date of a zoning change, a zoning variance, the issuance of a permit, or the adoption of a regulation by a local agency, directly affecting the use of land within one mile of the boundary of a public airport, shall be commenced in any county in which the commission or other designated body has not adopted an airport land use compatibility plan, but is making substantial progress toward the completion of the airport land use compatibility plan.
- (b) If a commission has been prevented from adopting the airport land use compatibility plan by June 30, 1991, or if the adopted airport land use compatibility plan could not become effective, because of a lawsuit involving the adoption of the airport land use compatibility plan, the June 30, 1991, date in subdivision (a) shall be extended by the period of time during which the lawsuit was pending in a court of competent jurisdiction.
- (c) Any action pursuant to Section 21679 commenced prior to January 1, 1990, in a county in which the commission or other designated body has not adopted an airport land use compatibility plan, but is making substantial progress toward the completion of the airport land use compatibility plan, which has not proceeded to final judgment, shall be held in abeyance until June 30, 1991. If the commission or other designated body

adopts an airport land use compatibility plan on or before June 30, 1991, the action shall be dismissed. If the commission or other designated body does not adopt an airport land use compatibility plan on or before June 30, 1991, the plaintiff or plaintiffs may proceed with the action.

- (d) An action to postpone the effective date of a zoning change, a zoning variance, the issuance of a permit, or the adoption of a regulation by a local agency, directly affecting the use of land within one mile of the boundary of a public airport for which an airport land use compatibility plan has not been adopted by June 30, 1991, shall be commenced within 30 days of June 30, 1991, or within 30 days of the decision by the local agency, or within the appropriate time periods set by Section 21167 of the Public Resources Code, whichever date is later.

**AERONAUTICS LAW**  
**PUBLIC UTILITIES CODE**  
**Division 9, Part 1**  
**Chapter 3—Regulations of Aeronautics**  
**(excerpts)**

**21402. Ownership; Prohibited Use of Airspace**

The ownership of the space above the land and waters of this State is vested in the several owners of the surface beneath, subject to the right of flight described in Section 21403. No use shall be made of such airspace which would interfere with such right of flight; provided, that any use of property in conformity with an original zone of approach of an airport shall not be rendered unlawful by reason of a change in such zone of approach.

**21403. Lawful Flight; Flight Within Airport Approach Zone**

- (a) Flight in aircraft over the land and waters of this state is lawful, unless at altitudes below those prescribed by federal authority, or unless conducted so as to be imminently dangerous to persons or property lawfully on the land or water beneath. The landing of an aircraft on the land or waters of another, without his or her consent, is unlawful except in the case of a forced landing or pursuant to Section 21662.1. The owner, lessee, or operator of the aircraft is liable, as provided by law, for damages caused by a forced landing.
- (b) The landing, takeoff, or taxiing of an aircraft on a public freeway, highway, road, or street is unlawful except in the following cases:
  - (1) A forced landing.
  - (2) A landing during a natural disaster or other public emergency if the landing has received prior approval from the public agency having primary jurisdiction over traffic upon the freeway, highway, road, or street.
  - (3) When the landing, takeoff, or taxiing has received prior approval from the public agency having primary jurisdiction over traffic upon the freeway, highway, road or street.

The prosecution bears the burden of proving that none of the exceptions apply to the act which is alleged to be unlawful.

- (c) The right of flight in aircraft includes the right of safe access to public airports, which includes the right of flight within the zone of approach of any public airport without restriction or hazard. The zone of approach of an airport shall conform to the specifications of Part 77 of the Federal Aviation Regulations of the Federal Aviation Administration, Department of Transportation.

**AERONAUTICS LAW**

**PUBLIC UTILITIES CODE**

**Division 9, Part 1**

**Chapter 4—Airports and Air Navigation Facilities**

**Article 2.7**

**REGULATION OF OBSTRUCTIONS**

**(excerpts)**

**21655. Proposed Site for Construction of State Building Within Two Miles of Airport Boundary**

Notwithstanding any other provision of law, if the proposed site of any state building or other enclosure is within two miles, measured by air line, of that point on an airport runway, or runway proposed by an airport master plan, which is nearest the site, the state agency or office which proposes to construct the building or other enclosure shall, before acquiring title to property for the new state building or other enclosure site or for an addition to a present site, notify the Department of Transportation, in writing, of the proposed acquisition. The department shall investigate the proposed site and, within 30 working days after receipt of the notice, shall submit to the state agency or office which proposes to construct the building or other enclosure a written report of the investigation and its recommendations concerning acquisition of the site.

If the report of the department does not favor acquisition of the site, no state funds shall be expended for the acquisition of the new state building or other enclosure site, or the expansion of the present site, or for the construction of the state building or other enclosure, provided that the provisions of this section shall not affect title to real property once it is acquired.

**21658. Construction of Utility Pole or Line in Vicinity of Aircraft Landing Area**

No public utility shall construct any pole, pole line, distribution or transmission tower, or tower line, or substation structure in the vicinity of the exterior boundary of an aircraft landing area of any airport open to public use, in a location with respect to the airport and at a height so as to constitute an obstruction to air navigation, as an obstruction is defined in accordance with Part 77 of the Federal Aviation Regulations, Federal Aviation Administration, or any corresponding rules or regulations of the Federal Aviation Administration, unless the Federal Aviation Administration has determined that the pole, line, tower, or structure does not constitute a hazard to air navigation. This section shall not apply to existing poles, lines, towers, or structures or to the repair, replacement, or reconstruction thereof if the original height is not materially exceeded and this section shall not apply unless just compensation shall have first been paid to the public utility by the owner of any airport for any property or property rights which would be taken or damaged hereby.

**21659. Hazards Near Airports Prohibited**

- (a) No person shall construct or alter any structures or permit any natural growth to grow at a height which exceeds the obstruction standards set forth in the regulations of the

Federal Aviation Administration relating to objects affecting navigable airspace contained in Title 14 of the Code of Federal Regulations, Part 77, Subpart C, unless a permit allowing the construction, alteration, or growth is issued by the department.

- (b) The permit is not required if the Federal Aviation Administration has determined that the construction, alteration, or growth does not constitute a hazard to air navigation or would not create an unsafe condition for air navigation. Subdivision (a) does not apply to a pole, pole line, distribution or transmission tower, or tower line or substation of a public utility.
- (c) Section 21658 is applicable to subdivision (b).

**AERONAUTICS LAW  
PUBLIC UTILITIES CODE  
Division 9, Part 1, Chapter 4  
Article 3  
REGULATION OF AIRPORTS  
(*excerpts*)**

**21661.5. City Council or Board of Supervisors and ALUC Approvals**

- (a) No political subdivisions, any of its officers or employees, or any person may submit any application for the construction of a new airport to any local, regional, state, or federal agency unless the plan for construction is first approved by the board of supervisors of the county, or the city council of the city, in which the airport is to be located and unless the plan is submitted to the appropriate commission exercising powers pursuant to Article 3.5 (commencing with Section 21670) of Chapter 4 of Part 1 of Division 9, and acted upon by that commission in accordance with the provisions of that article.
- (b) A county board of supervisors or a city council may, pursuant to Section 65100 of the Government Code, delegate its responsibility under this section for the approval of a plan for construction of new helicopter landing and takeoff areas, to the county or city planning agency.

**21664.5 Amended Airport Permits; Airport Expansion Defined**

- (a) An amended airport permit shall be required for every expansion of an existing airport. An applicant for an amended airport permit shall comply with each requirement of this article pertaining to permits for new airports. The department may by regulation provide for exemptions from the operation of this section pursuant to Section 21661, except that no exemption shall be made limiting the applicability of subdivision (e) of Section 21666, pertaining to environmental considerations, including the requirement for public hearings in connection therewith.
- (b) As used in this section, “airport expansion” includes any of the following:
  - (1) The acquisition of runway protection zones, as defined in Federal Aviation Administration Advisory Circular 150/1500-13, or of any interest in land for the purpose of any other expansion as set forth in this section.
  - (2) The construction of a new runway.
  - (3) The extension or realignment of an existing runway.
  - (4) Any other expansion of the airport’s physical facilities for the purpose of accomplishing or which are related to the purpose of paragraph (1), (2), or (3).
- (c) This section does not apply to any expansion of an existing airport if the expansion commenced on or prior to the effective date of this section and the expansion met the approval, on or prior to that effective date, of each governmental agency that required the approval by law.

**PLANNING AND ZONING LAW**  
**GOVERNMENT CODE**  
**Title 7—Planning and Land Use**  
**Division 1—Planning and Zoning**  
**Chapter 3—Local Planning**  
*Article 5*  
***AUTHORITY FOR AND SCOPE OF GENERAL PLANS***  
***(excerpts)***

**65302.3. General and Applicable Specific Plans; Consistency with Airport Land Use Plans; Amendment; Nonoccurrence Findings**

- (a) The general plan, and any applicable specific plan prepared pursuant to Article 8 (commencing with Section 65450), shall be consistent with the plan adopted or amended pursuant to Section 21675 of the Public Utilities Code.
- (b) The general plan, and any applicable specific plan, shall be amended, as necessary, within 180 days of any amendment to the plan required under Section 21675 of the Public Utilities Code.
- (c) If the legislative body does not concur with any provision of the plan required under Section 21675 of the Public Utilities Code, it may satisfy the provisions of this section by adopting findings pursuant to Section 21676 of the Public Utilities Code.
- (d) In each county where an airport land use commission does not exist, but where there is a military airport, the general plan, and any applicable specific plan prepared pursuant to Article 8 (commencing with Section 65450), shall be consistent with the safety and noise standards in the Air Installation Compatible Use Zone prepared for that military airport.

**PLANNING AND ZONING LAW**  
**GOVERNMENT CODE**  
**Title 7, Division 1**  
**Chapter 4.5—Review and Approval of Development Projects**  
**Article 3**  
***APPLICATION FOR DEVELOPMENT PROJECTS***  
***(excerpts)***

**65943. Completeness of Application; Determination; Submission of Additional Materials; Appeal; Extension of Time Limits; Fees**

- (a) Not later than 30 calendar days after any public agency has received an application for a development project, the agency shall determine in writing whether the application is complete and shall immediately transmit the determination to the applicant for the development project. If the written determination is not made within 30 days after receipt of the application, and the application includes a statement that it is an application for a development permit, the application shall be deemed complete for purposes of this chapter. Upon receipt of any re-submittal of the application, a new 30-day period shall begin, during which the public agency shall determine the completeness of the application. If the application is determined not to be complete, the agency's determination shall specify those parts of the application which are incomplete and shall indicate the manner in which they can be made complete, including a list and thorough description of the specific information needed to complete the application. The applicant shall submit materials to the public agency in response to the list and description.
- (b) Not later than 30 calendar days after receipt of the submitted materials, the public agency shall determine in writing whether they are complete and shall immediately transmit that determination to the applicant. If the written determination is not made within that 30-day period, the application together with the submitted materials shall be deemed complete for purposes of this chapter.
- (c) If the application together with the submitted materials are determined not to be complete pursuant to subdivision (b), the public agency shall provide a process for the applicant to appeal that decision in writing to the governing body of the agency or, if there is no governing body, to the director of the agency, as provided by that agency. A city or county shall provide that the right of appeal is to the governing body or, at their option, the planning commission, or both.

There shall be a final written determination by the agency on the appeal not later than 60 calendar days after receipt of the applicant's written appeal. The fact that an appeal is permitted to both the planning commission and to the governing body does not extend the 60-day period. Notwithstanding a decision pursuant to subdivision (b) that the application and submitted materials are not complete, if the final written determination on the appeal is not made within that 60-day period, the application with the submitted materials shall be deemed complete for the purposes of this chapter.

- (d) Nothing in this section precludes an applicant and a public agency from mutually agreeing to an extension of any time limit provided by this section.
- (e) A public agency may charge applicants a fee not to exceed the amount reasonably necessary to provide the service required by this section. If a fee is charged pursuant to



this section, the fee shall be collected as part of the application fee charged for the development permit.

#### **65943.5. Environmental Permit Applications; Appeals**

- (a) Notwithstanding any other provision of this chapter, any appeal pursuant to subdivision (c) of Section 65943 involving a permit application to a board, office, or department within the California Environmental Protection Agency shall be made to the Secretary for Environmental Protection.
- (b) Notwithstanding any other provision of this chapter, any appeal pursuant to subdivision (c) of Section 65943 involving an application for the issuance of an environmental permit from an environmental agency shall be made to the Secretary for Environmental Protection under either of the following circumstances:
  - (1) The environmental agency has not adopted an appeals process pursuant to subdivision (c) of Section 65943.
  - (2) The environmental agency declines to accept an appeal for a decision pursuant to subdivision (c) of Section 65943.
- (c) For purposes of subdivision (b), "environmental permit" has the same meaning as defined in Section 71012 of the Public Resources Code, and "environmental agency" has the same meaning as defined in Section 71011 of the Public Resources Code, except that "environmental agency" does not include the agencies described in subdivisions (c) and (h) of Section 71011 of the Public Resources Code.

#### **65944. Acceptance of application as complete; requests for additional information; restrictions; prior notice of necessary information; Proximity to Military Installation or Special Use Airspace**

- (a) After a public agency accepts an application as complete, the agency shall not subsequently request of an applicant any new or additional information which was not specified in the list prepared pursuant to Section 65940. The agency may, in the course of processing the application, request the applicant to clarify, amplify, correct, or otherwise supplement the information required for the application.
- (b) The provisions of subdivision (a) shall not be construed as requiring an applicant to submit with his or her initial application the entirety of the information which a public agency may require in order to take final action on the application. Prior to accepting an application, each public agency shall inform the applicant of any information included in the list prepared pursuant to Section 65940 which will subsequently be required from the applicant in order to complete final action on the application.
- (c) This section shall not be construed as limiting the ability of a public agency to request and obtain information which may be needed in order to comply with the provisions of Division 13 (commencing with Section 21000) of the Public Resources Code.

#### **65945. Requests for Notice of Proposal to Adopt or Amend Certain Plans or Ordinances By City or County; Subscription to Periodically Updated Notice as Alternative; Fees**

- (a) At the time of filing an application for a development permit with a city or county, the city or county shall inform the applicant that he or she may make a written request to receive notice from the city or county of a proposal to adopt or amend any of the following plans or ordinances:

- (1) A general plan.
- (2) A specific plan.
- (3) A zoning ordinance.
- (4) An ordinance affecting building permits or grading permits.

The applicant shall specify, in the written request, the types of proposed action for which notice is requested. Prior to taking any of those actions, the city or county shall give notice to any applicant who has requested notice of the type of action proposed and whose development project is pending before the city or county if the city or county determines that the proposal is reasonably related to the applicant's request for the development permit. Notice shall be given only for those types of actions which the applicant specifies in the request for notification.

The city or county may charge the applicant for a development permit, to whom notice is provided pursuant to this subdivision, a reasonable fee not to exceed the actual cost of providing that notice. If a fee is charged pursuant to this subdivision, the fee shall be collected as part of the application fee charged for the development permit.

- (b) As an alternative to the notification procedure prescribed by subdivision (a), a city or county may inform the applicant at the time of filing an application for a development permit that he or she may subscribe to a periodically updated notice or set of notices from the city or county which lists pending proposals to adopt or amend any of the plans or ordinances specified in subdivision (a), together with the status of the proposal and the date of any hearings thereon which have been set.

Only those proposals which are general, as opposed to parcel-specific in nature, and which the city or county determines are reasonably related to requests for development permits, need be listed in the notice. No proposal shall be required to be listed until such time as the first public hearing thereon has been set. The notice shall be updated and mailed at least once every six weeks; except that a notice need not be updated and mailed until a change in its contents is required.

The city or county may charge the applicant for a development permit, to whom notice is provided pursuant to this subdivision, a reasonable fee not to exceed the actual cost of providing that notice, including the costs of updating the notice, for the length of time the applicant requests to be sent the notice or notices.

**65945.3. Notice of Proposal to Adopt or Amend Rules or Regulations Affecting Issuance of Permits by Local Agency other than City or County; Fee**

At the time of filing an application for a development permit with a local agency, other than a city or county, the local agency shall inform the applicant that he or she may make a written request to receive notice of any proposal to adopt or amend a rule or regulation affecting the issuance of development permits.

Prior to adopting or amending any such rule or regulation, the local agency shall give notice to any applicant who has requested such notice and whose development project is pending before the agency if the local agency determines that the proposal is reasonably related to the applicant's request for the development permit.

The local agency may charge the applicant for a development permit, to whom notice is provided pursuant to this section, a reasonable fee not to exceed the actual cost of providing that

notice. If a fee is charged pursuant to this section, the fee shall be collected as part of the application fee charged for the development permit.

**65945.5. Notice of Proposal to Adopt or Amend Regulation Affecting Issuance of Permits and Which Implements Statutory Provision by State Agency**

At the time of filing an application for a development permit with a local agency, other than a city or county, the local agency shall inform the applicant that he or she may make a written request to receive notice of any proposal to adopt or amend a rule or regulation affecting the issuance of development permits.

Prior to adopting or amending any such rule or regulation, the local agency shall give notice to any applicant who has requested such notice and whose development project is pending before the agency if the local agency determines that the proposal is reasonably related to the applicant's request for the development permit.

The local agency may charge the applicant for a development permit, to whom notice is provided pursuant to this section, a reasonable fee not to exceed the actual cost of providing that notice. If a fee is charged pursuant to this section, the fee shall be collected as part of the application fee charged for the development permit.

**65945.7. Actions, Inactions, or Recommendations Regarding Ordinances, Rules or Regulations; Invalidity or Setting Aside Ground of Error Only if Prejudicial**

No action, inaction, or recommendation regarding any ordinance, rule, or regulation subject to this Section 65945, 65945.3, or 65945.5 by any legislative body, administrative body, or the officials of any state or local agency shall be held void or invalid or be set aside by any court on the ground of any error, irregularity, informality, neglect or omission (hereinafter called "error") as to any matter pertaining to notices, records, determinations, publications or any matters of procedure whatever, unless after an examination of the entire case, including evidence, the court shall be of the opinion that the error complained of was prejudicial, and that by reason of such error the party complaining or appealing sustained and suffered substantial injury, and that a different result would have been probable if such error had not occurred or existed. There shall be no presumption that error is prejudicial or that injury was done if error is shown.

**PLANNING AND ZONING LAW**  
**GOVERNMENT CODE**  
**Title 7, Division 1**  
**Chapter 9.3—Mediation and Resolution of Land Use Disputes**  
**(excerpts)**

**66030. Legislative Findings and Intent**

- (a) The Legislature finds and declares all of the following:
  - (1) Current law provides that aggrieved agencies, project proponents, and affected residents may bring suit against the land use decisions of state and local governmental agencies. In practical terms, nearly anyone can sue once a project has been approved.
  - (2) Contention often arises over projects involving local general plans and zoning, redevelopment plans, the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code), development impact fees, annexations and incorporations, and the Permit Streamlining Act (Chapter 4.5 (commencing with Section 65920)).
  - (3) When a public agency approves a development project that is not in accordance with the law, or when the prerogative to bring suit is abused, lawsuits can delay development, add uncertainty and cost to the development process, make housing more expensive, and damage California's competitiveness. This litigation begins in the superior court, and often progresses on appeal to the Court of Appeal and the Supreme Court, adding to the workload of the state's already overburdened judicial system.
- (b) It is, therefore, the intent of the Legislature to help litigants resolve their differences by establishing formal mediation processes for land use disputes. In establishing these mediation processes, it is not the intent of the Legislature to interfere with the ability of litigants to pursue remedies through the courts.

**66031. Actions Subject to Mediation Proceeding; Selecting a Mediator; Considerations; Failure to Select a Mediator**

- (a) Notwithstanding any other provision of law, any action brought in the superior court relating to any of the following subjects may be subject to a mediation proceeding conducted pursuant to this chapter:
  - (1) The approval or denial by a public agency of any development project.
  - (2) Any act or decision of a public agency made pursuant to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code).
  - (3) The failure of a public agency to meet the time limits specified in Chapter 4.5 (commencing with Section 65920), commonly known as the Permit Streamlining Act, or in the Subdivision Map Act (Division 2 (commencing with Section 66410)).
  - (4) Fees determined pursuant to Sections 53080 to 53082, inclusive, or Chapter 4.9 (commencing with Section 65995).
  - (5) Fees determined pursuant to Chapter 5 (commencing with Section 66000).

- (6) The adequacy of a general plan or specific plan adopted pursuant to Chapter 3 (commencing with Section 65100).
  - (7) The validity of any sphere of influence, urban service area, change of organization or reorganization, or any other decision made pursuant to the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 (Division 3 (commencing with Section 56000) of Title 5).
  - (8) The adoption or amendment of a redevelopment plan pursuant to the Community Redevelopment Law (Part 1 (commencing with Section 33000) of Division 24 of the Health and Safety Code).
  - (9) The validity of any zoning decision made pursuant to Chapter 4 (commencing with Section 65800).
  - (10) The validity of any decision made pursuant to Article 3.5 (commencing with Section 21670) of Chapter 4 of Part 1 of Division 9 of the Public Utilities Code.
- (b) Within five days after the deadline for the respondent or defendant to file its reply to an action, the court may invite the parties to consider resolving their dispute by selecting a mutually acceptable person to serve as a mediator, or an organization or agency to provide a mediator.
  - (c) In selecting a person to serve as a mediator, or an organization or agency to provide a mediator, the parties shall consider the following:
    - (1) The council of governments having jurisdiction in the county where the dispute arose.
    - (2) Any sub-regional or countywide council of governments in the county where the dispute arose.
    - (3) Any other person with experience or training in mediation including those with experience in land use issues, or any other organization or agency that can provide a person with experience or training in mediation, including those with experience in land use issues.
  - (d) If the court invites the parties to consider mediation, the parties shall notify the court within 30 days if they have selected a mutually acceptable person to serve as a mediator. If the parties have not selected a mediator within 30 days, the action shall proceed. The court shall not draw any implication, favorable or otherwise, from the refusal by a party to accept the invitation by the court to consider mediation. Nothing in this section shall preclude the parties from using mediation at any other time while the action is pending.

**PLANNING AND ZONING LAW**  
**GOVERNMENT CODE**  
**Title 7—Planning and Land Use**  
**Division 2—Subdivisions**  
**Chapter 3—Procedure**  
*Article 3*  
***REVIEW OF TENTATIVE MAP BY OTHER AGENCIES***  
*(excerpts)*

**66455.9. Potential Public School sites; Notice; Investigation**

Whenever there is consideration of an area within a development for a public school site, the advisory agency shall give the affected districts and the State Department of Education written notice of the proposed site. The written notice shall include the identification of any existing or proposed runways within the distance specified in Section 17215 of the Education Code. If the site is within the distance of an existing or proposed airport runway as described in Section 17215 of the Education Code, the department shall notify the State Department of Transportation as required by the section and the site shall be investigated by the State Department of Transportation required by Section 17215.

**EDUCATION CODE**  
**Title 1—General Education Code Provisions**  
**Division 1—General Education Code Provisions**  
**Part 10.5—School Facilities**  
**Chapter 1—School Sites**  
*Article 1*  
**GENERAL PROVISIONS**  
*(excerpts)*

**17215. Site Near Airport**

- (a) In order to promote the safety of pupils, comprehensive community planning, and greater educational usefulness of school sites, before acquiring title to or leasing property for a new school site, the governing board of each school district, including any district governed by a city board of education, or a charter school, shall give the State Department of Education written notice of the proposed acquisition or lease and shall submit any information required by the State Department of Education if the site is within two miles, measured by air line, of that point on an airport runway or a potential runway included in an airport master plan that is nearest to the site.
- (b) Upon receipt of the notice required pursuant to subdivision (a), the State Department of Education shall notify the Department of Transportation in writing of the proposed acquisition or lease. If the Department of Transportation is no longer in operation, the State Department of Education shall, in lieu of notifying the Department of Transportation, notify the United States Department of Transportation or any other appropriate agency, in writing, of the proposed acquisition or lease for the purpose of obtaining from the department or other agency any information or assistance that it may desire to give.
- (c) The Department of Transportation shall investigate the site and, within 30 working days after receipt of the notice, shall submit to the State Department of Education a written report of its findings including recommendations concerning acquisition or lease of the site. As part of the investigation, the Department of Transportation shall give notice thereof to the owner and operator of the airport who shall be granted the opportunity to comment upon the site. The Department of Transportation shall adopt regulations setting forth the criteria by which a site will be evaluated pursuant to this section.
- (d) The State Department of Education shall, within 10 days of receiving the Department of Transportation's report, forward the report to the governing board of the school district or charter school. The governing board or charter school may not acquire title to or lease the property until the report of the Department of Transportation has been received. If the report does not favor the acquisition or lease of the property for a school site or an addition to a present school site, the governing board or charter school may not acquire title to or lease the property. If the report does favor the acquisition or lease of the property for a school site or an addition to a present school site, the governing board or charter school shall hold a public hearing on the matter prior to acquiring or leasing the site.
- (e) If the Department of Transportation's recommendation does not favor acquisition or lease of the proposed site, state funds or local funds may not be apportioned or expended for the acquisition or lease of that site, construction of any school building on that site, or for the expansion of any existing site to include that site.

- (f) This section does not apply to sites acquired prior to January 1, 1966, nor to any additions or extensions to those sites.



**EDUCATION CODE**  
**Title 3—Postsecondary Education**  
**Division 7—Community Colleges**  
**Part 49—Community Colleges, Education Facilities**  
**Chapter 1—School Sites**  
*Article 2*  
**SCHOOL SITES**  
*(excerpts)*

**81033. Investigation: Geologic and Soil Engineering Studies; Airport in Proximity**

- (c) To promote the safety of students, comprehensive community planning, and greater educational usefulness of community college sites, the governing board of each community college district, if the proposed site is within two miles, measured by air line, of that point on an airport runway, or runway proposed by an airport master plan, which is nearest the site and excluding them if the property is not so located, before acquiring title to property for a new community college site or for an addition to a present site, shall give the board of governors notice in writing of the proposed acquisition and shall submit any information required by the board of governors.

Immediately after receiving notice of the proposed acquisition of property which is within two miles, measured by air line, of that point on an airport runway, or runway proposed by an airport master plan, which is nearest the site, the board of governors shall notify the Division of Aeronautics of the Department of Transportation, in writing, of the proposed acquisition. The Division of Aeronautics shall make an investigation and report to the board of governors within 30 working days after receipt of the notice. If the Division of Aeronautics is no longer in operation, the board of governors, in lieu of notifying the Division of Aeronautics, shall notify the Federal Aviation Administration or any other appropriate agency, in writing, of the proposed acquisition for the purpose of obtaining from the authority or other agency any information or assistance it may desire to give.

The board of governors shall investigate the proposed site and, within 35 working days after receipt of the notice, shall submit to the governing board a written report and its recommendations concerning acquisition of the site. The governing board shall not acquire title to the property until the report of the board of governors has been received. If the report does not favor the acquisition of the property for a community college site or an addition to a present community college site, the governing board shall not acquire title to the property until 30 days after the department's report is received and until the board of governors' report has been read at a public hearing duly called after 10 days' notice published once in a newspaper of general circulation within the community college district, or if there is no such newspaper, then in a newspaper of general circulation within the county in which the property is located.

- (d) If, with respect to a proposed site located within two miles of an operative airport runway, the report of the board of governors submitted to a community college district governing board under subdivision (c) does not favor the acquisition of the site on the sole or partial basis of the unfavorable recommendation of the Division of Aeronautics of the Department of Transportation, no state agency or officer shall grant, apportion, or allow to that community college district for expenditure in connection with that site, any state funds otherwise made available under any state law whatever for community

college site acquisition or college building construction, or for expansion of existing sites and buildings, and no funds of the community college district or of the county in which the district lies shall be expended for those purposes. However, this section shall not be applicable to sites acquired prior to January 1, 1966, or to any additions or extensions to those sites.

If the recommendation of the Division of Aeronautics is unfavorable, the recommendation shall not be overruled without the express approval of the board of governors and the State Allocation Board.

**PUBLIC RESOURCES CODE**  
**California Environmental Quality Act Statutes**  
**Chapter 2.6—General**  
*(excerpts)*

**21096. Technical Resources to Assist in Preparation of Environmental Impact Report as it Relates to Airport-Related Safety Hazards and Noise Problems; Use of Airport Land Use Planning Handbook; Negative Declaration for a Project**

- (a) If a lead agency prepares an environmental impact report for a project situated within airport land use compatibility plan boundaries, or, if an airport land use compatibility plan has not been adopted, for a project within two nautical miles of a public airport or public use airport, the Airport Land Use Planning Handbook published by the Division of Aeronautics of the Department of Transportation, in compliance with Section 21674.5 of the Public Utilities Code and other documents, shall be utilized as technical resources to assist in the preparation of the environmental impact report as the report relates to airport-related safety hazards and noise problems.
- (b) A lead agency shall not adopt a negative declaration for a project described in subdivision (a) unless the lead agency considers whether the project will result in a safety hazard or noise problem for persons using the airport or for persons residing or working in the project area.

**Business and Professions Code**  
**Section 11000 – 11010**  
*(excerpts)*

**11000.**

- (a) “Subdivided lands” and “subdivision” refer to improved or unimproved lands or lands, wherever situated within California, divided or proposed to be divided for the purpose of sale or lease or financing, whether immediate or future, into five or more lots or parcels. However, land or lands sold by lots or parcels of not less than 160 acres which are designated by lot or parcel description by government surveys and appear as such on the current assessment roll of the county in which the land or lands are situated shall not be deemed to be “subdivided lands” or “a subdivision” within the meaning of this section, unless the land or lands are divided or proposed to be divided for the purpose of sale for oil and gas purposes, in which case the land or lands shall be deemed to be “subdivided lands” or “a subdivision” within the meaning of this section. This chapter also does not apply to the leasing of apartments, offices, stores, or similar space within an apartment building, industrial building, commercial building, or mobile home park, as defined under Section 18214 of the Health and Safety Code, except that the offering of leases for a term in excess of five years to tenants within a mobile home park as a mandatory requirement and prerequisite to tenancy within the mobile home park shall be subject to the provisions of this chapter. The leasing of apartments in a community apartment project, as defined in Section 11004 in an apartment or similar space within a commercial building or complex, shall be subject to the provisions of this chapter.
- (b) Nothing in this section shall in any way modify or affect any of the provisions of Section 66424 of the Government Code.
- (c) Subdivisions, as defined in Section 10249.1, which are located entirely outside California shall be exempt from the provisions of this part.

**11000.1.**

- (a) “Subdivided lands” and “subdivision”, as defined by Sections 11000 and 1104.5, also include improved or unimproved land or lands, a lot or lots, or a parcel or parcels, of any size, in which, for the purpose of sale or lease of financing, whether immediate or future, five or more undivided interests are created or are proposed to be created.
- (b) This section does not apply to the creation or proposed creation of undivided interests in land if any one of the following conditions exists:
  - (1) The undivided interests are held or to be held by persons related one to the other by blood or marriage.
  - (2) The undivided interests are to be purchased and owned solely by persons who present evidence satisfactory to the Real Estate Commissioner that they are knowledgeable and experienced investors who comprehend the nature and extent of the risks involved in the ownership of these interests. The Real Estate Commissioner shall grant an exemption from this part if the undivided interests are to be purchased by no more than 10 persons, each of whom furnishes a signed statement to the commissioner that he or she:

- (A) is fully informed concerning the real property to be acquired and his or her interest in that property including the risks involved in ownership of undivided interests,
  - (B) is purchasing the interest or interests for his or her own account and with no present intention to resell or otherwise dispose of the interest for value, and
  - (C) expressly waives protections afforded to a purchaser by this part.
- (3) The undivided interests are created as a result of a foreclosure sale.
  - (4) The undivided interests are created by a valid order or decree of a court.
  - (5) The offering and sale of the undivided interests have been expressly qualified by the issuance of a permit from the Commissioner of Corporations pursuant to the Corporate Securities Law of 1968 (Division 1 (commencing with Section 25000) of Title 4 of the Corporations Code).

**11010.**

- (a) Except as otherwise provided pursuant to subdivision (c) or elsewhere in this chapter, any person who intends to offer subdivided lands within this state for sale or lease shall file with the Department of Real Estate an application for a public report consisting of a notice of intention and a completed questionnaire on a form prepared by the department.
- (b) (13) (A) The location of all existing airports, and of all proposed airports shown on the general plan of any city or county, located within two statute miles of the subdivision. If the property is located within an airport influence area, the following statement shall be included in the notice of intention:

## NOTICE OF AIRPORT IN VICINITY

This property is presently located in the vicinity of an airport, within what is known as the airport influence area. For that reason, the property may be subject to some of the annoyances or inconveniences associated with proximity to airport operations (for example: noise, vibration, or odors). Individual sensitivities to those annoyances, if any, are associated with the property before you complete your purchase and determine whether they are acceptable to you.

- (B) For purposes of this section, an “airport influence area,” also known as an “airport referral area”, is the area in which current or future airport-related noise, overflight, safety, or airspace protection factors may significantly affect land uses or necessitate restrictions on those uses as determined by an airport land use commission.

**LEGISLATIVE HISTORY SUMMARY  
PUBLIC UTILITIES CODE  
Section 21670 ET SEQ.  
Airport land Use Commission Statutes**

- 1967 Original ALUC statute enacted.
- Establishment of ALUCs required in each county containing a public airport served by a certificated air carrier.
  - The purpose of ALUCs is indicated as being to make recommendations regarding height restrictions on buildings and the use of land surrounding airports.
- 1970 Assembly Bill 1856 (Badham) Chapter 1182, Statutes of 1970 — Adds provisions which:
- Require ALUCs to prepare comprehensive land use plans.
  - Require such plans to include a long-range plan and to reflect the airport's forecast growth during the next 20 years.
  - Require ALUC review of airport construction plans (Section 21661.5).
  - Exempt Los Angeles County from the requirement of establishing an ALUC.
- 1971 The function of ALUCs is restated as being to require new construction to conform to Department of Aeronautics standards.
- 1973 ALUCs are permitted to establish compatibility plans for military airports.
- 1982 Assembly Bill 2920 (Rogers) Chapter 1041, Statutes of 1982 — Adds major changes which:
- More clearly articulate the purpose of ALUCs.
  - Eliminate reference to “achieve by zoning.”
  - Require consistency between local general and specific plans and airport land use commission plans; the requirements define the process for attaining consistency, they do not establish standards for consistency.
  - Eliminate the requirement for proposed individual development projects to be referred to an ALUC for review once local general/specific plans are consistent with the ALUC's plan.
  - Require that local agencies make findings of fact before overriding an ALUC decision.
  - Change the vote required for an override from 4/5 to 2/3.
- 1984 Assembly Bill 3551 (Mountjoy) Chapter 1117, Statutes of 1984 — Amends the law to:
- Require ALUCs in all counties having an airport which serves the general public unless a county and its cities determine an ALUC is not needed.
  - Limit amendments to compatibility plans to once per year.
  - Allow individual projects to continue to be referred to the ALUC by agreement.
  - Extend immunity to airports if an ALUC action is overridden by a local agency not owning the airport.
  - Provide state funding eligibility for preparation of compatibility plans through the Regional Transportation Improvement Program process.
- 1987 Senate Bill 633 (Rogers) Chapter 1018, Statutes of 1987 — Makes revisions which:
- Require that a designated body serving as an ALUC include two members having “expertise in aviation.”

- Allows an interested party to initiate court proceedings to postpone the effective date of a local land use action if a compatibility plan has not been adopted.
  - Delete sunset provisions contained in certain clauses of the law.
  - Allows reimbursement for ALUC costs in accordance with the Commission on State Mandates.
- 1989 Senate Bill 255 (Bergeson) Chapter 54, Statutes of 1989 —
- Sets a requirement that comprehensive land use plans be completed by June 1991.
  - Establishes a method for compelling ALUCs to act on matters submitted for review.
  - Allows ALUCs to charge fees for review of projects.
  - Suspends any lawsuits that would stop development until the ALUC adopts its plan or until June 1, 1991.
- 1989 Senate Bill 235 (Alquist) Chapter 788, Statutes of 1989 — Appropriates \$3,672,000 for the payment of claims to counties seeking reimbursement of costs incurred during fiscal years 1985-86 through 1989-90 pursuant to state-mandated requirement (Chapter 1117, Statutes of 1984) for creation of ALUCs in most counties. This statute was repealed in 1993.
- 1990 Assembly Bill 4164 (Mountjoy) Chapter 1008, Statutes of 1990 — Adds section 21674.5 requiring the Division of Aeronautics to develop and implement a training program for ALUC staffs.
- 1990 Assembly Bill 4265 (Clute) Chapter 563, Statutes of 1990 — With the concurrence of the Division of Aeronautics, allows ALUCs to use an airport layout plan, rather than a long-range airport master plan, as the basis for preparation of a compatibility plan.
- 1990 Senate Bill 1288 (Beverly) Chapter 54, Statutes of 1990 — Amends Section 21670.2 to give Los Angeles County additional time to prepare compatibility plans and meet other provisions of the ALUC statutes.
- 1991 Senate Bill 532 (Bergeson) Chapter 140, Statutes of 1991 —
- Allows counties having half of their compatibility plans completed or under preparation by June 30, 1991, an additional year to complete the remainder.
  - Allows ALUCs to continue to charge fees under these circumstances.
  - Fees may be charged only until June 30, 1992, if plans are not completed by then.
- 1993 Senate Bill 443 (Committee on Budget and Fiscal Review) Chapter 59, Statutes of 1993 — Amends Section 21670(b) to make the formation of ALUCs permissive rather than mandatory as of June 30, 1993. (Note: Section 21670.2 which assigns responsibility for coordinating the airport planning of public agencies in Los Angeles County is not affected by this amendment.)
- 1994 Assembly Bill 2831 (Mountjoy) Chapter 644, Statutes of 1994 — Reinstates the language in Section 21670(b) mandating establishment of ALUCs, but also provides for an alternative airport land use planning process. Lists specific actions which a county and affected cities must take in order for such alternative process to receive Caltrans' approval. Requires that ALUCs be guided by information in the Caltrans' Airport Land Use Planning Handbook when formulating airport land use plans.

- 1994 Senate Bill 1453 (Rogers) Chapter 438, Statutes of 1994 — Amends Caltrans Environmental Quality Act (CEQA) statutes as applied to preparation of environmental documents affecting projects in the vicinity of airports. Requires lead agencies to use the Airport Land Use Planning Handbook as a technical resource when assessing the airport-related noise and safety impacts of such projects.
- 1997 Assembly Bill 1130 (Oller) Chapter 81, Statutes of 1997 — Added Section 21670.4 concerning airports whose planning boundary straddles a county line.
- 2000 Senate Bill 1350 (Rainey) Chapter 506, Statutes of 2000 — Added Section 21670(f) clarifying that special districts are among the local agencies to which airport land use planning laws are intended to apply.
- 2001 Assembly Bill 93 (Wayne) Chapter 946, Statutes of 2001 — Added Section 21670.3 establishing the San Diego County Regional Airport Authority and assigning it various powers and duties regarding the establishment, planning and operation of airports within the county.
- 2002 Assembly Bill 3026 (Dutra) Chapter 438, Statutes of 2002 — In all sections where the term “comprehensive land use plan” is used this bill changed it to “airport land use compatibility plan.”
- 2002 Assembly Bill 2776 (Simitian) Chapter 496, Statutes of 2002— Amends Business & Professions code and Civil code. Requires additional notification in real estate transactions regarding a property’s proximity to airports and possible associated annoyances.
- 2002 Senate Bill 1468 (Knight) Chapter 971, Statutes of 2002— Amended Section 21675 requiring airport land use compatibility plans created for military airports to be consistent with the safety and noise standards in the Air Installation Compatible Use Zone prepared for that airport.
- 2003 Assembly Bill 332 (Mullin) Chapter 351, Statutes of 2003 —
- Clarifies that community college districts and school districts along with special districts are subject to airport land use laws in the State Aeronautics Act.
  - Adds that if a local entity proposes to overrule an ALUC decision of incompatible land use then they must notify and provide findings to both the ALUC and Caltrans Aeronautics. Caltrans and the ALUC may provide comments in response and those comments must be made a part of the final local decision.
  - Adds that prior to granting building construction permits, local agencies shall be guided by the criteria established in the Airport Land Use Planning Handbook and any related federal aviation regulations to the extent that the criteria has been incorporated into their airport land use compatibility plan.
- 2007 Senate Bill 10 (Kehoe) Chapter 287, Statutes of 2007 — The San Diego County Regional Airport Authority Reform Act of 2007. Restructures the airport authority established in 2001 by AB 93 (Wayne), with a set of goals related to governance, accountability, planning and operations at San Diego International Airport.



## Appendix B

# Federal Aviation Regulations Part 77

(Effective January 18, 2011)

### **Subpart A** *General*

#### **77.1 Purpose.**

This part establishes:

- (a) The requirements to provide notice to the FAA of certain proposed construction, or the alteration of existing structures;
- (b) The standards used to determine obstructions to air navigation, and navigational and communication facilities;
- (c) The process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities or equipment; and
- (d) The process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations.

#### **77.3 Definitions.**

For the purpose of this part:

“Non-precision instrument runway” means a runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance, or area type navigation equipment, for which a straight-in non-precision instrument approach procedure has been approved, or planned, and for which no precision approach facilities are planned, or indicated on an FAA planning document or military service military airport planning document.

Planned or proposed airport is an airport that is the subject of at least one of the following documents received by the FAA:

- (1) Airport proposals submitted under 14 CFR Part 157.
- (2) Airport Improvement Program requests for aid.

- (3) Notices of existing airports where prior notice of the airport construction or alteration was not provided as required by 14 CFR Part 157.
- (4) Airport layout plans.
- (5) DOD proposals for airports used only by the U.S. Armed Forces.
- (6) DOD proposals on joint-use (civil-military) airports.
- (7) Completed airport site selection feasibility study.

“Precision instrument runway” means a runway having an existing instrument approach procedure utilizing an Instrument Landing System (ILS), or a Precision Approach Radar (PAR). It also means a runway for which a precision approach system is planned and is so indicated by an FAA-approved airport layout plan; a military service approved military airport layout plan; any other FAA planning document, or military service military airport planning document.

“Public use airport” is an airport available for use by the general public without a requirement for prior approval of the airport owner or operator.

“Seaplane base” is considered to be an airport only if its sea lanes are outlined by visual markers.

“Utility runway” means a runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight and less.

“Visual runway” means a runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan, a military service approved military airport layout plan, or by any planning document submitted to the FAA by competent authority.

### **Subpart B** ***Notice Requirements***

#### **77.5 Applicability.**

- (a) If you propose any construction or alteration described in §77.9, you must provide adequate notice to the FAA of that construction or alteration.
- (b) If requested by the FAA, you must also file supplemental notice before the start date and upon completion of certain construction or alterations that are described in §77.9.
- (c) Notice received by the FAA under this subpart is used to:
  - (1) Evaluate the effect of the proposed construction or alteration on safety in air commerce and the efficient use and preservation of the navigable airspace and of airport traffic capacity at public use airports;
  - (2) Determine whether the effect of proposed construction or alteration is a hazard to air navigation;
  - (3) Determine appropriate marking and lighting recommendations, using FAA Advisory Circular 70/7460–1, Obstruction Marking and Lighting;

- (4) Determine other appropriate measures to be applied for continued safety of air navigation; and
- (5) Notify the aviation community of the construction or alteration of objects that affect the navigable airspace, including the revision of charts, when necessary.

#### **77.7 Form and time of notice.**

- (a) If you are required to file notice under §77.9, you must submit to the FAA a completed FAA Form 7460–1, Notice of Proposed Construction or Alteration. FAA Form 7460–1 is available at FAA regional offices and on the Internet.
- (b) You must submit this form at least 45 days before the start date of the proposed construction or alteration or the date an application for a construction permit is filed, whichever is earliest.
- (c) If you propose construction or alteration that is also subject to the licensing requirements of the Federal Communications Commission (FCC), you must submit notice to the FAA on or before the date that the application is filed with the FCC.
- (d) If you propose construction or alteration to an existing structure that exceeds 2,000 ft. in height above ground level (AGL), the FAA presumes it to be a hazard to air navigation that results in an inefficient use of airspace. You must include details explaining both why the proposal would not constitute a hazard to air navigation and why it would not cause an inefficient use of airspace.
- (e) The 45-day advance notice requirement is waived if immediate construction or alteration is required because of an emergency involving essential public services, public health, or public safety. You may provide notice to the FAA by any available, expeditious means. You must file a completed FAA Form 7460–1 within 5 days of the initial notice to the FAA. Outside normal business hours, the nearest flight service station will accept emergency notices.

#### **77.9 Construction or alteration requiring notice.**

If requested by the FAA, or if you propose any of the following types of construction or alteration, you must file notice with the FAA of:

- (a) Any construction or alteration that is more than 200 ft. AGL at its site.
- (b) Any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:
  - (1) 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway more than 3,200 ft. in actual length, excluding heliports.
  - (2) 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway no more than 3,200 ft. in actual length, excluding heliports.
  - (3) 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in paragraph (d) of this section.
- (c) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and

Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 15 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a) or (b) of this section.

- (d) Any construction or alteration on any of the following airports and heliports:
  - (1) A public use airport listed in the Airport/Facility Directory, Alaska Supplement, or Pacific Chart Supplement of the U.S. Government Flight Information Publications;
  - (2) A military airport under construction, or an airport under construction that will be available for public use;
  - (3) An airport operated by a Federal agency or the DOD.
  - (4) An airport or heliport with at least one FAA-approved instrument approach procedure.
- (e) You do not need to file notice for construction or alteration of:
  - (1) Any object that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation;
  - (2) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device meeting FAA-approved siting criteria or an appropriate military service siting criteria on military airports, the location and height of which are fixed by its functional purpose;
  - (3) Any construction or alteration for which notice is required by any other FAA regulation.
  - (4) Any antenna structure of 20 feet or less in height, except one that would increase the height of another antenna structure.

#### **77.11 Supplemental notice requirements.**

- (a) You must file supplemental notice with the FAA when:
  - (1) The construction or alteration is more than 200 feet in height AGL at its site; or
  - (2) Requested by the FAA.
- (b) You must file supplemental notice on a prescribed FAA form to be received within the time limits specified in the FAA determination. If no time limit has been specified, you must submit supplemental notice of construction to the FAA within 5 days after the structure reaches its greatest height.
- (c) If you abandon a construction or alteration proposal that requires supplemental notice, you must submit notice to the FAA within 5 days after the project is abandoned.
- (d) If the construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

**Subpart C**  
***Standards for Determining Obstructions to***  
***Air Navigation or Navigational Aids or Facilities***

**77.13 Applicability.**

This subpart describes the standards used for determining obstructions to air navigation, navigational aids, or navigational facilities. These standards apply to the following:

- (a) Any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment or materials used and any permanent or temporary apparatus.
- (b) The alteration of any permanent or temporary existing structure by a change in its height, including appurtenances, or lateral dimensions, including equipment or material used therein.

**77.15 Scope.**

- (a) This subpart describes standards used to determine obstructions to air navigation that may affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities. Such facilities include air navigation aids, communication equipment, airports, Federal airways, instrument approach or departure procedures, and approved off-airway routes.
- (b) Objects that are considered obstructions under the standards described in this subpart are presumed hazards to air navigation unless further aeronautical study concludes that the object is not a hazard. Once further aeronautical study has been initiated, the FAA will use the standards in this subpart, along with FAA policy and guidance material, to determine if the object is a hazard to air navigation.
- (c) The FAA will apply these standards with reference to an existing airport facility, and airport proposals received by the FAA, or the appropriate military service, before it issues a final determination.
- (d) For airports having defined runways with specially prepared hard surfaces, the primary surface for each runway extends 200 feet beyond each end of the runway. For airports having defined strips or pathways used regularly for aircraft takeoffs and landings, and designated runways, without specially prepared hard surfaces, each end of the primary surface for each such runway shall coincide with the corresponding end of the runway. At airports, excluding seaplane bases, having a defined landing and takeoff area with no defined pathways for aircraft takeoffs and landings, a determination must be made as to which portions of the landing and takeoff area are regularly used as landing and takeoff pathways. Those determined pathways must be considered runways, and an appropriate primary surface as defined in §77.19 will be considered as longitudinally centered on each such runway. Each end of that primary surface must coincide with the corresponding end of that runway.
- (e) The standards in this subpart apply to construction or alteration proposals on an airport (including heliports and seaplane bases with marked lanes) if that airport is one of the following before the issuance of the final determination:
  - (1) Available for public use and is listed in the Airport/Facility Directory, Supplement Alaska, or Supplement Pacific of the U.S. Government Flight Information Publications; or

- (2) A planned or proposed airport or an airport under construction of which the FAA has received actual notice, except DOD airports, where there is a clear indication the airport will be available for public use; or,
- (3) An airport operated by a Federal agency or the DOD; or,
- (4) An airport that has at least one FAA-approved instrument approach.

**77.17 Obstruction standards.**

- (a) An existing object, including a mobile object, is, and a future object would be an obstruction to air navigation if it is of greater height than any of the following heights or surfaces:
  - (1) A height of 499 feet AGL at the site of the object.
  - (2) A height that is 200 feet AGL, or above the established airport elevation, whichever is higher, within 3 nautical miles of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 feet in actual length, and that height increases in the proportion of 100 feet for each additional nautical mile from the airport up to a maximum of 499 feet.
  - (3) A height within a terminal obstacle clearance area, including an initial approach segment, a departure area, and a circling approach area, which would result in the vertical distance between any point on the object and an established minimum instrument flight altitude within that area or segment to be less than the required obstacle clearance.
  - (4) A height within an en route obstacle clearance area, including turn and termination areas, of a Federal Airway or approved off-airway route, that would increase the minimum obstacle clearance altitude.
  - (5) The surface of a takeoff and landing area of an airport or any imaginary surface established under §77.19, 77.21, or 77.23. However, no part of the takeoff or landing area itself will be considered an obstruction.
- (b) Except for traverse ways on or near an airport with an operative ground traffic control service furnished by an airport traffic control tower or by the airport management and coordinated with the air traffic control service, the standards of paragraph (a) of this section apply to traverse ways used or to be used for the passage of mobile objects only after the heights of these traverse ways are increased by:
  - (1) 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance.
  - (2) 15 feet for any other public roadway.
  - (3) 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road.
  - (4) 23 feet for a railroad.
  - (5) For a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it.

**77.19 Civil airport imaginary surfaces.**

The following civil airport imaginary surfaces are established with relation to the airport and to each runway. The size of each such imaginary surface is based on the category of each runway according to the type of approach available or planned for that runway. The slope and dimensions of the approach surface applied to each end of a runway are determined by the most precise approach procedure existing or planned for that runway end.

(a) Horizontal surface. A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by Swinging arcs of a specified radii from the center of each end of the primary surface of each runway of each airport and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc is:

- (1) 5,000 feet for all runways designated as utility or visual;
- (2) 10,000 feet for all other runways. The radius of the arc specified for each end of a runway will have the same arithmetical value. That value will be the highest determined for either end of the runway. When a 5,000-foot arc is encompassed by tangents connecting two adjacent 10,000-foot arcs, the 5,000-foot arc shall be disregarded on the construction of the perimeter of the horizontal surface.

(b) Conical surface. A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

(c) Primary surface. A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway; but when the runway has no specially prepared hard surface, the primary surface ends at each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of the primary surface is:

- (1) 250 feet for utility runways having only visual approaches.
- (2) 500 feet for utility runways having non-precision instrument approaches.
- (3) For other than utility runways, the width is:
  - (i) 500 feet for visual runways having only visual approaches.
  - (ii) 500 feet for non-precision instrument runways having visibility minimums greater than three-fourths statute mile.
  - (iii) 1,000 feet for a non-precision instrument runway having a non-precision instrument approach with visibility minimums as low as three-fourths of a statute mile, and for precision instrument runways.
  - (iv) The width of the primary surface of a runway will be that width prescribed in this section for the most precise approach existing or planned for either end of that runway.

(d) Approach surface. A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.

- (1) The inner edge of the approach surface is the same width as the primary surface and it expands uniformly to a width of:

- (i) 1,250 feet for that end of a utility runway with only visual approaches;
  - (ii) 1,500 feet for that end of a runway other than a utility runway with only visual approaches;
  - (iii) 2,000 feet for that end of a utility runway with a non-precision instrument approach;
  - (iv) 3,500 feet for that end of a non-precision instrument runway other than utility, having visibility minimums greater than three-fourths of a statute mile;
  - (v) 4,000 feet for that end of a non-precision instrument runway, other than utility, having a non-precision instrument approach with visibility minimums as low as three-fourths statute mile; and
  - (vi) 16,000 feet for precision instrument runways.
- (2) The approach surface extends for a horizontal distance of:
- (i) 5,000 feet at a slope of 20 to 1 for all utility and visual runways;
  - (ii) 10,000 feet at a slope of 34 to 1 for all non-precision instrument runways other than utility; and
  - (iii) 10,000 feet at a slope of 50 to 1 with an additional 40,000 feet at a slope of 40 to 1 for all precision instrument runways.
- (3) The outer width of an approach surface to an end of a runway will be that width prescribed in this subsection for the most precise approach existing or planned for that runway end.
- (e) Transitional surface. These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface which project through and beyond the limits of the conical surface, extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

**77.21 Department of Defense (DOD) airport imaginary surfaces.**

- (a) Related to airport reference points. These surfaces apply to all military airports. For the purposes of this section, a military airport is any airport operated by the DOD.
- (1) Inner horizontal surface. A plane that is oval in shape at a height of 150 feet above the established airfield elevation. The plane is constructed by scribing an arc with a radius of 7,500 feet about the centerline at the end of each runway and interconnecting these arcs with tangents.
  - (2) Conical surface. A surface extending from the periphery of the inner horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation.
  - (3) Outer horizontal surface. A plane, located 500 feet above the established airfield elevation, extending outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.



- (b) Related to runways. These surfaces apply to all military airports.
- (1) Primary surface. A surface located on the ground or water longitudinally centered on each runway with the same length as the runway. The width of the primary surface for runways is 2,000 feet. However, at established bases where substantial construction has taken place in accordance with a previous lateral clearance criteria, the 2,000-foot width may be reduced to the former criteria.
  - (2) Clear zone surface. A surface located on the ground or water at each end of the primary surface, with a length of 1,000 feet and the same width as the primary surface.
  - (3) Approach clearance surface. An inclined plane, symmetrical about the runway centerline extended, beginning 200 feet beyond each end of the primary surface at the centerline elevation of the runway end and extending for 50,000 feet. The slope of the approach clearance surface is 50 to 1 along the runway centerline extended until it reaches an elevation of 500 feet above the established airport elevation. It then continues horizontally at this elevation to a point 50,000 feet from the point of beginning. The width of this surface at the runway end is the same as the primary surface, it flares uniformly, and the width at 50,000 is 16,000 feet.
  - (4) Transitional surfaces. These surfaces connect the primary surfaces, the first 200 feet of the clear zone surfaces, and the approach clearance surfaces to the inner horizontal surface, conical surface, outer horizontal surface or other transitional surfaces. The slope of the transitional surface is 7 to 1 outward and upward at right angles to the runway centerline.

### **77.23 Heliport imaginary surfaces.**

- (a) Primary surface. The area of the primary surface coincides in size and shape with the designated take-off and landing area. This surface is a horizontal plane at the elevation of the established heliport elevation.
- (b) Approach surface. The approach surface begins at each end of the heliport primary surface with the same width as the primary surface, and extends outward and upward for a horizontal distance of 4,000 feet where its width is 500 feet. The slope of the approach surface is 8 to 1 for civil heliports and 10 to 1 for military heliports.
- (c) Transitional surfaces. These surfaces extend outward and upward from the lateral boundaries of the primary surface and from the approach surfaces at a slope of 2 to 1 for a distance of 250 feet measured horizontally from the centerline of the primary and approach surfaces.

## **Subpart D**

### *Aeronautical Studies and Determinations*

### **77.25 Applicability.**

- (a) This subpart applies to any aeronautical study of a proposed construction or alteration for which notice to the FAA is required under 77.9.
- (b) The purpose of an aeronautical study is to determine whether the aeronautical effects of the specific proposal and, where appropriate, the cumulative impact resulting from the proposed construction or alteration when combined with the effects of other existing or proposed structures, would constitute a hazard to air navigation.

- (c) The obstruction standards in subpart C of this part are supplemented by other manuals and directives used in determining the effect on the navigable airspace of a proposed construction or alteration. When the FAA needs additional information, it may circulate a study to interested parties for comment.

**77.27 Initiation of studies.**

The FAA will conduct an aeronautical study when:

- (a) Requested by the sponsor of any proposed construction or alteration for which a notice is submitted; or
- (b) The FAA determines a study is necessary.

**77.29 Evaluating aeronautical effect.**

- (a) The FAA conducts an aeronautical study to determine the impact of a proposed structure, an existing structure that has not yet been studied by the FAA, or an alteration of an existing structure on aeronautical operations, procedures, and the safety of flight. These studies include evaluating:
  - (1) The impact on arrival, departure, and en route procedures for aircraft operating under visual flight rules;
  - (2) The impact on arrival, departure, and en route procedures for aircraft operating under instrument flight rules;
  - (3) The impact on existing and planned public use airports;
  - (4) Airport traffic capacity of existing public use airports and public use airport development plans received before the issuance of the final determination;
  - (5) Minimum obstacle clearance altitudes, minimum instrument flight rules altitudes, approved or planned instrument approach procedures, and departure procedures;
  - (6) The potential effect on ATC radar, direction finders, ATC tower line-of-sight visibility, and physical or electromagnetic effects on air navigation, communication facilities, and other surveillance systems;
  - (7) The aeronautical effects resulting from the cumulative impact of a proposed construction or alteration of a structure when combined with the effects of other existing or proposed structures.
- (b) If you withdraw the proposed construction or alteration or revise it so that it is no longer identified as an obstruction, or if no further aeronautical study is necessary, the FAA may terminate the study.

**77.31 Determinations.**

- (a) The FAA will issue a determination stating whether the proposed construction or alteration would be a hazard to air navigation, and will advise all known interested persons.
- (b) The FAA will make determinations based on the aeronautical study findings and will identify the following:

- (1) The effects on VFR/IFR aeronautical departure/arrival operations, air traffic procedures, minimum flight altitudes, and existing, planned, or proposed airports listed in §77.15(e) of which the FAA has received actual notice prior to issuance of a final determination.
  - (2) The extent of the physical and/or electromagnetic effect on the operation of existing or proposed air navigation facilities, communication aids, or surveillance systems.
- (c) The FAA will issue a Determination of Hazard to Air Navigation when the aeronautical study concludes that the proposed construction or alteration will exceed an obstruction standard and would have a substantial aeronautical impact.
- (d) A Determination of No Hazard to Air Navigation will be issued when the aeronautical study concludes that the proposed construction or alteration will exceed an obstruction standard but would not have a substantial aeronautical impact to air navigation. A Determination of No Hazard to Air Navigation may include the following:
- (1) Conditional provisions of a determination.
  - (2) Limitations necessary to minimize potential problems, such as the use of temporary construction equipment.
  - (3) Supplemental notice requirements, when required.
  - (4) Marking and lighting recommendations, as appropriate.
- (e) The FAA will issue a Determination of No Hazard to Air Navigation when a proposed structure does not exceed any of the obstruction standards and would not be a hazard to air navigation.

### **77.33 Effective period of determinations.**

- (a) A determination issued under this subpart is effective 40 days after the date of issuance, unless a petition for discretionary review is received by the FAA within 30 days after issuance. The determination will not become final pending disposition of a petition for discretionary review.
- (b) Unless extended, revised, or terminated, each Determination of No Hazard to Air Navigation issued under this subpart expires 18 months after the effective date of the determination, or on the date the proposed construction or alteration is abandoned, whichever is earlier.
- (c) A Determination of Hazard to Air Navigation has no expiration date.

### **77.35 Extensions, terminations, revisions and corrections.**

- (a) You may petition the FAA official that issued the Determination of No Hazard to Air Navigation to revise or reconsider the determination based on new facts or to extend the effective period of the determination, provided that:
  - (1) Actual structural work of the proposed construction or alteration, such as the laying of a foundation, but not including excavation, has not been started; and
  - (2) The petition is submitted at least 15 days before the expiration date of the Determination of No Hazard to Air Navigation.

- (b) A Determination of No Hazard to Air Navigation issued for those construction or alteration proposals not requiring an FCC construction permit may be extended by the FAA one time for a period not to exceed 18 months.
- (c) A Determination of No Hazard to Air Navigation issued for a proposal requiring an FCC construction permit may be granted extensions for up to 18 months, provided that:
  - (1) You submit evidence that an application for a construction permit/license was filed with the FCC for the associated site within 6 months of issuance of the determination; and
  - (2) You submit evidence that additional time is warranted because of FCC requirements; and
  - (3) Where the FCC issues a construction permit, a final Determination of No Hazard to Air Navigation is effective until the date prescribed by the FCC for completion of the construction. If an extension of the original FCC completion date is needed, an extension of the FAA determination must be requested from the Obstruction Evaluation Service (OES).
  - (4) If the Commission refuses to issue a construction permit, the final determination expires on the date of its refusal.

**Subpart E**  
***Petitions for Discretionary Review***

**77.37 General.**

- (a) If you are the sponsor, provided a substantive aeronautical comment on a proposal in an aeronautical study, or have a substantive aeronautical comment on the proposal but were not given an opportunity to state it, you may petition the FAA for a discretionary review of a determination, revision, or extension of a determination issued by the FAA.
- (b) You may not file a petition for discretionary review for a Determination of No Hazard that is issued for a temporary structure, marking and lighting recommendation, or when a proposed structure or alteration does not exceed obstruction standards contained in subpart C of this part.

**77.39 Contents of a petition.**

- (a) You must file a petition for discretionary review in writing and it must be received by the FAA within 30 days after the issuance of a determination under 77.31, or a revision or extension of the determination under 77.35.
- (b) The petition must contain a full statement of the aeronautical basis on which the petition is made, and must include new information or facts not previously considered or presented during the aeronautical study, including valid aeronautical reasons why the determination, revisions, or extension made by the FAA should be reviewed.
- (c) In the event that the last day of the 30-day filing period falls on a weekend or a day the Federal government is closed, the last day of the filing period is the next day that the government is open.
- (d) The FAA will inform the petitioner or sponsor (if other than the petitioner) and the FCC (whenever an FCC-related proposal is involved) of the filing of the petition and that the determination is not final pending disposition of the petition.

**77.41 Discretionary review results.**

- (a) If discretionary review is granted, the FAA will inform the petitioner and the sponsor (if other than the petitioner) of the issues to be studied and reviewed. The review may include a request for comments and a review of all records from the initial aeronautical study.
- (b) If discretionary review is denied, the FAA will notify the petitioner and the sponsor (if other than the petitioner), and the FCC, whenever a FCC-related proposal is involved, of the basis for the denial along with a statement that the determination is final.
- (c) After concluding the discretionary review process, the FAA will revise, affirm, or reverse the determination.



# Next Generation Air Transportation System

## INTRODUCTION

The Next Generation Air Transportation System (NextGen) is the transformation of the current U.S. aviation system or National Airspace System (NAS) from land-based navigational aids to a satellite-based navigation system. The satellite-based technologies will significantly improve safety, capacity and efficiency on the ground as well as in the air while providing environmentally friendly procedures and technologies that will reduce fuel burn, carbon emissions and in some instances will also reduce noise. The transformation to NextGen is expected to occur by employing technologies, operational advances, and policies to provide necessary future safety, security, capacity, and enhanced environmental performance. Ongoing investments in airport infrastructure – runways, terminals and technology – will ensure that maximum benefits will be gained from transforming the air traffic system and updating aircraft fleets. The investment in advanced engines, airframes and sustainable fuels, along with new procedures, will help reduce aviation’s environmental footprint. As NextGen has to date been mostly in planning and design stages, and has only recently entered implementation, there is insufficient detail at this time to address specifics of land use compatibility for California airports. However, it is important to note that some of the recently announced implementation initiatives have indicated that several metropolitan areas in California, including both Southern California and the Bay Area, are candidates for early and midterm NextGen implementation. The early implementation initiatives will likely impact large metropolitan areas by introducing NextGen supported arrival and departure procedures and associated airspace redesigns at high volume airports. In the far-term NextGen is also likely to bring about changes associated with reduced runway separation standards for all airports as well as the virtual tower concepts for small, uncontrolled airports.

The remainder of this appendix discusses proposed NextGen improvements and their potential impact on the airport environment in two categories: operational improvements and noise and other environmental improvements.

## OPERATIONAL IMPROVEMENTS: NEXTGEN AIRPORT AND AIRSPACE CONCEPTS

Several NextGen concepts will result in significant increase of airspace and airport capacity and may therefore influence local land use policies. This section presents the most influential NextGen improvements and technologies in relation to land use policies as they relate to each of the three basic phases of flight: departure, en route and arrival.

### Integrated Departure/Arrival Management

NextGen capabilities will provide a number of improvements to terminal area operations that save fuel, increase predictability and minimize maneuvers such as holding patterns and delaying vectors. Areas of particular interest for land use compatibility planning purposes are Flexible Terminal Operations (FTO), Optimized Profile Descent (OPD) also known in the industry as Continuous Descent Arrivals (CDA), and Performance-Based Navigation (PBN) routes and procedures that leverage emerging technologies and aircraft navigation capabilities. All these capabilities are described in further detail in subsequent sections. In addition, new airspace designs will take advantage of expanded use of terminal procedures and separation standards, which will be particularly applicable in major metropolitan areas supporting multiple high volume airports. These NextGen operational concepts will increase aircraft flow and introduce additional routes and flexibility to reduce delays. These concepts can also be implemented to improve land use compatibility by reducing noise exposure and by designing routes to avoid noise sensitive land uses.

***Flexible Terminal Operations:*** This concept introduces technologies and procedures necessary to increase access to and manage the separation of aircraft in the terminal environment and improves access to runways in low visibility conditions. These concepts can assist airports with minimizing airport operational constraints that can impede full implementation of preferential runway use and other noise abatement programs. Programs included in the FTO include:

- ◆ Wake Turbulence Mitigation for Departures (WTMD): technologies that leverage a national rule change allowing increased departures from Closely Spaced Parallel Runways when WTMD technology is being utilized.
- ◆ Wake Turbulence Mitigation for Arrivals (WTMA): concept feasibility prototypes for WTMA decision support tools, designed to enable reduction of wake.
- ◆ Approaches, Ground Based Augmentation Systems (GBAS): systems that use existing GPS single civil frequency to provide Category I GBAS service for airport arrivals, and design improvements to this architecture to support future Category II/III service.
- ◆ Closely Spaced Parallel Operations: increased arrival, departure and taxi operations to airports with closely spaced parallel runways in all weather conditions. The FAA is targeting enhanced procedures that will allow dependent operations to closely spaced parallel runways or converging approaches to runways closer than 2,500 feet, as well as supporting independent operations to parallel runways between 2,500 feet and 4,300 feet.



- ◆ Approaches, NextGen Navigation Initiatives: increased capacity during Instrument Meteorological Conditions (IMC) with improvements supporting terminal and approach phases of flight as well as improved situational awareness on the airport surface:
  - Enabling a reduction of required Runway Visual Range minimums during IMC.
  - Implementing significant changes to the national standard for Distance Measuring Equipment (DME) usage to expand the service volume of DME-DME area navigation (RNAV) without the need for an inertial reference unit.
  - Investigating the use of ADS-B, ASDE-X, GPS augmentation systems such as GBAS and the Wide Area Augmentation System (WAAS) and other systems providing RNAV and Required Navigation Performance (RNP) to deliver information to the cockpit aimed at improving situational awareness on the airport surface.
- ◆ Arrivals (RNAV and RNP with 3D Required Time of Arrival (RTA)): RTA capability that will ensure the safe and efficient transition of aircraft from en route to terminal airspace with appropriate sequencing and spacing.

**Arrival Management:** NextGen capabilities will provide improvements to terminal area operations that save fuel, increase predictability and minimize arrival management. Enhanced traffic management tools will analyze flights approaching an airport from hundreds of miles away, across facility boundaries, and will calculate scheduled arrival times to maximize arrival performance. These advances will improve the flow of arrival traffic to maximize use of existing capacity. Air Traffic controllers will gain automated information on airport arrival demand and available capacity, enabling them to improve sequencing and balance between arrival and departure rates.

Information such as proposed arrival time, sequencing and route and runway assignments will be exchanged with the aircraft through a data communications link to negotiate a final flight path. The final flight path will ensure that the flight has no potential conflicts, and that there is an efficient arrival to the airport, while maintaining overall efficiency of the airspace. Airports can influence the design of these final flight paths to help reduce the overflight of noise sensitive land uses. These arrival management concepts also attempt to reduce the stair-step arrival procedures, which use more fuel and produce greater emissions and noise exposure than the continuous descents that are often incorporated in the NextGen concepts.

**Departure Management:** Departure performance will be improved with NextGen by using multiple precise departure paths from each runway end through RNAV and RNP procedures. Multiple departure paths will enable controllers to place each aircraft on a separate precise track, avoiding known constraints, thunderstorms and other severe weather near the airport.

The ability to operate simultaneously on closely spaced parallel runways – through increased accuracy in surveillance and navigation, and through improved understanding of wake vortices – means airports in effect will gain capacity for their existing runways. Precise departure paths will optimize system operations for entire metropolitan areas, reducing delays

by allowing each airport to operate more independently. This will better separate arrival and departure flows for airports in proximity to one another, which provide more efficient access to both commercial service and general aviation airports in congested metropolitan regions. These precise departures also can be designed to support airports that are limited by terrain and other obstacles or have periods of reduced visibility. Precise paths will reduce flight time, fuel burn and emissions. As explained in further detail later in this appendix, precise departures may also decrease, increase or redistribute aircraft noise.

***En Route Management:*** As the aircraft climbs into the en route airspace, enhanced processing of surveillance data will improve position information and enable the flight crew and controllers to take advantage of reduced separation standards. Because the flight crew will be able to monitor the position of other aircraft from their flight deck, air traffic personnel will be able to assign spacing responsibility to the flight crew as the aircraft climbs to its cruising altitude. The aircraft will be able to merge into the overhead stream with a minimum of additional maneuvers.

Data communications will provide routine and strategic information to the flight crew and automate some routine tasks for both pilots and controllers. Air Traffic controllers will be able to focus on providing more preferred and direct routes and altitudes, saving fuel and time.

At times, traffic delays, airspace restrictions or adverse weather will require additional changes to the flight path agreement. When rerouting is needed, controllers will be able to assign offsets to the published route. Tailored to each flight, these offsets will be a way of turning a single published route into a “multi-lane highway in the sky.” Use of offsets will increase capacity in a section of airspace. Since the final agreement will be reached via data messaging, complex reroutes can be more detailed than those constrained by the limitations of voice communications and reduce one source of error in communications.

Furthermore, the capabilities described in the arrival and departure management sections also expand the use of terminal separation standards and procedures within the en route environment. A redesign of the airspace will permit a greater number of RNAV and RNP procedures within the transition and en route airspace to allow for increased throughput. Extended application of terminal procedures and separation standards allows greater flexibility for traffic to be re-routed during severe weather and other disruptions to normal flows.

## **NOISE AND OTHER ENVIRONMENTAL NEXTGEN IMPROVEMENTS**

The overarching environmental goal for NextGen is environmental protection that allows sustained aviation growth. The NextGen Draft Environmental Policy statement on aircraft noise reads: “The noise goal is to reduce the number of people exposed to significant noise in areas around U.S. airports in absolute terms compared to today, notwithstanding aviation

growth, and to further explore and institute noise mitigation identified to improved health and welfare.”<sup>1</sup>

Furthermore, the NextGen policy articulates a “ five pillar” approach to addressing environmental challenges, including noise. These pillars are:

- ◆ **Commitment to Increasing Scientific Knowledge Base:** We must improve our scientific understanding of the impacts of aviation.
- ◆ **Commitment to Technology Improvements:** The U.S. will support a comprehensive approach to environment and energy based on aviation’s traditional strengths of technological advances and innovation.
- ◆ **Commitment to Operational Improvements:** The development and integration of clean and quiet operational procedures will foster NAS operational capabilities that will function more efficiently and contribute to mitigating environmental impacts and improving energy efficiency.
- ◆ **Supportive Use of Policy Approaches and Market-based Measures:** The U.S. will develop and implement appropriate policies, programs, and mechanisms to support advantageous technology and operational innovations and accelerate their integration into the commercial fleet, the airport environment, and the entire NAS.
- ◆ **Development and Use of Advanced Decision-Support Tools:** The environmental challenges confronting NextGen will require advanced decision-support tools that account for interdependencies of impacts and the cost-benefit analyses of potential solutions are critical for well-informed decision-making.

The remainder of the section discusses NextGen implications for airport noise and land use compatibility planning, with particular emphasis on the first three pillars.

### **Scientific Knowledge Base**

As part of the development of the NextGen Environmental Policy, the Federal Aviation Administration (FAA) Office of Environment and Energy has developed a research roadmap to address critical noise impacts research needs. This roadmap was developed in collaboration with and participation of researchers across numerous disciplines and around the world, as well as with the broad community of aviation stakeholders including the public. The roadmap will enable FAA and interested parties to define systematic, focused, and complementary research programs, in which limited resources could be pooled to advance the scientific knowledge on how best to address the impacts of aviation noise on society.

### ***Need for Research***

Though it is clear that aircraft noise has been reduced for millions of people over the past 30 years despite increasing air traffic (see Figure C1), noise issues continue to generate

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<sup>1</sup> Draft policy contained in JPDO email, dated 5/18/2010.

community reactions that can slow efforts to increase capacity. If air transport capacity is to increase to meet coming demand, the understanding of aircraft noise and its effects on people needs to be improved and FAA policy reviewed in light of this better understanding.

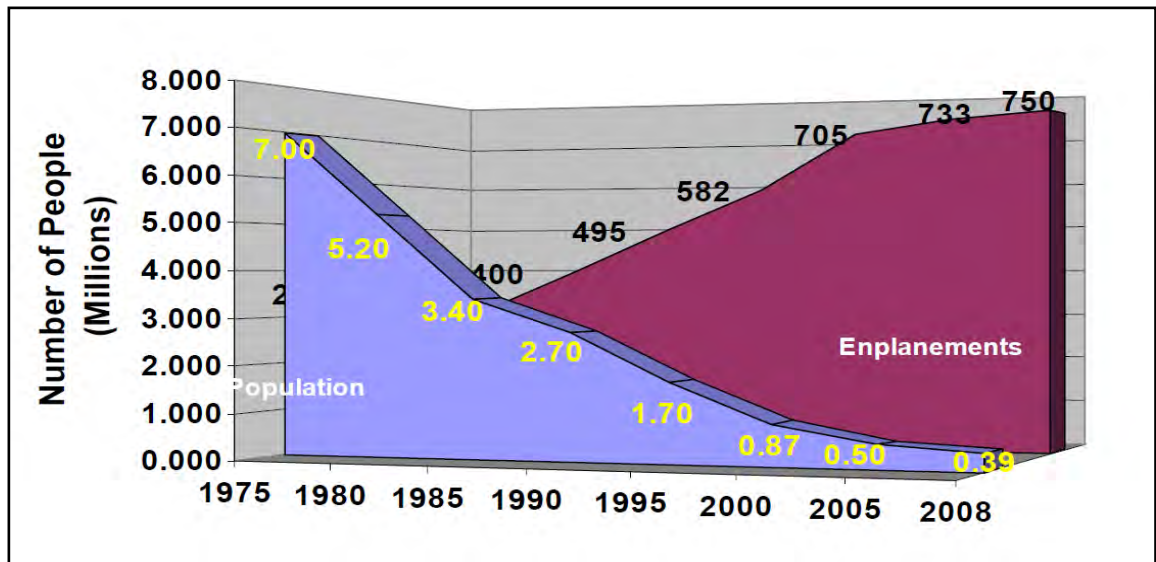


Figure C1 US Trends: decline in population exposed to levels exceeding 65 DNL  
(Source: FAA, 2010)

The technical bases for FAA's noise policies were last reviewed in 1992. Currently, this policy identifies a value of 65 dB Day-Night Average Sound Level (DNL)<sup>2</sup> as the threshold of significant impact for purposes of the National Environmental Policy Act (NEPA) analyses of FAA major actions; this threshold corresponds to about 13% of the population which will report high annoyance. The policy is based on the best available scientific evidence on the effects of aircraft noise and should this relationship be outdated, a policy review/update will be appropriate.

### Goals for Aviation Noise Research

Research will provide the needed scientific basis for examining or updating FAA noise policy and insure that decisions about major FAA actions and any FAA-sponsored airport noise studies will be informed by the best available information. Three goals have been identified. First, with the proper technical evidence, FAA could update land use compatibility guidelines, the NEPA significance thresholds, and criteria for judging and targeting mitigation measures. Second, application of up-to-date research results will help build public trust in noise analyses and, through better communication, increase understanding about aircraft noise, its effects and the likely changes that can be expected from airport and airspace projects. Third, updated research results can focus noise abatement or airport/airspace design efforts for efficiency and help to balance noise with other environmental considerations.

The FAA has identified four critical research areas based on gaps in current knowledge and capabilities: (1) noise effects on health and welfare, (2) noise in National Parks and

<sup>2</sup> For the purposes of this report DNL is considered to be approximately equivalent to the Community Noise Equivalent Level (CNEL); the cumulative noise metric for assessing aircraft noise exposure in California.

wilderness, (3) NextGen noise modeling enhancements, and (4) overall costs of aircraft noise on society. Detailed research roadmaps, including identification of preliminary research projects to address unresolved issues, are being developed by FAA.

## Technology Improvements

New engine/airframe technologies and alternative fuels will play key roles in achieving environmental and energy goals. There are four major federal research programs underway that will support NextGen technology goals.

**FAA CLEEN:** The FAA’s Continuous Low Energy, Emissions and Noise (CLEEN) Consortium will demonstrate aircraft and engine technologies that reduce noise, local air quality, and greenhouse gas emissions at the source to a developmental level that will allow quicker industry uptake of these new environmental technologies. These efforts will result in a fleet that will operate more efficiently with less energy usage and permit expansion of airports in a manner consistent with the environmental goals of the NextGen plan. Solutions that involve technology improvements in engines and airframes in a foreseeable timeframe require successful maturation and certification of new technologies within the next 5-8 years.

CLEEN has identified three milestones for identifying improved noise goals:

- ◆ N+1 (2015): 32 dB cumulative reduction from current Stage 4 noise levels
- ◆ N+2 (2020-2025): 42 dB cumulative reduction from current Stage 4 noise levels
- ◆ N+3 (2030-2035): 71 dB cumulative reduction from current Stage 4 noise levels

Achievement of these milestones and integration of CLEEN aircraft into the fleet would likely result in significant aircraft noise being confined to compatible land uses (the airport property line or adjacent property).

**NASA Environmentally Responsible Aviation (ERA) Project:** The goal of NASA’s Environmentally Responsible Aviation (ERA) Project is to explore and document the feasibility, benefits and technical risk of vehicle concepts and enabling technologies that will reduce the impact of aviation on the environment. The project’s primary goal is to select vehicle concepts and technologies that can simultaneously reduce fuel burn, noise and emissions; it contains three subprojects: Airframe Technology, Propulsion Technology and Vehicle Systems Integration.

**Optimized Profile Descent:** OPD is designed to reduce fuel consumption, emissions, and noise during descent by allowing pilots to set aircraft engines near idle throttle while they descend. OPDs use the capabilities of the aircraft Flight Management System to fly a continuous, descending path without level segments. The noise benefit of OPD are generally well outside the area of significant noise impact (i.e., 65 dB CNEL), but can be as much as 5 to 7 decibels per event. Anecdotally, residents find that the lack of power adjustments (that are required in the traditional “step-down” approach) is a noticeable benefit of OPD.

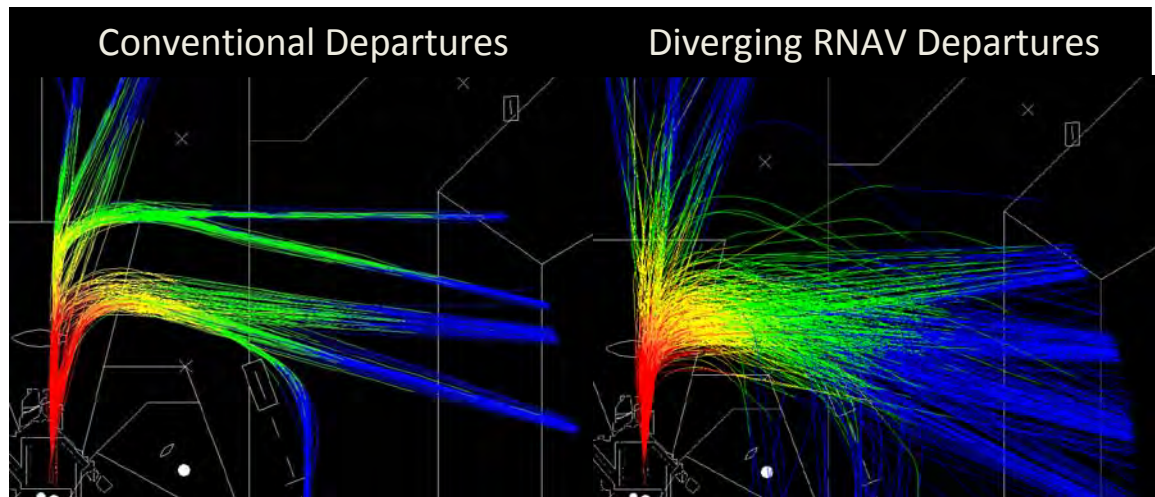
**Performance-Based Navigation:** PBN is comprised of RNAV and RNP and describes an aircraft’s capability to navigate using performance standards. RNAV enables aircraft to fly on

any desired flight path within the coverage of ground- or spaced-based navigation aids, or within the limits of the capability of aircraft self-contained systems, or a combination of both capabilities. RNP is RNAV with the addition of an onboard performance monitoring and alerting capability.

RNAV and RNP specifications facilitate more efficient design of airspace and procedures which collectively result in improved safety, access, capacity, predictability, operational efficiency, and environment. Specifically, improved access and flexibility help to enhance reliability and reduce delays by defining more precise terminal area procedures. They also reduce emissions and fuel consumption.

Consolidation of flights through RNAV and other advanced navigational procedures will reduce noise in most locations, but it will also increase noise levels in some concentrated locations (see Figure C2). Similarly, adverse noise impacts may be present in communities that will lie beneath flight paths of newly developed PBN procedures where conventional procedures were not previously present. Care should be taken in the development of procedures and routes to avoid noise-sensitive communities to the extent possible.

One of the major challenges to implementing RNP procedures will be meeting environmental review requirements, even for projects that provide a net environmental benefit. This may require numerous NEPA reviews to assess the impacts from the consolidated flight tracks. As of this writing, FAA is developing guidance for preparing such environmental reviews.



**Figure C2 Benefits of RNP/RNAV Procedures**  
(Source: FAA, 2010)

### **Policy Approaches**

Another key element of NextGen is to develop and implement appropriate policies, programs, and mechanisms to support advantageous technology and operational innovations and accelerate their integration into the commercial fleet, the airport environment, and the entire NAS. The Joint Planning and Development Office (JPDO) noise policy was articulated above. Specific policy measures to achieve the larger policy goals include such strategies as public/private research and development consortium (such as CLEEN), regulatory approaches, and financial incentives.

## Advanced Decision-Support Tools

FAA, in collaboration with NASA and Transport Canada, is currently engaged in a multi-year effort to develop a comprehensive tool suite that allows aviation noise, emissions and fuel burn inventories and thorough assessment of the environmental impacts of aviation. This tool suite comprises the Environmental Design Space (EDS), Aviation Environmental Design Tool (AEDT), Aviation Environmental Portfolio Management Tool for Economics (APMT-Economics) and Aviation environmental Portfolio Management Tool for Impacts (APMT-Impacts). Once fully mature, this integrated tool suite will be capable of characterizing and quantifying the interdependencies among aviation-related noise and emissions, impacts on health and welfare, and industry and consumer costs and associated environmental benefits under different policy, technology, operational, and market scenarios.

## EXAMPLES OF ONGOING NEXTGEN IMPROVEMENTS

***Automatic Dependent Surveillance – Broadcast (ADS-B):*** The FAA first rolled out ADS-B in Alaska, a site chosen because the rugged terrain severely limits radar coverage. Aircraft were equipped with ADS-B avionics, including a cockpit display. This display provided the pilot with the aircraft's location, the location of other aircraft, and graphical and textual weather information on a moving map.

ADS-B now covers the Gulf of Mexico, where the FAA, in partnership with the Helicopter Association International, installed a network of ADS-B ground stations on oil and natural gas platforms and the surrounding shoreline. This brings air traffic surveillance services, more precise aircraft locations and weather data to both low-altitude helicopters servicing the platforms and high-altitude commercial flights operating beyond radar coverage in the Gulf.

The FAA also rolled out ADS-B in Louisville. Louisville was chosen as a key site in part because United Parcel Service (UPS) voluntarily equipped 107 of its aircraft with ADS-B avionics in order to save time, fuel and carbon emissions on flights to and from its Louisville hub. The system is being used by controllers in the tower at Louisville International Airport and at the Louisville Terminal Radar Approach Control (TRACON) facility.

Controllers in the Philadelphia area also have the capability to use ADS-B to track and separate aircraft. ADS-B coverage in Philadelphia extends 60 nautical miles out from Philadelphia International Airport and approximately 10,000 feet up. It also covers the surface area and the approach corridors to the runways. Philadelphia was selected in part because UPS has equipped some of its aircraft with ADS-B and a large amount of their operations are conducted there.

Ground stations have been installed in South Florida, which means that pilots flying in aircraft equipped with ADS-B avionics in that region now receive free traffic and weather information on their cockpit displays.

ADS-B coverage will be nationwide in 2013.

**Area Navigation (RNAV):** The FAA RNAV test bed features RNAV routes between Florida airports (including Miami, Orlando and Daytona) and New York area airports (Teterboro, JFK, LaGuardia and Newark). The precision allowed by RNAV routes improves the efficiency of operations along the crowded East Coast corridor, saving time and money for airlines serving those routes and reducing delays for passengers. OPDs and Tailored Arrivals are being used in Miami. Both operational maneuvers allow aircraft to descend in a more direct alignment with runways, increasing predictability while reducing emissions and fuel burn.

**Surface Management:** The FAA is using JFK and Memphis to test new Surface Management programs in order to facilitate better aircraft flow on the ground. This will enhance runway safety on runways, taxiways and ramp areas and reduce delays, while also lowering emissions and fuel use.

**International:** The FAA has also entered into agreements with international partners across the Atlantic and Pacific to accelerate the deployment of NextGen technologies and procedures to improve aviation safety, efficiency and capacity while reducing the environmental footprint during all phases of flight. The Atlantic agreement, reached between the FAA and the European Union, is called the Atlantic Interoperability Initiative to Reduce Emissions (AIRE). The Pacific agreement, first reached with Australia and New Zealand and more recently joined by Japan and Singapore, is called the Asia and Pacific Initiative to Reduce Emissions (ASPIRE).



# Measuring Aircraft Noise

## OVERVIEW

By one common definition, noise is simply *unwanted* sound. *Sound* is something that can be precisely defined and physically measured. *Noise*, on the other hand, is highly subjective. Sounds which may be pleasant and desirable to one person may be noise to someone else. Moreover, even when people agree that a sound constitutes noise, their reactions to that noise may vary substantially.

The subjective and highly complex nature of noise is implicit even in the measurement of noise. These characteristics are particularly evident with respect to measurement of aircraft noise. As discussed in this appendix, aircraft noise differs in many respects from other sources of noise, including other transportation noise. Also discussed are the efforts which have been and continue to be made to devise ways of describing and quantifying aircraft noise. Lastly, issues involved with measuring noise levels for a particular airport and projecting potential future noise exposure are addressed.

## CHARACTERISTICS OF AIRCRAFT NOISE

Noise is often perceived to be the most significant of the effects associated with airport activity. To better understand aircraft noise exposure, it is important to recognize the variables involved with regard to different types of aircraft, aircraft flight routes, and other factors such as pilot technique.

### Type of Aircraft

As background to the topics which follow, an understanding of the fundamental characteristics of sound is valuable. Tables D1 and D2 provide some basic information on sound measurement and sound attenuation, respectively. Figure D1 lists typical sound levels of common indoor and outdoor sound sources.

**This appendix examines the various factors involved in measurement of aircraft noise. The discussion covers:**

- Characteristics of aircraft noise
- Aircraft noise metrics
- Calculation of aircraft noise contours

**TABLE D1: MEASUREMENT OF SOUND**

### Sound

Sound is transmitted in the form of pressure waves. These waves are created by oscillation of particles of air—that is, air particles being displaced from and returning to an equilibrium position. As the particles are displaced, they bump into surrounding particles which bump into others and so on. In this manner, sound is transmitted through the atmosphere. Sounds are heard when the pressure waves of displaced air particles strike the eardrum, causing it to vibrate.

The physical properties of a sound can be measured in terms of three basic components: *magnitude*, *frequency*, and *duration*. Although these components can be directly measured, useful measures of sound are complicated both by environmental variables and the way in which people hear sound.

### Magnitude

The magnitude or strength of a sound is determined by how much the air particles are displaced from equilibrium by the sound pressure waves. The greater the amplitude of the pressure fluctuation, the more acoustic energy the sound wave carries. Simply measuring the magnitude of sound on a linear scale is not practical, however, because the range of sound pressures which the human ear can detect is enormous—a ratio of 1 to approximately  $1^{14}$  (1 followed by 14 zeros). By converting this ratio to a logarithmic scale, the range can be reduced to 14 units. The unit of sound level measurement on this scale is the bel (in honor of Alexander Graham Bell). Normally, though, these units are divided into tenths—that is, decibels. The range of human hearing thus extends from 0 decibels, corresponding to the faintest sound level that the healthy, unimpaired human ear can detect, to more than 140 decibels. (Sound levels of nearly 200 decibels are possible—such as inside a rocket engine—but are greater than the unprotected human ear can withstand.)

The use of a logarithmic scale for measurement of the magnitude of sound is often the cause for confusion because it does not directly correspond to the way in which people perceive the relative loudness of different sound levels. People tend to think that, if two equal sounds are combined, the result will seem twice as loud. In reality, however, combining two equal sounds—although it doubles the sound energy—produces only a 3 dB increase in magnitude, an amount which is barely perceptible. For one sound to be judged twice as loud as another, it actually must be 10 dB higher (meaning that the acoustic energy must increase 10-fold). Because we perceive the loudness of sounds in relative rather than absolute terms, the relationship of 10 dB per doubling of loudness applies to any 10 dB increase—sound level increases from 40 dB to 50 dB or from 80 dB to 90 dB are both perceived as representing a doubling of loudness.

### Frequency

The frequency of a sound—its tonal quality—depends upon the relative rapidity of the air pressure oscillation. In a low-pitched tone, the sound waves are relatively far apart (that is, the wavelength is relatively long); while in a high-pitched tone they are squeezed much closer together. Frequency is measured in cycles per second (also called hertz or Hz). Although some pure tone sounds contain only one frequency, more often sound is a mixture of different frequencies. The response of the human ear to different sounds is significantly affected by the frequency of those sounds. Although people can hear sound frequencies as low as 20 Hz and as high as 20,000 Hz, they do not hear all frequencies in this range equally well. Very low and very high frequency sounds are perceived to be less loud than mid-range sounds. Most environmental sound measurements consequently are weighted to simulate the varying frequency sensitivity of the human ear. A widely used weighting for general environmental sounds (as opposed to large-amplitude impulse sounds such as sonic booms) is the A-weighted sound level expressed in decibels (abbreviated as “dBA”).

### Duration

The third component of sound is the length of time over which it occurs. Many sounds have a distinct beginning and ending; others, such as from aircraft overflights, gradually increase and decrease without a sharp definition of when they start or stop. In the latter case, the duration of the sound is usually measured in terms of the time period over which the sound level exceeds a specified threshold. Because sound levels vary from one moment to the next, it is not possible to say that a given noise was “so many decibels” except when referring to an instantaneous measurement or by averaging the sound level over time. As discussed elsewhere in this appendix, numerous methods have been developed which seek to measure the overall exposure produced by a noise event or events within a defined period of time.

As experienced on the ground, the noise emitted by different types of aircraft has distinct differences in terms of both the overall sound level and other properties. The extent of the differences in sound levels generated by a selection of general aviation, air carrier, and military aircraft can be seen in Figure D2. The illustrations depict the typical noise “footprint” created by a single landing and takeoff of each aircraft.

**TABLE D2: SOUND ATTENUATION**

**Sound Attenuation in the Outdoor Environment**

Among the basic characteristics of sound, which are of particular interest in the discussion of aircraft-generated noise, is sound attenuation or reduction over distance. Part of the reduction occurs because sound energy is spread over a three-dimensional, geometrically increasing area as the distance from the source increases. At sufficient distances from the source, geometric spreading alone results in a 6 dB loss per doubling of distance. Actual attenuation of sound is greater than this as a result of factors such as absorption by the atmosphere. Also, atmospheric attenuation is greater for high-frequency sound than for sound with a low frequency.

Other factors also influence the extent to which sound is attenuated in the environment. Sound propagation through the air is affected by meteorological conditions including air temperature, temperature inversions, humidity, wind speed, and air turbulence. Sound traveling along a hard ground surface is attenuated by approximately an additional 2.5 dB in 1,000 feet (compared to the attenuation in air alone) and tall grasses or shrubs can double this figure. Structures, terrain, or other barriers can provide significant attenuation for ground-to-ground sound as well. Ground cover and objects on the ground, however, have little effect on reducing air-to-ground sound such as that from aircraft. Moreover, buildings and other such objects can cause reflections which may even *increase* the localized sound level.

**Sound Attenuation Provided by Buildings**

For indoor activities, another significant factor affecting the level of aircraft-generated noise to which people are exposed is the amount of sound attenuation provided by the building. The sound insulation capabilities of buildings are measured in several ways.

One measure commonly associated with the individual structural components of a building is the *Sound Transmission Class (STC)*. The STC rating of a component is expressed as a single number, in decibels, and is calculated in laboratory testing of the component. STC ratings are often used in construction specifications to indicate a required sound insulation capability. The original application of STC ratings was with regard to interior partitions, but it can also give some indication of the sound attenuation provided by exterior walls, windows, and doors.

Caution must be used, however, when attempting to evaluate the exterior-to-interior sound level attenuation of a building by means of STC ratings. First, as a single number, the STC of a structural component may not adequately reflect differences in the component's relative abilities to block sounds of different frequencies. Secondly, the overall sound attenuation provided by most buildings cannot be calculated from STC ratings. The various components of a building each have different noise insulation qualities. Moreover, sound tends to enter an interior space not so much through individual components, but by way of openings and gaps such as vents, door jambs, and so forth. Interior noise levels from exterior sources thus are substantially determined by the weak link in the overall construction.

A more general measure of a building's sound attenuation attributes is its *Noise Level Reduction (NLR)*. Like STC, NLR is a single-number value measured in decibels and as such may disguise a building's varying response to different sound frequencies. Unlike STC, though, NLR is measured in field testing of actual structures. It thus takes into account the fact that buildings are made up of numerous components.

Each of the footprints is broadly representative of those produced by other aircraft similar to the ones included. However, the actual sound level produced by any single aircraft takeoff or landing will vary not only among specific makes and models of aircraft, but also from one operation to another of identical aircraft.

*In several respects, aircraft noise is intrinsically different from other types of transportation noise.*

- *Directionality: Few other noises routinely come from overhead.*  
*Intermittent Occurrence: Unlike the often constant drone common from highway noise, aircraft noise is usually composed of discrete events.*
- *Vibration: Blade slap noise from helicopters and propeller driven aircraft, and the low- frequency rumble created behind jet aircraft as they take off, often cause perceptible vibration in structures.*
- *Fear: In part because the source is from overhead, there is sometimes a sense of fear attached to how people perceive aircraft noise that is seldom evident with noise from highways and railroads.*

*As discussed later in this appendix and in the appendix which follows, these characteristics often necessitate different approaches to aircraft noise exposure mitigation than are used with respect to other noise sources.*

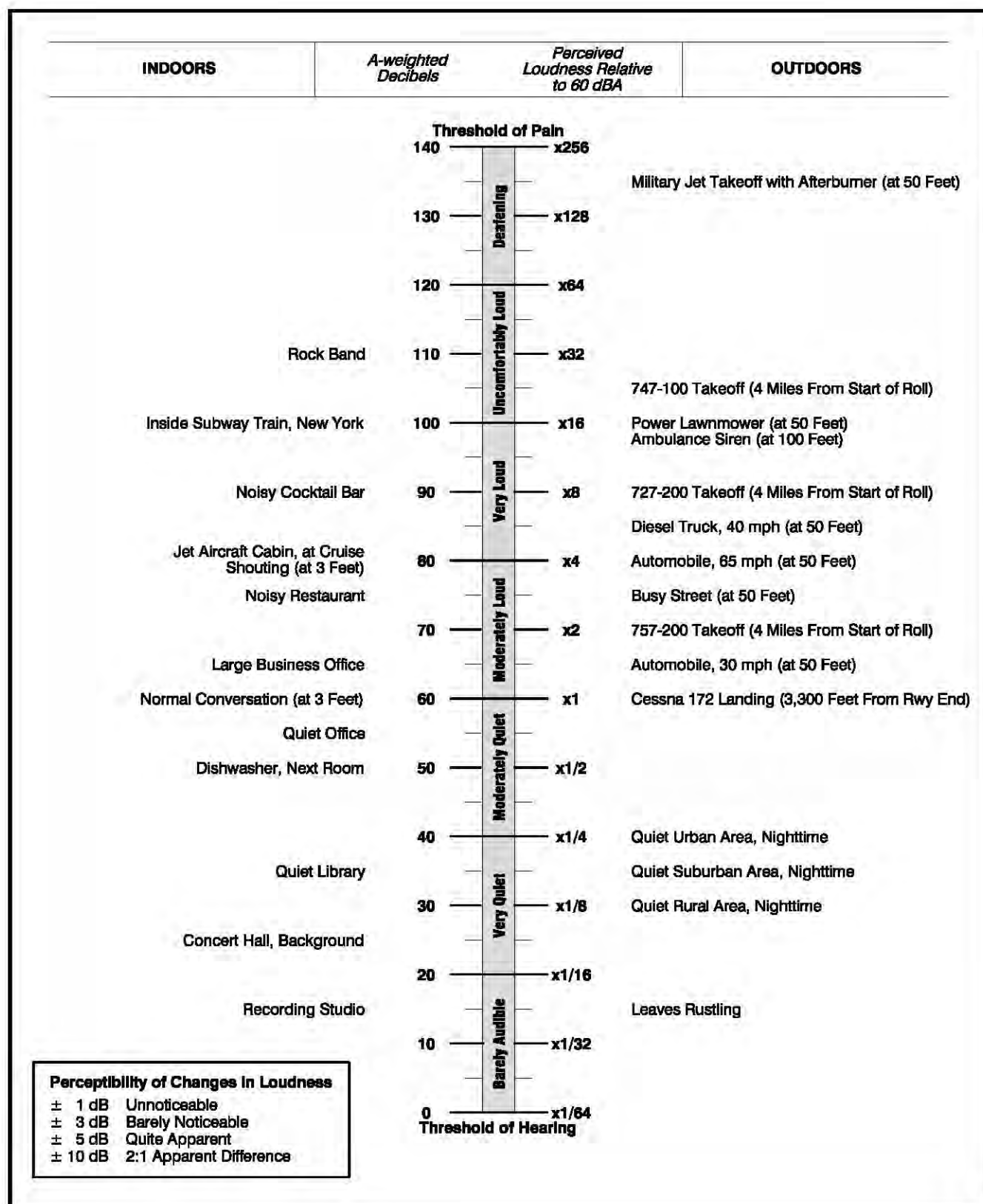


FIGURE D1

## Typical Decibel Level of Common Sounds

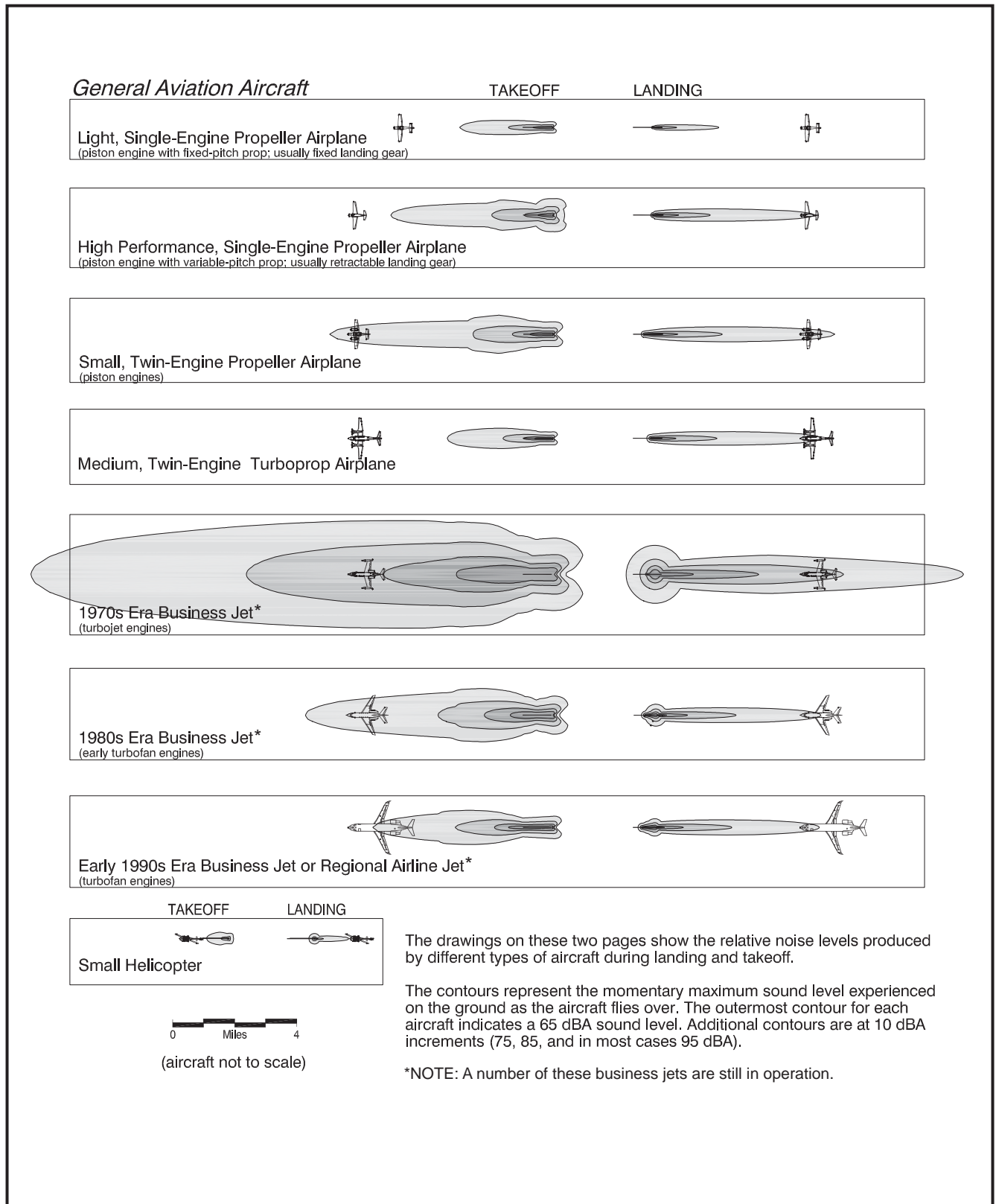


FIGURE D2

## Noise Footprints of Selected Aircraft

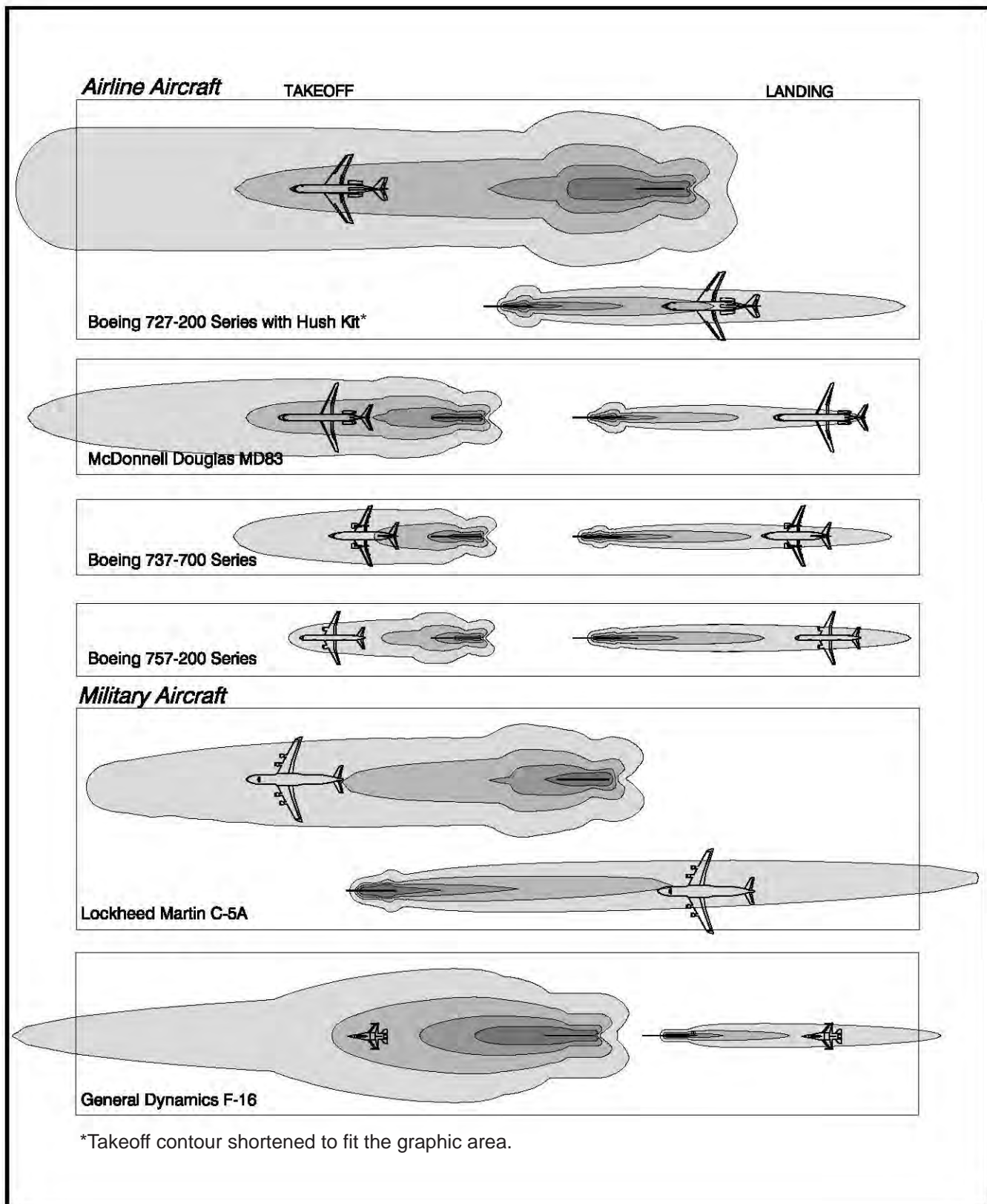


FIGURE D2 CONTINUED

## ***Jet Airplanes***

Both the character and the sound level (magnitude) of jet airplane noise has changed over time as new engine technologies have been developed and introduced into the air carrier and business jet aircraft fleets. The old, pure-jet engines produce noise that is both very loud and at the high end of the frequency spectrum. Newer generation, fan-jet engines—in which a substantial volume of the air entering the engine bypasses the combustion chamber—create noise that is comparatively lower both in magnitude and frequency. Even among fan-jet engines, noise levels have been considerably reduced with the most recent models compared to the earliest types.

Most of the overall noise level improvements experienced in recent years at airports having jet activity have resulted from retirement of the older, louder jet aircraft. As of January 1, 2000, the older-model, so-called Stage 2, fanjet aircraft have been phased out of the nation's air carrier fleet in accordance with federal law. The phase-out of Stage 2 aircraft, however, applied only to aircraft weighing more than 75,000 pounds; Stage 2 business jet aircraft which weigh less than this amount are still allowed to operate. Such aircraft can produce a significant proportion of the noise exposure at general aviation airports.

Furthermore, the effect of the technological improvements on aircraft noise levels differs between takeoffs (departures) and landings (approaches). Decreased engine exhaust noise together with improved climb-out performance (aircraft reach a higher altitude more quickly) have enabled major reductions in departure noise levels. Approach noise has recently become a more prominent issue with the increase in use of Stage 3 aircraft. Greater noise emissions from the fans and compressors in high-bypass engines have increased the comparative importance—and sometimes the actual noise levels—of aircraft approaches. One further concern to be addressed is sideline noise produced by the reverse thrust applied as aircraft land. This noise, particularly evident lateral to runways, can be the subject of complaints, but usually has little effect on overall noise contours because of the dominance of takeoff noise.

The extent to which jet aircraft noise will be further reduced in the future depends upon several factors. Continued technological advancements appear capable of reducing noise emissions to levels below those of the newest aircraft now in production. The question then becomes one of how quickly such technologies will be introduced into the national and world-wide aircraft fleets. Also an important consideration is the rate at which older, noisier aircraft will be phased out of operation. Lastly, in terms of cumulative noise exposure, a key factor is the volume of future aircraft operations. Even with improved technologies, the potential exists for the overall noise level at airports to increase along with growth in the number of aircraft operations.

### ***Propeller Airplanes***

The dominant noise from most propeller airplanes, whether they are driven by piston or turbine engines, is from the propeller slapping against the air as it rotates. Propeller airplane noise varies depending upon the number of engines, the rotational speed of the propellers, the number of blades on each propeller, and the pitch of the blades, as well as, to some extent, the type of engine.

A common perception is that propeller airplanes typically emit significantly less noise than jet airplanes. Early-technology (and most tactical military) jet aircraft clearly are very noisy—more so than most propeller airplanes. With current model jets, however, the distinction is much less. Indeed, aircraft weight accounts for much of the difference. Most propeller airplanes flying today are substantially smaller and lighter than jet airplanes. For aircraft of similar weight, the noise levels of aircraft that are propeller driven and those that have new-technology, fan-jet engines are not greatly different. Another factor affecting the relative noise levels generated by the two aircraft types is the takeoff climb profile. Because jets climb much more rapidly than typical propeller airplanes, the noise levels measured on the ground diminish rapidly with increased distance from the runway. Consequently, at points sufficiently far from the runway end, the higher altitude attained by jets may make them effectively quieter than propeller airplanes. This phenomenon can be seen from comparisons among the aircraft noise footprints depicted in Figure D2.

Unlike jet aircraft, the noise levels produced by average, propeller-driven, small airplanes found at general aviation airports has not changed appreciably over the years. The potential for future technological improvements is limited. Moreover, small, private airplanes tend not to be replaced with newer models at anywhere near the rate common to jet aircraft used by the airlines. Thus, for many years to come, the noise exposure of typical propeller airplanes is likely to remain similar to what it is now.

### ***Helicopters***

Helicopter noise has a character all its own. Although a portion of the noise emanates from the engines themselves, the uniqueness of helicopter noise is mostly due to the modulation of sound created by the relatively slow-turning main rotor as it hits the air around it. This sound modulation is referred to as *blade slap*. Blade slap is most pronounced during low-speed descents and high-speed cruise. To a listener on the ground, it is most audible as the helicopter approaches. Helicopters are also notable for creating perceived vibration or rattle in structures.

Research into methods of reducing helicopter noise is on-going. How successful and cost-effective the results will be remains to be seen. (Figure D3 depicts the normal sound level range of helicopter operations, measured at a distance of 250 feet.)



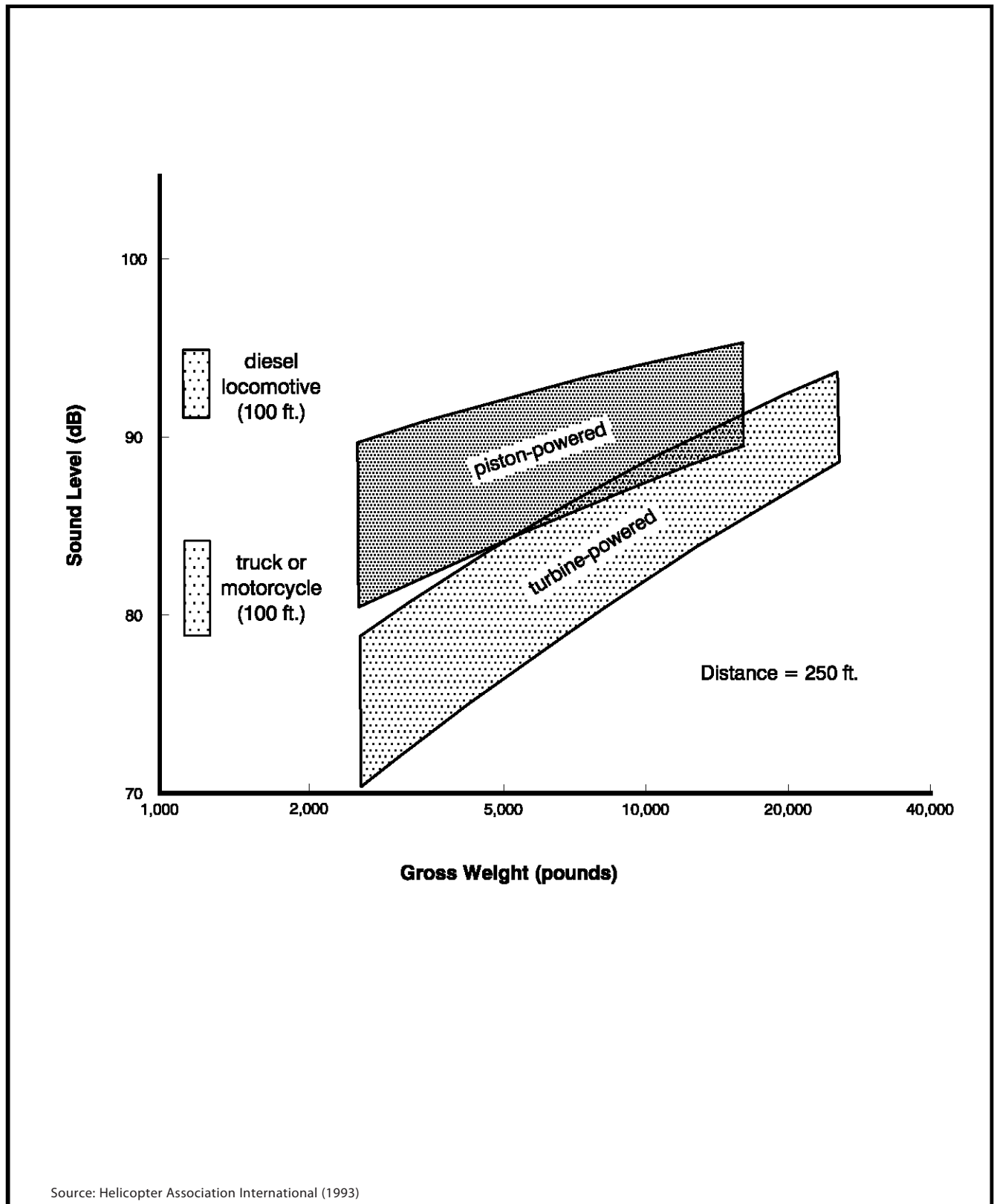


FIGURE D3  
Helicopter Noise Levels

## Common Aircraft Flight Routes

In general, the most significant noise exposure created by aircraft is concentrated near the ends of airport runways. The locations of aircraft flight routes to, from, and around an airport, however, are also a major determinant of where noise exposure occurs. This section describes the major factors which determine the type and location of aircraft flight routes near airports.

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*The discussion in this section concerns the flight routes and procedures used by aircraft under normal flying conditions. Appendix E contains information regarding how pilots and aircraft react under emergency circumstances.*

*An essential point to emphasize in this discussion of aircraft flight routes is that airport land use commissions have no authority to regulate where aircraft fly. That responsibility rests with the FAA.*

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## Types of Flight Rules

Aircraft fly to and from airports under two different sets of operating procedures defined by Federal Aviation Regulations:

- ◆ **Visual Flight Rules (VFR)**—VFR operating procedures apply at airports when weather conditions (specifically, the horizontal visibility and the cloud ceiling height) permit pilots sufficient time to see a runway for landing as well as to see and avoid other aircraft in flight and obstacles on the ground. These minimums are set by Federal Aviation Regulations Part 91. Within controlled airspace around airports the minimum visibility requirement for VFR flight is basically three statute miles. By requesting a special VFR clearance, pilots can obtain minimums as low as one statute mile. Minimums of one statute mile also are permitted in uncontrolled airspace.
- ◆ **Instrument Flight Rules (IFR)**—Under IFR procedures, pilots must rely on the aircraft's cockpit instrumentation, ground- or satellite-based navigational aids, and (where available) air traffic control services. IFR procedures are required when the weather conditions are below the minimums for VFR operations. Airport instrument procedures fall into two basic categories: *approach procedures* and *departure procedures*. Published procedures for individual airports are formally defined in accordance with federal guidelines and must be approved by the FAA. Airports may have one or more of each type of procedure based upon different navigational aids and applicable to different runway ends.

A mixture of VFR and IFR procedures are frequently used for aircraft operations at airports. IFR procedures can be followed during VFR conditions. This is the standard practice for air carrier aircraft, is often used by corporate aircraft, and also occurs during instrument flight training. Additionally, VFR procedures are often used at the termination of an IFR flight once the pilot has the airport in sight.

## ***Airplane VFR Traffic Patterns***

Federal Aviation Administration guidelines establish the standard traffic pattern flown by airplanes approaching and departing airports under VFR conditions. Airplane traffic patterns are defined in terms of a generalized *routing* and an *altitude* (or height above the airport).

The generalized routing is in the form of a racetrack-shaped path leading to and from the runway in use (Figure D4). FAA guidelines specify only the shape of the pattern, not its size. Unless precluded by local operating conditions, traffic patterns use left-hand turns. The direction of flow within a traffic pattern depends mostly upon wind conditions. Aircraft will almost always take off and land facing as closely into the wind as the choice of runway alignment permits. When winds are calm, other factors such as attaining the most efficient flow of traffic or minimizing noise exposure may influence which runways are used.

Most pilots normally fly a standard pattern for non-towered airports. However, use of such a pattern is not mandatory. Depending upon the direction from which the flight is coming, a pilot may choose to make a *base entry* or *straight in* approach to landing. Also, after takeoff, an aircraft may depart the pattern at various points.

Traffic patterns at airports where an air traffic control tower is operating are more regulated, but often more variable, than at airports without towers. Pilots commonly request the type of entry or departure which will be most convenient to them. Controllers may grant such requests if conditions allow. However, when traffic is heavy, controllers will tell pilots which aircraft to follow and when to make turns. Atypical flight tracks can sometimes result.

The existence of standard patterns tends to give people who are not pilots the impression that aircraft follow well-defined *highways in the sky*. The reality is that considerable variation occurs in how pilots fly traffic patterns. This variation is expected and normal.

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**F**igure D5 depicts the actual flight tracks at an airport having both air carrier and general aviation operations, recorded from FAA radar over two six-hour periods. Although certain primary traffic corridors can be seen, the significant diversity in flight track locations is also apparent. Additionally, even for aircraft following nearly identical tracks, performance differences and the need to avoid conflicts with other aircraft results in wide variations in aircraft altitudes at any given point along a track.

These variations in flight paths and altitudes may be somewhat reduced in the future. At least near major air carrier airports, new technologies are enabling aircraft to closely follow precisely defined flight paths. The potential for creation of enhanced noise abatement flight procedures is a potential benefit of this new technology (also see Appendix C: Next Gen).

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- ◆ **Landings**—For landings, pilots of average single-engine airplanes usually fly the downwind leg (see Figure D4) anywhere from 1/4 to 1 nautical mile (1,500 to 6,000 feet) laterally from the runway. The base leg may extend even farther from the airport, particularly when other aircraft are in the traffic pattern. There is a tendency by many pilots to fly a relatively wide pattern at airports with a long, wide runway even when no other aircraft are present. Also, terrain and other local operating conditions can affect

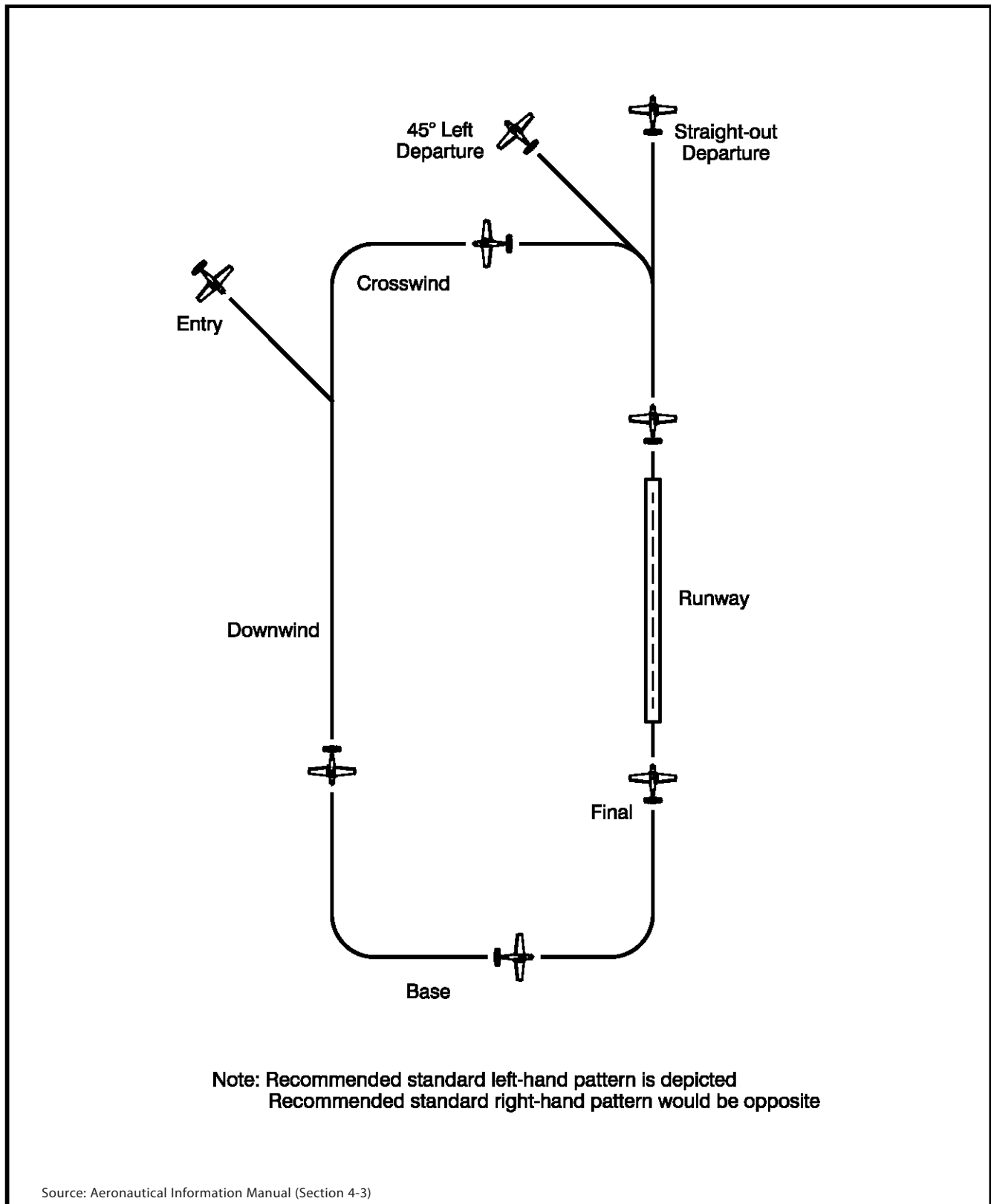


FIGURE D4

## Standard Traffic Pattern

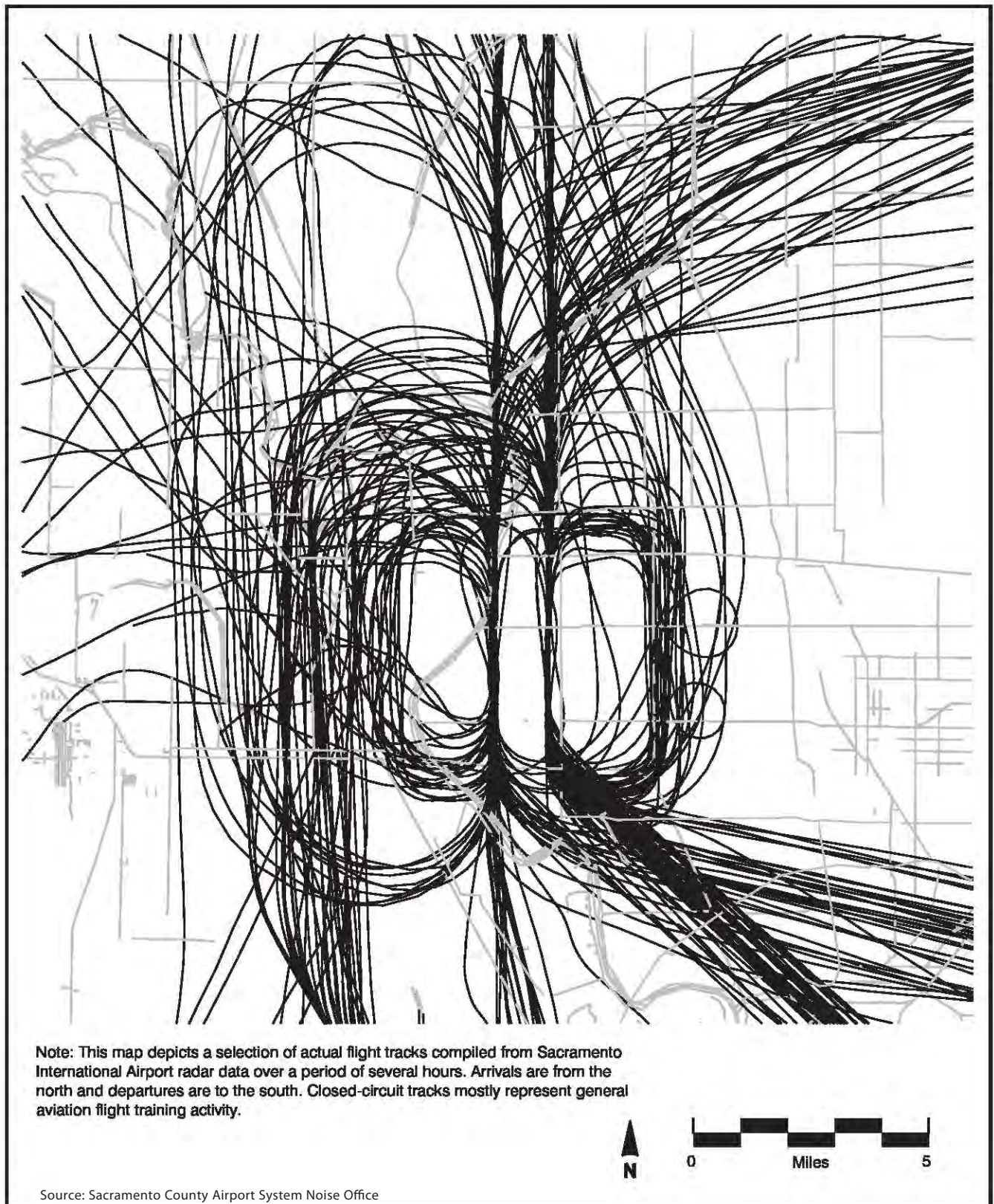


FIGURE D5  
Sample Plot of Actual Flight Tracks

how traffic patterns are commonly flown at any given airport. When larger and faster airplanes fly a traffic pattern, the pattern is not only typically higher, but also farther out than one flown by smaller airplanes.

- ◆ **Takeoffs**—On takeoff, the normal procedure for small airplanes is to fly straight ahead until reaching an altitude of at least 400 feet above the airport elevation. Depending upon runway length, aircraft type, air temperature, and pilot technique, this altitude may be reached over the end of the runway or not until nearly a mile beyond the runway end. Some pilots (especially those of agricultural aircraft) begin a turn at a lower altitude. Jets and other large airplanes normally climb straight ahead until reaching an altitude of at least 1,500 feet above airport elevation.

At most airports, the traffic pattern altitude for small airplanes is set at 800 to 1,000 feet above the airport elevation. Higher altitudes are sometimes established for large aircraft. These altitudes, however, apply only to a portion of the traffic pattern (mostly the *downwind* leg). Elsewhere in the pattern, aircraft are descending toward a landing or climbing after takeoff. FAA regulations regarding minimum en route altitudes (in populated areas, 1,000 feet above the highest obstacle within 2,000 feet of the aircraft) do not apply while an aircraft is landing at or taking off from an airport. The actual altitude of an aircraft at any particular point along the traffic pattern is largely dependent upon its performance capabilities plus, on landing, any visual glide slope guidance or other navigational aids which may be installed at the airport.

### ***Instrument Approach Procedures***

Instrument approach procedures are classified as either *precision* or *non-precision*.

- ◆ **Precision Approach Procedures**—Precision approach procedures provide both vertical and horizontal guidance to the aircraft. Current procedures all rely upon using navigational aids located at the airport and elsewhere on the ground nearby. In the future, the satellite-based Global Positioning System (GPS) is expected to enable precision approaches without the need for navigational equipment on the ground.

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*The FAA is currently implementing the instrument approach known as Wide Area Augmentation System (WAAS). The WAAS will allow GPS to be used as a primary means of navigation from takeoff through Category I precision approach.*

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- ◆ **Non-precision Approach Procedures**—Non-precision approach procedures give only horizontal guidance. Pilots must rely upon other means (other navigation aids on or off the airport and/or radar control) to determine when to descend to a lower altitude along the approach course. Historically, non-precision approaches required installation of navigational equipment on the ground at the airport or in the vicinity. Stand-alone GPS-based non-precision approaches have come into use over the past several years.

Precision approach procedures typically allow lower approach minimums than do non-precision approach procedures. Most precision approach procedures allow aircraft to land with weather conditions as low as a 200-foot cloud ceiling and a  $\frac{1}{2}$ -mile visibility. Some major air carrier airports have navigational aids which enable suitably equipped aircraft to land with *zero-zero* conditions. Good minimums for non-precision approach procedures are generally double those typical of a precision approach procedure.

Instrument approach procedures are divided into as many as four segments: *initial*, *intermediate*, *final*, and *missed*. The initial and intermediate approach segments serve to guide the aircraft from major air routes to the airport vicinity. Once an aircraft is established on the final approach course, it generally is aligned with the runway and is at a precise altitude. Aircraft fly the final approach segment until reaching the specified minimum altitude at which point, if the runway is visible, the aircraft either proceeds straight ahead to the runway or circles to land on another runway. The missed approach segment of the procedure is utilized if the runway is not visible when the aircraft reaches a predetermined position (indicated by navigational aids or timing) and minimum altitude or the pilot elects to abandon the approach earlier. Missed approach procedures enable the aircraft to climb back to a safe altitude and then either wait for operating conditions to improve or proceed to another airport.

Until the mid 1990s, all instrument approach procedures relied upon ground-based navigational aids. Since that time, procedures utilizing GPS have come increasingly into use. Initially, all GPS procedures were “overlays”—near duplicates of already existing ground-based procedures. More recently, procedures based solely upon GPS have been established. To date, all GPS procedures are still classified as non-precision (providing horizontal guidance only). Ultimately, GPS has the potential to allow establishment of new instrument approach procedures with lower minimums or even curved approach paths. Another key advantage of GPS approach procedures is that they do not require installation of on-ground navigational aids. Runways for which ground-based procedures are not technically practical or cost-effective (because of relatively low activity levels) thus may be capable of accommodating a GPS-based approach.

Despite this potential, it should be realized that, even with GPS, every runway will not become an instrument runway, let alone a precision instrument runway. The FAA has adopted minimum design criteria for runways to support various categories of instrument approach procedures (whether GPS or otherwise). For example, the minimum runway length requirement (as of late 2010) is 3,200 feet for a non-precision approach. This minimum requirement has been established for many years. Additionally, lateral setback distances from the runway and the presence of obstacles in the approach and missed approach path are major determinants of the visibility and descent minimums that an approach can have.

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**C**altrans Guidance: Even though GPS may enable many runways currently without an instrument approach procedure to have one in the future, ALUCs cannot necessarily assume this will occur for any particular runway. ALUCs are limited by state law to basing their compatibility plans on master plans or layout plans adopted by airport proprietors. Therefore, unless the adopted plan indicates a runway to be a future instrument runway or the instrument procedure already exists, ALUCs should not base their plans on the possibility that a procedure will be created.

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### **Instrument Departure Procedures**

All airports with instrument approach capabilities also have published instrument departure procedures. These procedures enable aircraft to depart an airport and climb to en route airspace. Departure procedures are usually less complex than approach procedures and often



do not depend upon on-airport navigational aids. For air carrier and charter aircraft operations, certain minimum visibility conditions must be met before the aircraft can take off. No minimums are set for operations by private aircraft operating under Federal Aviation Regulations Part 91. Also, instrument departures are permitted from any airport, even those without an instrument approach procedure.

### ***Airport-Related Factors***

Adjustments to standard traffic patterns frequently are made to reflect specific conditions at individual airports. Airports where multiple runways are simultaneously used may limit the pattern locations of individual runways in order to avoid air traffic conflicts. Similarly, when two or more airports are situated close together, limitations on their traffic pattern locations may be necessary.

High terrain on one side of an airport is another local condition which may dictate establishment of a right-hand pattern to a runway. Finally, the locations of traffic patterns and flight routes to and from an airport are sometimes defined so as to minimize aircraft overflights of residential or other noise-sensitive land uses.

### **Specialized Aircraft Flight Routes**

In addition to the common arrival and departure flight routes flown by most aircraft, some airports have activity by specialized aircraft which may have their own particular routes.

### ***Helicopter Flight Patterns***

Normal flight patterns for helicopters are the same as those for airplanes in certain ways and are different in others. Most of the differences result from the distinct operating characteristics of helicopters.

- ◆ **Visual Flight Rules**—Helicopter flight under VFR conditions involves significant differences from airplane flight. For example, en route altitude is generally lower for helicopter flights than it is for airplanes. Federal Aviation Regulations Part 91 establishes the minimum en route altitude for all aircraft in urban areas at 1,000 feet above the highest obstacle within a 2,000 foot horizontal radius of the aircraft. Helicopters, however, may be operated at less than these minimums if “the operation is conducted without hazard to persons or property on the surface.”

The FAA has not established a standard airport traffic pattern for helicopters comparable to that for airplanes. FAR Part 91 dictates only that helicopters should “avoid the flow of fixed-wing traffic.” This is often accomplished by flying both at a lower altitude than the airplane traffic pattern and along different routes. Also, many airports and heliports have adopted official or unofficial helicopter approach and departure routes.

- ◆ Because helicopters require little or no landing or takeoff roll along the ground the way airplanes do, they can approach or depart a landing/takeoff site from virtually any direction when not limited by obstacles, established procedures, or other factors. Given the choice, helicopters, like airplanes, will land and take off as closely into the direction of the wind as possible. Helicopter landing approach and takeoff climb angles are



comparatively steeper, however. Also, the length of these segments can be much shorter than needed for airplanes.

- ◆ **Instrument Flight Rules**—Under instrument weather conditions, helicopters mostly follow the same flight rules as airplanes. At airports, for example, properly equipped helicopters can use the same instrument approach and departure procedures as those flown by airplanes. Some helicopter facilities, however, may have instrument procedures exclusively for helicopter use.

### ***Agricultural Aircraft***

In agricultural locations, agricultural *crop duster* aircraft often are the principal contributors to an airport's overall noise impact. Agricultural aircraft noise differs from that of other aircraft and is difficult to accurately portray in aircraft noise contours. A key factor is that these aircraft seldom climb to normal traffic pattern altitudes and they often make turns at low altitudes close to the runway.

### **Other Factors Affecting Aircraft Noise Levels**

Although aircraft characteristics and flight routes are the principal determinants of aircraft noise exposure, other factors have noteworthy contributing roles.

### ***Ground Operations***

Although airborne aircraft operations are the primary source of aircraft noise in the vicinity of an airport, ground operations can also produce significant exposure under certain circumstances. Particular locations of ground operation noise include:

- ◆ **On the Runway**—Significant noise levels are generated behind an aircraft, especially a jet aircraft, as full engine thrust is produced during acceleration to takeoff. (More specifically, the highest noise levels are experienced at a 15 to 45 degree angle from the aircraft path; directly behind the aircraft is a zone of relative quiet.) On landing roll-out, power settings on most aircraft are low and the noise is comparatively minimal. The one significant exception is when jet aircraft use reverse thrust to decelerate after landing. This action can produce high noise levels in front and to the sides of the aircraft. (Note: reverse thrust noise is included in standard Integrated Noise Model (INM) computations.)
- ◆ **Taxiing**—Aircraft mostly use low power settings when taxiing between parking locations and a runway. For most aircraft, the resulting noise levels are minimal and not a factor off the airport property. There are exceptions, however. For example, aircraft require added power to begin moving when stopped. Also, large aircraft need to apply moderate power to engines on one side in order to turn while taxiing at low speeds. With propeller airplanes, moderately high engine power is briefly necessary to start the engine. Noise levels increase correspondingly for these few moments.
- ◆ **At Runway Holding Bays**—Pre-flight engine run-ups by piston aircraft are usually conducted at holding bays or other locations near the ends of runways. Many people perceive the noise from pre-flight run-ups of propeller-aircraft engines to be more annoying than the noise from overflights, even if the sounds have equal loudness. Part of the reason for this greater annoyance is that run-up noise is thought to be (although it is

not) less necessary and more under the control of the aircraft operator. For land uses near the end of a runway, run-up noise can be louder and more prolonged than overflight noise. This is especially true when a runway is used predominantly in one direction. The runway end which is used for landings—when aircraft are typically the quietest—is also the end at which pre-flight engine run-ups are normally conducted.

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*Airport land use commissions seldom adopt land use compatibility criteria which specifically consider noise from aircraft ground operations not on the runway. Nevertheless, these noise sources can be significant in locations immediately adjacent to an airport. INM allows analysis of aircraft run-up noise.*

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- ◆ **At Airline Terminals**—Activity around airline terminals can be a noticeable source of noise. Auxiliary power units on board jet aircraft (used for cabin temperature control, to operate electrical equipment, etc. while on the ground) are one such source. These noise sources can be bothersome at airports where terminal areas are situated close to noise-sensitive land uses.
- ◆ **Aircraft Maintenance Facilities**—Maintenance testing of aircraft engines can require the use of high power settings and resulting noise levels. This activity may occur in or near airline or fixed base operations maintenance hangars or sometimes at other locations on an airport. At airports where frequent engine testing creates significant noise exposure on nearby land uses, construction of noise barriers or testing enclosures (sometimes called “run-up enclosures”) has become necessary.

### **Other Variables**

The noise levels experienced on the ground as an aircraft flies over are primarily dependent upon the inherent loudness of the aircraft, the aircraft’s altitude, and the horizontal distance between the receiver and the aircraft flight track. Other variables may also be important as well and are discussed below.

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*It should be noted that the cumulative noise level contours which ALUCs use for land use compatibility planning purposes normally do not take into account variables such as these. Unless special steps are taken to calibrate the noise contours for a particular airport with actual noise measurements taken at that airport, the contours will reflect standard aircraft operating characteristics.*

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- ◆ **Pilot Technique**—An important variable in aircraft noise is the pilot. Depending upon the techniques that the pilot employs, the same aircraft can generate significantly different noise levels. Conditions which produce some of the greatest noise variations include:
  - The angle of climb while on takeoff (also affected by aircraft payload, air temperature, and wind);
  - Power adjustments during takeoff;
  - The propeller pitch setting on airplanes with variable pitch propellers, especially at high takeoff power settings;
  - Flap settings (especially during landings by large aircraft); and

- The airspeed and descent rate relationships that determine the extent of helicopter blade slap during landing operations.

Pilot awareness of the aircraft configurations that create abnormally high noise levels can be a significant factor in helping to reduce actual aircraft noise exposure.

- ◆ **Air Temperature**—Aircraft engines, both piston and turbine, operate less efficiently when temperatures are high. The lower power results in reduced climb rates. For propeller airplanes, somewhat higher noise levels may result. However, for jets, the lower power also results in lower noise emissions, thus essentially cancelling out the effect of reduced climb rates.
- ◆ **Sound Wave Reflection**—The presence of nearby structures or steep terrain can cause sound wave reflections which may locally increase noise levels. Water or hard ground surfaces can particularly contribute to such occurrences. Certain meteorological conditions—such as a temperature inversion layer—also can reflect sound back to the ground, resulting in higher noise levels.
- ◆ **Height of Terrain**—Rising or falling terrain changes the distance between an aircraft and people on the ground relative to the flat ground assumed in standard INM calculations. These changes in turn increase or reduce the actual sound levels experienced on the ground compared to the levels calculated by the noise model.

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*The FAA's Integrated Noise Model, versions 6.0 and higher, allows assessment of the effects of elevation variations.*

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## AIRCRAFT NOISE METRICS

Measurement of sound is a relatively straightforward and objective process. Environmental noise, however, is comprised of a multitude of varying sounds having different magnitudes, frequencies, and durations, and stemming from different sources. Moreover, to be useful, measures of environmental noise must take into account the ways in which noise affects people.

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**M***etric: A standard or scale of measurement.*

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In many communities, particularly urban communities, aircraft and other modes of transportation constitute the most predominant sources of noise. Over the years, a variety of noise metrics have been devised in order to assess these forms of noise. Some of these metrics are general-purpose and can be applied to almost any noise source. Others are intended more specifically for measuring aircraft noise and particularly noise associated with aircraft operations to and from airports. These noise metrics can be grouped according to whether they measure the sound level of a single event or are cumulative measures of many events. Essentially all noise description metrics employ a logarithmic scale and the measurement units are expressed in decibels (dB). An A-weighted decibel scale (see Table D1) is generally used.

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*Each of these metrics has notable advantages and disadvantages which differ depending upon the purpose of the noise measurement.*

---

### Single-Event Metrics

The sound level associated with an individual aircraft flying nearby (see Figure D6) can be characterized as:

- ◆ Beginning at some point when the sound can be distinguished above a threshold or ambient sound level;
- ◆ Reaching a maximum level; then
- ◆ Diminishing until it is no longer distinct.

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*Ambient Noise Level: The background noise level absent any readily distinguishable sounds.*

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### Instantaneous Sound Levels

Sound levels can be measured on a continuous basis for each instant during this cycle. A significant point is the maximum sound level attained ( $L_{\max}$ ).  $L_{\max}$  is an important determinant of whether speech interference may occur.

### Single-Event Energy

The limitation of an instantaneous sound level measurement is that it provides no information regarding the duration of a sound. Two different aircraft overflights thus can produce vastly different total amounts of sound energy at a given point on the ground depending upon how quickly the aircraft pass by. To compare the total sound produced by individual aircraft flyovers, a reference time of one second is used. In other words, this measurement method indicates the level of a continuous one-second sound which contains the same amount of energy as the complete noise event. The resulting noise metric is called *Single Event Noise Exposure Level* (SENEL).

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*The SENEL metric used in California is virtually identical to the Sound Exposure Level (SEL) metric used by the Federal Aviation Administration and other federal agencies.*

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Figure D6 illustrates the relationship between  $L_{\max}$  and SENEL for a typical aircraft noise event. Because aircraft noise events last more than one second, SENEL values are higher than the  $L_{\max}$  recorded for any individual event. The relationship between SENEL and  $L_{\max}$  is not constant, however. For most aircraft noise events, SENEL is about 5 to 10 dB higher than  $L_{\max}$ ; the shorter the noise event is, the closer the two numbers will be.

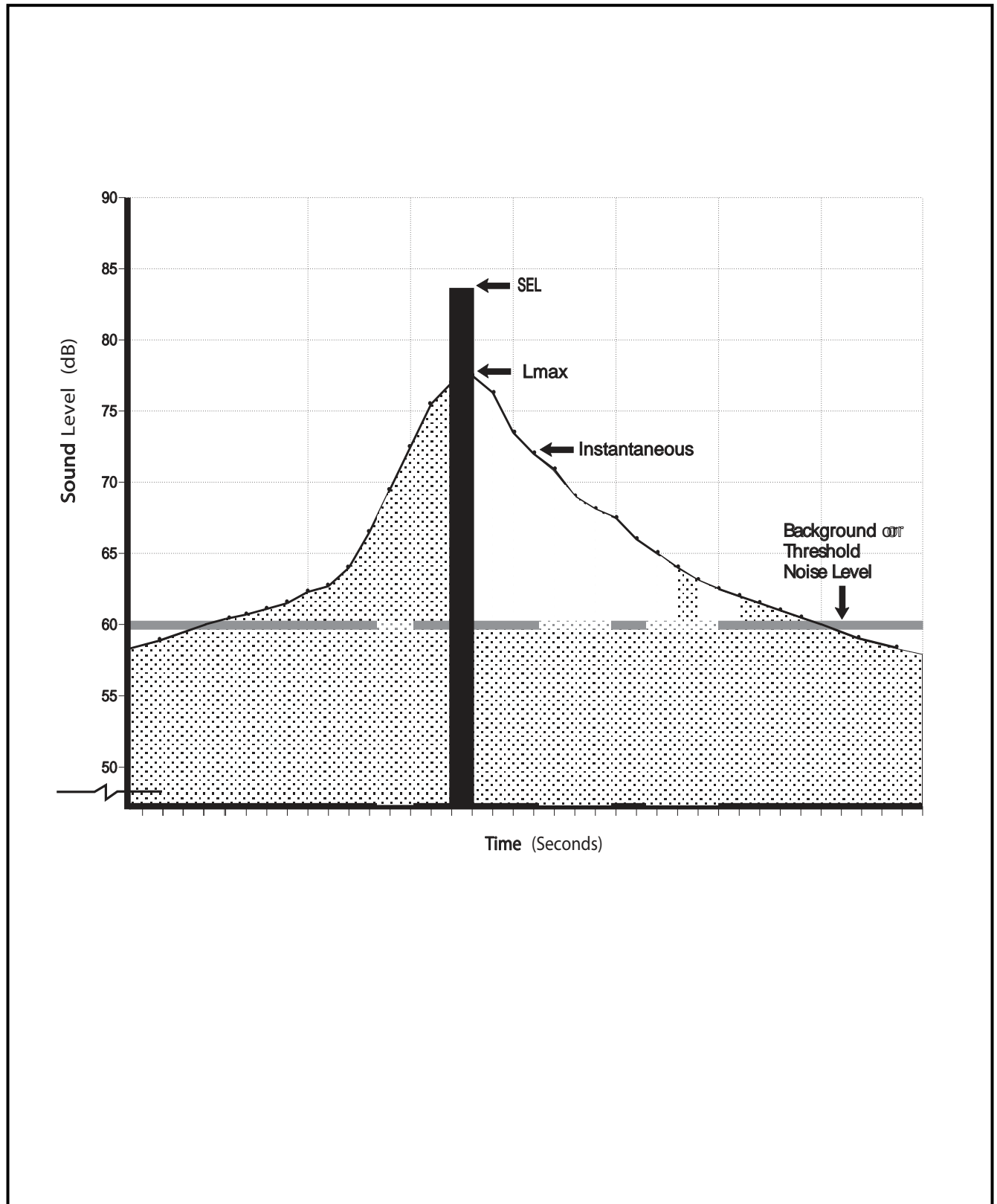


FIGURE D6  
Typical Aircraft Noise Event

## **Cumulative Noise Metrics**

In order to provide a single measure of continuous or multiple noise events over an extended period of time, a variety of cumulative noise level metrics have been devised. Most of these metrics result in a weighted average measurement of noise over time.

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*Various other cumulative noise metrics exist in addition to the ones mentioned here. Some are used for measuring other aspects of noise (the amount of time noise exceeds a certain level, for example) or noise from sources other than airports. Others were created as communications tools rather than for policy making purposes. Still others are found primarily in other countries. None of these metrics are considered applicable to airport land use compatibility planning in California.*

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### **Equivalent Sound Level**

A standard measure of sound level averaged over a specified period of time is the *Equivalent Sound Level* (abbreviated  $L_{eq}$ ). This metric indicates the constant sound level in decibels which would produce the same amount of sound energy as a series of events having fluctuating sound levels. The more closely spaced the noise events over the entire measurement period, the closer  $L_{eq}$  will come to  $L_{max}$ . This is the case for noise from a busy highway, for example. For infrequent noise events, such as at a low-activity general aviation airport,  $L_{eq}$  may not be much higher than the ambient noise level.

### **Time-Weighted Cumulative Noise Metrics**

Undoubtedly the most widely used metrics for assessment of aircraft noise levels are time-weighted cumulative noise metrics. These types of metrics include the community noise equivalent level (CNEL) used in California and the *Day-Night Average Sound Level* (abbreviated as DNL, but symbolized in formulas as  $L_{dn}$ ) adopted by the Environmental Protection Agency and the Federal Aviation Administration and used elsewhere in the United States.

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*This Handbook primarily refers to cumulative noise metrics in term of CNEL rather than DNL in that the former is the metric used in most California state noise regulations including those for airports.*

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Both metrics are similar to the Equivalent Sound Level ( $L_{eq}$ ) except that they compensate for the widely assumed increase in people's sensitivity to noise during nighttime hours. Each aircraft operation occurring between 10:00 p.m. and 7:00 a.m. is treated as if it were ten operations. Similarly, CNEL (but not DNL) includes a penalty weighting for operations taking place between 7:00 and 10:00 p.m. in the evening. Each aircraft operation during these hours is counted as if it were three operations. Logarithmically, these multipliers are the equivalent of adding 10 dB to the noise level of each nighttime operation and 4.77 dB to the noise level of each evening operation. These noise level penalties are intended to correspond to the drop in ambient noise level which studies have found takes place from daytime to evening and nighttime in a typical community. The evening and nighttime decrease in ambient sound levels—from both outdoor and indoor sources—is commonly considered to be the principal explanation for people's heightened sensitivity to noises during these periods.

CNEL values are normally depicted by a series of contours representing points of equal noise exposure in 5 dB increments (see example in Figure D7). Specialized computer programs—as described in the next section—are normally used for calculation of noise contours.

## CALCULATION OF AIRCRAFT NOISE CONTOURS

Just as the metrics created for describing aircraft noise have evolved over the years, so have the means available for calculating current and future noise levels around airports. Today, highly sophisticated computer models are commonly used to carry out the noise calculations. Still, as precise as these models can be, they depend upon the accuracy of the data entered into them. These topics are discussed in the text which follows.

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*When developing or updating compatibility plans, ALUCs (or their staff or consultants) sometimes need to prepare aircraft noise contours. Even when creation of noise contours is not necessary as part of a compatibility planning process, it is important that ALUCs and their staffs understand the factors involved.*

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### Aircraft Noise Models

#### ***Integrated Noise Model***

In the U.S., by far the most commonly used aircraft noise model is the Federal Aviation Administration's Integrated Noise Model (INM) computer program. INM was developed by the FAA as a means of standardizing the assessment of aircraft noise levels in the vicinity of airports. The original INM program dates back to 1978. As of late 2010, the most recent version is 7.0b which was introduced in 2009 (INM 7.0 was released in 2007). Each iteration of the program has added to its sophistication, allowing noise contours to be computed more efficiently and more accurately. However, one effect of the upgrading of the noise calculation algorithms at the core of the program has been that identical input data may result in slightly different output contours than produced by earlier versions.

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*Anyone can obtain the INM software through the FAA. However, most airports and ALUCs retain consultants to prepare noise analyses. Major airports commonly have their own staff trained in use of the program, but rely on consultants to prepare noise analyses due to the amount of effort involved.*

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The INM is capable of providing output in a variety of formats and metrics. Noise contours can be produced using CNEL, DNL, or any of several other cumulative noise metrics. Single-event contours can also be run. Finally, detailed data for a single point, or a grid of multiple points, can be produced.

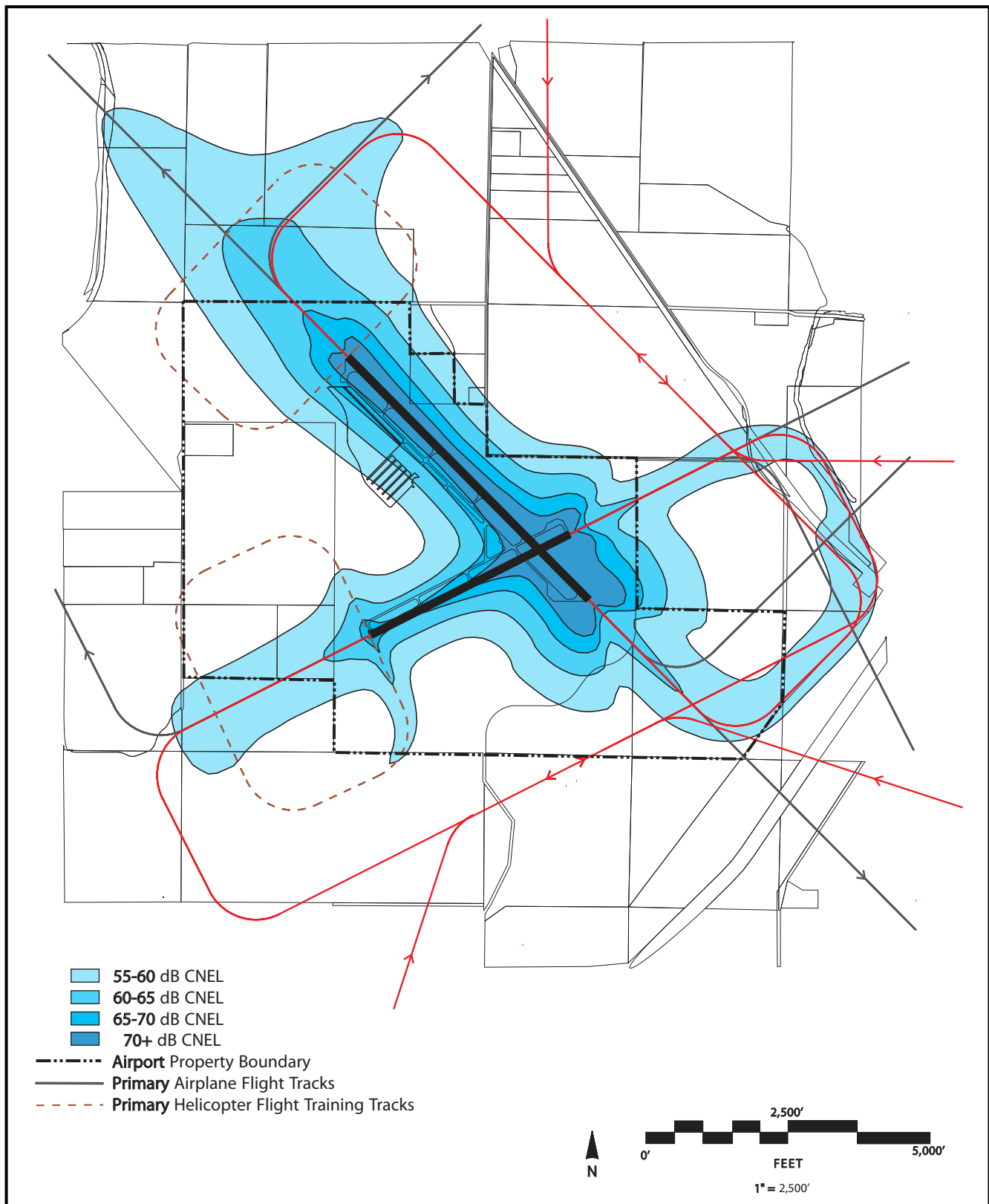


FIGURE D7

## Example of Airport Noise Contours



### ***Other Noise Models***

While INM has widespread general utility, other noise models have been created for use in more specialized circumstances. (Also, other countries have developed their own variations of noise models.)

- ◆ **NOISEMAP**—The current U.S. Air Force NOISEMAP model has capabilities similar to the latest version of INM, but is designed for use at military aviation facilities or civil airports with a substantial amount of military aircraft operations. The aircraft noise database in NOISEMAP consists solely of military aircraft or military versions of civil aircraft. Civil aircraft can be added using the INM database however. The noise computation algorithms are slightly different between the two models, but the output noise contours are very similar.

### **Sources of Aircraft Noise Model Input Data**

In order to calculate noise contours or other noise impact information, INM and the other noise models require several types of data. Some of the data is built into the model database, although it can be modified by the user. Other data must be entered for each individual noise study. Still other types of data can be entered to refine the analyses, but are not required.

#### ***Built-In Data***

The database built into INM consists primarily of aircraft-related data. Information is included on more than 200 different types of aircraft and helicopters. The majority of aircraft are jet aircraft, with most of those consisting of air carrier aircraft. Propeller aircraft and helicopters are represented in the database, but are more represented in the approved substitution database. Military aircraft are comparatively less represented in the INM. For each of the aircraft in the database, standardized data is provided for:

- ◆ Performance characteristics (takeoff distance, climb rates, etc.);
- ◆ Power settings used at various stages of landing or takeoff; and
- ◆ For each power setting, the amount of noise measured at various distances from the aircraft.

The database reflects average operating conditions for each aircraft type. In most cases this data is used directly when calculating noise contours. INM also has the capability of accepting user input data to better fit known variations for a particular aircraft or airport. For example, adjustments or “calibration” of the standard aircraft parameters can be done based upon data obtained from flight track monitoring systems. Production of noise contours cannot use noise measurement data from noise monitors.

**TABLE D3: NOISE AND OPERATIONS MONITORING SYSTEMS**

### *History*

Aircraft noise and operations monitoring systems have been installed at California airports since the 1970s. The earliest systems measured aircraft noise levels at fixed positions, separating aircraft noise events from other noise sources primarily by their isolation from such sources, and the use of threshold values for noise levels and event duration. Other noise event parameters were evaluated during data analysis to improve discrimination of aircraft noise events. Later systems relied on airport staff input of FAA flight strips (which the FAA did not make available until at least 14 days after the flights). Using a computer, sequential noise events were then matched to the reported FAA takeoff release times. In this manner, aircraft noise events were reasonably well separated from other noise sources and it was possible to determine the noise levels produced by individual aircraft.

Over time, noise and operations monitoring systems have taken advantage of better computers and of access to aircraft flight data directly from FAA data disks and computer downloads, use of passive radar systems to gather data without the need for FAA cooperation, and most recently, direct connection to the FAA TRACON radar system using an FAA-approved "gateway."

### *Present-Day Systems*

Today, many California airports have fully integrated noise and operations data collection and analysis systems which allow rapid matching of aircraft noise events, specific flights, and their flight paths. Some airports have systems which monitor noise levels, without access to FAA radar data. In such systems, recordings of radio transmissions by the FAA Tower and the aircraft are used to correlate noise events to specific flights.

Permanent aircraft noise and operations monitoring systems provide a highly credible database of noise level and operational data including:

- Long-term measurements of cumulative noise levels
- Statistically valid distributions of measured single-event noise levels by aircraft type and operator
- Precise definition of flight tracks and areas of aircraft overflights
- Census of aircraft types and operations
- Flight profiles
- Adherence to established flight procedures
- Variations in noise levels and operational procedures over time
- Changes in noise levels due to changes in operations
- Identification of aircraft flights and noise levels associated with complaints and political concerns
- Accurate input data for the INM
- Validation of INM-predicted CNEL contours

Although each system has distinct capabilities, noise and operations monitoring systems will typically be capable of producing a wide range of standard or customized statistical analyses and maps. Most systems either utilize or can be integrated with geographic information system (GIS) databases. All of these systems enable precise judging of changes in noise levels and compliance with the established noise emissions criteria. Additionally, by accurately defining aircraft noise exposures, they help facilitate justification and implementation of noise mitigation programs such as sound insulation or property acquisition.

Although permanent noise and operations monitoring systems are unsurpassed as an objective method of providing current aircraft noise data, a major limitation is their cost. Fully integrated systems such as these can range from about \$500,000 to several million for the largest systems.

The high costs limit the practicality of fully integrated systems for smaller airports. At these facilities, noise measurements can be made using portable monitoring units set to discriminate between aircraft and non-aircraft noise levels in the same manner as the earliest systems. Noise sampling techniques may be used to provide reasonable estimates of cumulative noise exposures over longer periods and single-event data can be collected for comparison to noise levels predicted using the INM. In addition, short-term radar data, or observations of aircraft flight paths in the field or at the radar scope, can be used to develop reasonable assumptions for standard aircraft flight tracks.

While not as sophisticated as the fully integrated systems, even the portable units can serve an important function of all monitoring systems. They serve as an essential source of information with which to respond to public queries and concerns over aircraft noise.

## **User-Provided Data**

The user-provided data critical to operation of INM consists of defining where aircraft fly and how often. An extensive amount of data is usually available for major air carrier airports and other airports situated in the surrounding metropolitan area. For general aviation, solid data may be scarce and use of estimates may become necessary.

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*Inputs to CNEL contour calculation include:*

- *Runway system configuration and runway lengths.*
  - *The geometry of common aircraft flight tracks.*
  - *The standard approach slope used for each runway.*
  - *The number of operations by aircraft type or group.*
  - *Runway utilization distribution by aircraft type and time of day.*
  - *The distribution of operations by time of day for each type of aircraft.*
  - *The distribution of operations for each flight track.*
- 

Specific types of data needed by INM are listed above. Potential sources for this data include the following:

- ◆ **Radar Flight Track Data**—For airports covered by FAA terminal radar control (TRACON) facilities, recorded flight track data is an ideal source of information on where aircraft fly. Not only can the path of the aircraft along the ground be identified, but also the altitude and the type of aircraft as well. The current version of INM is capable of handling an indefinite number of flight tracks. In addition, recent versions of the software allow for some refinement of flight track depiction process—a set of dispersed subtracks offset horizontally (but not in altitude) from the primary tracks can now be modeled to more accurately account for the variability in flight track dispersion that naturally occurs.
- ◆ **Control Tower Counts of Aircraft Operations**—At airports having functioning air traffic control towers, tower personnel maintain complete data on the number of aircraft operations. This data categorizes the operations as to whether they were conducted by air carrier, air taxi, general aviation, or military aircraft (a note of caution here: air carrier and air taxi counts may include operations other than by scheduled airlines). Also counted are itinerant (headed to or from other airports) versus local (consisting mostly of flight training “touch-and-go”) operations. Tower count data can usually be obtained from airport management or directly from the FAA and is also available via the Internet.
- ◆ **Airport Management Records**—Neither air traffic control tower nor automated counter data fully identify the types of aircraft operations. Additional data needs to be obtained from other sources. Information on numbers of scheduled airline flights, air cargo aircraft operations, fire attack aircraft missions, and other distinct forms of aircraft activity are often maintained by airport management, particularly if landing fees are collected from these users. Airport management also may have information on the types of aircraft based at the airport which can be used to help estimate the mix of aircraft operations.
- ◆ **Wind Data**—Wind direction data gathered at the airport in question or at a nearby location can be useful in estimating the percentage of usage of each of the airport’s runways.

- ◆ **Interviews with Airport Personnel**—Individuals who regularly operate or observe aircraft at the airport comprise a final source of valuable, although qualitative, information on aircraft types, runway usage, flight tracks, time of day distribution, and other inputs to noise modeling. Interviews with control tower staff, flight instructors, and others can help fill the gaps in quantitative data.
- ◆ **Projected Activity**—The data sources listed above are all potentially useful in preparation of noise contours representing current airport activity. To develop contours depicting projected future noise exposure, forecasts of future activity are necessary. Additionally, assumptions must be made regarding future changes in the aircraft fleet mix, runway utilization, and other noise model input data.

### ***Optional Data***

To refine the precision of noise contours, the latest versions of INM allow entry of terrain data. Whereas earlier versions assumed that the airport and surrounding areas were all on level ground, this capability enables the effects of increased or decreased distances between the aircraft and the ground to be calculated. (The effects of shielding or reverberation produced by the terrain are not taken into account, however.)

Another form of data which can be entered into the program on an optional basis is census data. Although this information has no effect on the contours, its entry can facilitate evaluation of the numbers of people impacted by various noise levels or aircraft operational scenarios.

### **Limitations of Aircraft Noise Contour Modeling**

Despite the increasing sophistication and accuracy of aircraft noise models, several limitations are important to note.

- ◆ **Aircraft Database Limitations**—Even though additional aircraft have been added to the database with each version of the program, INM (as well as the other noise models) tend to be slow in including the newest models of aircraft. Often it is necessary to substitute similar aircraft. The INM contains a database of approved aircraft substitutions for aircraft with similar noise footprints. This approved substitution database contains more than 260 aircraft and helicopters. The INM database lacks information on specialized aircraft such as agricultural aircraft or fire fighting aircraft. Lastly, all of the databases include only existing aircraft. When modeling projections of noise exposure more than twenty or so years in the future, assumptions must be made on the types of aircraft that will be operating and appropriate aircraft substitutions using existing aircraft made.
- ◆ **Flight Tracks**—Close to the end of runways, nearly all aircraft flight tracks are aligned with the runway, especially on arrivals or on departures from a short runway. The greater the distance from the runway ends, the more the tracks disperse. The accuracy of noise contours in these areas depends greatly upon the number and location of flight tracks entered into the noise model. If too few flight tracks are defined, the noise contours will tend to take on a spiky rather than usually more realistic bulbous shape. This is particularly the case with general aviation aircraft in that their flight tracks ordinarily vary quite widely. Even air carrier aircraft following instrument procedures have a noticeable divergence in their flight tracks, although certain flight corridors are normally

evident. On the other hand, attempts to model a large number of flight tracks can be difficult and, if little is known as to their precise location or frequency of use, not necessarily more accurate. The recent enhancement of INM allowing modeling of dispersed sub-tracks adjacent to the primary tracks can help improve the realism of noise contours.

- ◆ **Helicopter Noise**—Because of their separate flight tracks, different operating characteristics, and typically low activity volumes, helicopter operations are often not included in noise contour calculations. However, a simulation of helicopter noise can be included in Integrated Noise Model calculations. Also, the noise exposure of some types of helicopters can be modeled with the separate U.S. Air Force NOISEMAP model (for military helicopters) and the resulting exposure then manually added to aircraft exposure calculated with the INM.
- ◆ **Ground Operations**—As noted previously, various types of aircraft ground operations can be significant noise sources at some airports. Although the current version of INM allows some of this activity to be modeled (specifically, run-up operations), this is typically not done unless a problem with noise from this source is known to exist.
- ◆ **Local Environmental Conditions**—The noise calculation algorithms built into the model assume an average set of physical and atmospheric conditions in the area surrounding an airport. Thus, localized factors such as reflection or diffraction of sound off of or around terrain or buildings are not considered. Similarly, daily local atmospheric conditions—such as temperature, humidity, wind, and cloud cover—may result in day-to-day variations from the predicted annual average noise levels.
- ◆ **Precision**—Because of the many variables and assumptions associated with their computation, cumulative noise contours representing existing airport activity are often considered to have a precision of approximately  $\pm 3$  dB. Greater precision (within  $\pm 1$  dB) can be obtained at airports where flight track data is available from radar and/or a permanent noise monitoring system is installed. In any case, precision is greatest close to the runway and decreases beyond where flight tracks diverge.
- ◆ **Projections of Future Noise Exposure**—As imprecise as modeling of current noise contours can sometimes be, contours representing projections of future noise exposure are inherently even less precise. Uncertainty regarding future aircraft technologies and the timing of when current aircraft models will be phased out of use is one source of imprecision. Perhaps even more unknown is the future number of operations of various aircraft types likely to occur at any particular airport.

## EFFECTS OF NOISE ON PEOPLE

A central consideration in setting noise compatibility policies is to understand the ways in which noise affects people.

### Types of Effects

Noise, especially aircraft noise, affects people and their activities in varied and complex ways. Three principal types of effects can be identified: *physiological*, *behavioral*, and *subjective*.

- ◆ **Physiological Effects**—Physiological effects can be either temporary or permanent. Among the temporary effects are startle reactions and the effects of sustained sleep interference. Hearing loss is the most obvious permanent effect of noise. Research indicates that off-airport aircraft noise, even from the loudest aircraft, is not severe enough to produce permanent or even sustained (after the noise ceases) effects on hearing. Less is known about the non-auditory health effects of aircraft noise. Despite new research conducted over the last two decades, a U.S. Environmental Protection Agency conclusion in 1982 remains valid today:

“Research implicates noise as one of several factors producing stress-related health effects such as heart disease, high blood pressure and stroke, ulcers and other digestive disorders. The relationship between noise and these effects has not yet been quantified.”

- ◆ **Behavioral Effects**—Behavioral effects are usually measured in terms of interference with human activities. Speech interference and interference with the enjoyment of radio or television are the most often cited examples. Interference with concentration on mental activities and disruption of sleep are two others. Most of the readily identifiable aircraft noise effects fall into this category.
- ◆ **Subjective Effects**—By their very nature, subjective effects are unique to each individual and, therefore, difficult to quantify. Subjective effects of noise are commonly described in terms of annoyance or other similar terms. Because of the great variability in the ways people perceive and react to the unpleasant aspects of noise, prediction of how any one individual will react is nearly impossible. Most research consequently focuses on identifying predictable results among a group or community of people.

The latter two categories are examined more closely in the following discussion.

## **Effects of Noise on Human Activities**

### ***Speech Communication***

Scientific research has found that the maximum continuous sound level that will permit relaxed conversation with 100% intelligibility throughout a typical residential living room (talker/listener separation greater than approximately 3.5 feet) is 45 dB ( $L_{eq} = 45$  dB). A 95% intelligibility—considered to be “satisfactory conversation”—can be obtained with a steady sound level of up to 64 dB. When the noise level approaches 80 dB, intelligibility drops to near zero even when a loud voice is used (EPA–1974). Interference with communication may result from masking of the speaker’s words or by causing the speaker to pause.

Outdoors, because of the absence of reflecting walls to provide the reverberation found indoors, the sound level of speech as it reaches the ear decreases comparatively more rapidly with increasing distance between the talker and listener. In a steady background noise, there comes a point—as the talker and listener increase their separation where speech can no longer be understood because it is masked by the noise.

Almost all fluctuating sound levels found in the everyday environment will, if averaged over a long time period, have less impact on speech intelligibility than a steady sound which has the same Equivalent Sound Level ( $L_{eq}$ ). This occurs because most of the time the background noise level is less than the Equivalent Sound Level (because of the logarithmic base of sound

intensity measurement, a loud sound need have only a relatively short duration to raise the  $L_{eq}$  substantially). In circumstances where assessment of speech interference is particularly important, measurement of the amount of time during which noise levels exceed a level for acceptable communication can be informative.

### **Effects on Learning**

Closely related to speech interference are the effects of noise on learning and, more broadly, on cognitive tasks. Recent studies have shown a strong relationship between noise and children's reading ability (FICAN-2000). Children's attention spans also appear to be adversely affected by noise. Adults are affected as well. Some studies indicate that, in a noisy environment, adults have increased difficulty accomplishing complex tasks.

One of the issues associated with assessment of these effects is which noise metric correlates most closely with the impacts. For example, DNL, with its nighttime weighting, may not be the best measure of noise impacts on schools. Also, DNL and  $L_{eq}$  were developed primarily to address annoyance issues, not effects on learning or health-related matters. Future research into this issue also may help in assessment of the manner in which the effects of loud, intermittent noise events such as aircraft overflights differ from lower volume, but relatively constant, noise sources such as highways.

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*The FAA considers an aircraft  $L_{eq}$  of 45 dB during normal schools hours the "usual design objective" for sound insulation of schools. (FAA Order 5100.38C). Schools are encouraged to meet the American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools (ANSI/ASA S12.60-2010) published by the American National Standard Institute and Acoustical Society of America.*

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### **Sleep Disturbance**

The extent to which environmental noise disturbs human sleep patterns varies greatly from individual to individual as well as from one time to another for any particular individual. Whether an individual is aroused by a noise depends upon the individual's sleep state and sleep habits, the loudness or suddenness of the noise, the information value of the noise (a child crying, for example), and other factors. Also, most people adapt over time to increased levels of noise during sleep.

When the noise source emanates from outdoors—as is the case with aircraft noise—additional factors affect the loudness of the noise as heard indoors. The noise level reduction provided by the type of construction is one of these determinants. A greater variable, though, is whether windows are open or closed.

Early studies of the effects of noise on sleep disturbance produced varying results. A major factor in these differences, though, is whether the study evaluated people sleeping in a laboratory or in their own homes. Generally, laboratory studies have shown considerably more sleep disturbance than is evident in field studies. More recent studies, all conducted in the field, have produced relatively consistent results. These studies have included:

- ◆ A 1990 British study;
- ◆ A 1992 U.S. Air Force study of residents near Castle Air Force Base and Los Angeles International Airport; and
- ◆ A 1995 study comparing the effects of the closure of Stapleton International Airport with the opening of Denver International Airport.

In 1997, the Federal Interagency Committee on Aviation Noise (FICAN) sought to put the subject to rest with publication of a recommended new dose-response curve predicting awakening. This curve was calculated using data from the above three studies, among others. The 1997 FICAN curve represents the upper limit of the observed field data and should be interpreted as predicting the maximum percent of the exposed population expected to be behaviorally awakened.

FICAN found a much lower likelihood of awakenings from noise than had been indicated in earlier studies, including the 1992 FICON report. For example, at an indoor sound exposure of SEL 80 dB, the FICAN curve predicts 10% awakenings. By comparison, FICON predicted over 30%. FICAN, however, notes two particular caveats to the prediction curve: (1) it applies only to long-term residents; and (2) it cannot be generalized to apply to children in that only adults were included in the studies.

## **Subjective Reactions to Noise**

### ***Factors Influencing Individuals' Annoyance at Noise***

Numerous studies have been conducted that attempt to identify the types of factors which contribute to an individual's annoyance at noise. Annoyance as assessed in most of these studies is not limited to reactions separate from interference with speech communication, disturbance to sleep, and other such behavioral effects. Rather, annoyance is a complex reaction to many physical and emotional factors, including adverse effects on behavior.

Below is a list of common annoyance factors:

- ◆ Demographic characteristics of the individual (age, sex, economic status, etc.).
- ◆ Residential dwelling characteristics (single versus multi-family; owner-occupied versus rental).
- ◆ The loudness, tonal qualities, and other inherent unpleasant characteristics of the noise itself.
- ◆ How often the noise occurs.
- ◆ The duration of the noise.
- ◆ The predictability of the noise.
- ◆ Experience and expectations regarding noise levels in the community (is the noise likely to get better or worse in the future?).
- ◆ Personal sensitivity to noise.



- ◆ Beliefs regarding the preventability of the noise.
- ◆ Attitudes regarding the importance of the activity associated with the noise.
- ◆ Perceptions concerning the extent to which efforts have been made to minimize the noise levels.
- ◆ The activity in which the individual is engaged at the time of the noise.
- ◆ Beliefs regarding the health effects of noise.
- ◆ Feelings of fear or anxiety associated with the noise.

Listed above, in no particular order, are many of the factors which have been demonstrated to influence the extent of an individual's annoyance at noise. As can be seen, some of these factors are objective, measurable influences, but many are highly subjective. The significance of these subjective factors varies widely from individual to individual and, even for a given individual, from one set of circumstances to another.

The last factor in the above list suggests that annoyance is not strictly a noise-derived phenomenon, but one which also involves a safety component. This factor is particularly important with respect to annoyance at aircraft overflights. Although people may not fear the aircraft noise itself, they may be apprehensive of the prospect that an aircraft could crash onto their property and it is the noise that mostly creates their awareness of the aircraft's presence. The altitude of the aircraft and individuals' understanding of how aircraft fly thus are additional factors in the airport-related annoyance equation.

### ***Rates of Annoyance***

Even though studies have been able to identify most of the factors affecting an individual's annoyance at noise, predicting how any one individual will react to typical environmental noises has proved virtually impossible. Consequently, most studies seek instead to assess the rate of annoyance within broad segments of the population.

A summary of the effects of noise on people, including the reactions of average communities is presented in the FICON report. This summary is reproduced here as Table D4.

### ***Complaints***

One manner in which annoyance at noise is sometimes exhibited is through complaints. Many airports maintain logs of noise complaints received. In addition to providing an avenue for people to express their concerns, noise complaint phone lines can help in identifying the nature and location of particular aircraft noise problems.

Complaints, however, cannot necessarily be equated to annoyance rates within a community. Annoyance can exist without resulting in complaints and complaints may occur even without a high rate of annoyance. Moreover, there is not necessarily a correlation between complaints and noise exposure. At many airports, residential areas subjected to the highest noise levels produce relatively few complaints perhaps because of the predictability of the events. More common is for the majority of complaints to originate from locations outside the defined noise contours. Table D4 summarizes the effects of noise on people.

**TABLE D4: SUMMARY OF EFFECTS OF NOISE ON PEOPLE**

Day-Night Average Sound Level (Decibels)	Effects <sup>1</sup>			
	Hearing Loss (Qualitative Description)	Annoyance <sup>2</sup> (Percentage of Population Highly Annoyed) <sup>3</sup>	Average Community Reaction <sup>4</sup>	General Community Attitude Toward Area
≥75	May begin to occur	37%	Very severe	Noise is likely to be the most important of all adverse aspects of the community environment.
70	Will not likely occur	22%	Severe	Noise is one of the most important adverse aspects of the community environment.
65	Will not occur	12%	Significant	Noise is one of the important adverse aspects of the community environment.
60	Will not occur	7%	Moderate to Slight	Noise is one of the important adverse aspects of the community environment.
≤55	Will not occur	3%		Noise considered no more important than various other environmental factors

<sup>1</sup> All data is drawn from National Academy of Science 1977 report *Guidelines for Preparing Environmental Impact Statements on Noise*, Report of Working Group 69 on Evaluation of Environmental Impact of Noise.

<sup>2</sup> A summary measure of the general adverse reaction of people to living in noisy environments that cause speech interference; sleep disturbance; desire for tranquil environment; and the inability to use the telephone, radio or television satisfactorily.

<sup>3</sup> The percentage of people reporting annoyance to lesser extents is higher in each case. An unknown small percentage of people will report being "highly annoyed" even in the quietest surroundings. One reason is the difficulty all people have in integrating annoyance over a very long time. USAF Update with 400 points (Finegold et al. 1992)

Source: *Federal Interagency Committee on Noise (1992)*

<sup>4</sup> Attitudes or other non-acoustic factors can modify this. Noise at low levels can still be an important problem, particularly when it intrudes into a quiet environment.

**NOTE:**

Research implicates noise as a factor producing stress-related health effects such as heart disease, high blood pressure and stroke, ulcers and other digestive disorders. The relationships between noise and these effects, however, have not as yet been conclusively demonstrated. (Thompson 1981; Thompson et al. 1989; CHABA 1981; CHABA 1982; Hattis et al. 1980; and U.S. EPA 1981)

- ◆ Exceptionally loud, large, or low-flying aircraft which are not normal for the airport;
- ◆ Changes in flight patterns which cause increased noise impacts; or
- ◆ A small number of people who frequently complain about airport activities.

### **Other Variables in Airport-Related Noise Annoyance**

Several other inter-related variables appear to influence the extent of airport-related annoyance within a community. For some of these, relatively little research has been conducted. The apparent significance is thus more qualitative than quantified.

- ◆ **Differences among Airport Types**—Virtually all research on aircraft noise has been conducted at major airline airports, most of which are located in urban areas. The aircraft activity at these airports generates relatively predictable, frequent, loud noise events. In contrast, most general aviation airports have relatively few loud noise events and the total number of aircraft operations may vary substantially from day to day. Also, many general aviation airports are located in relatively quiet, suburban or rural settings where aircraft noise may be perceived as more intrusive than in noisier communities.
- ◆ **Significance of Overflight Frequency versus Noise Event Loudness**—Cumulative noise exposure metrics reflect a combination of both the frequency with which overflights occur and the loudness of those events. Any given noise exposure level can be the result of either a small number of noisy overflights or a high incidence of just moderately noisy events. A basic assumption in use of cumulative noise contours for compatibility planning is that community reactions will be the same under each of these circumstances.
- ◆ **Time of Day Weighting**—Some evidence suggests that, because people are more likely to be home during the evening (7:00 p.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) than in the day, the same noise exposure produces more annoyance during those hours. This consideration is reflected in the CNEL metric by inclusion of a penalty factor on evening and nighttime aircraft operations.



# Aircraft Accident Characteristics

## 2010 AIRCRAFT ACCIDENT RESEARCH

### Accident Points and Procedure

The purpose of this updated study of aircraft accident locations was to identify any changes in accident location patterns compared to the old aircraft accident database used for the previous versions of the California Airport Land Use Planning Handbook. If no substantial changes in accident characteristics are discovered, the data would be used to revalidate accident information from the 2002 *Handbook*. Additionally, this update was part of an attempt to answer questions raised regarding the uniqueness of California aviation, and whether or not flying has substantially changed since the ten-year period covered in the previous database.

This updated study focused on the accidents that occurred between the years 2000 and 2009. The 2002 *Handbook* studied accidents between 1983 and 1992, with a total 873 accident records.

The current study began by downloading a database file from the National Transportation Safety Board (NTSB) which contained records of all the aircraft accidents ever recorded by the NTSB or other government agency.

For the ten years from 2000 through 2009, there were approximately 17,000 accidents contained in the nationwide database. Although the previous study included all 50 states, this update to the accident patterns focused exclusively on California. In the 2000 through 2009 period, the NTSB database listed approximately 1,800 accidents and incidents in California.

This study of aircraft accidents, like the 2002 *Handbook* study, was primarily concerned with the risks to people and property on the ground. The following specific criteria were applied to the accident records to create a dataset representative of these concerns.

- ◆ Only accidents – no incidents. Aircraft accidents are defined as events associated with flight which result either in fatal or serious injury to a person (either on board the aircraft on the ground) or in substantial damage to the aircraft. This study purposely excluded incidents as there is less data available for them.

- ◆ Occurred off the runway – beyond the primary surface
- ◆ Occurred during takeoff, climb, approach and landing
- ◆ Occurred within 5 miles of the airport
- ◆ Only fixed wing, powered aircraft

After these criteria were applied, approximately 10% of the 1,800 records remained. The majority of the 90% of records removed were because the accidents or incidents occurred on or very close to the runway.

The foundation of this study was based on the assumption that the latitude and longitude of accident locations as reported by the NTSB could be used to accurately locate and depict accident locations. Due to this assumption, the database for the time period which was studied, intentionally excluded NTSB records which did not have latitude and longitude recorded for the accident location.

It should be noted that only 15% of the 1,800 accidents studied in the 2000 through 2009 period lacked latitude and longitude information for the accident location. The majority of the exclusions made were based on the above bulleted criteria.

After applying these specific criteria to the 1,806 California accidents, the database was reduced to 154 accidents.

### **Analyzing the Data**

Our initial methodology was to use the latitude and longitude as reported for each of those 154 accidents and plot them on an X and Y coordinate system. The X value represents the distance of the accident site lateral to the runway end, while the Y value represents the medial distance of the accident site in relation to the runway end. The X and Y coordinate system was originally used in the previous study because it provides a simple and accurate way to locate all of the accident sites relative to the fixed position of the runway end.

To calculate the X and Y values of the accident sites, the coordinates as reported in the NTSB database were entered into Google Earth. When latitude and longitude coordinates are entered into Google Earth, the location appears on the earth as a point between crosshairs. Measurements were then taken from the accident location, as depicted by the latitude and longitude coordinates, relative to the runway end associated with the aircraft operation.

In order to confirm the accuracy of coordinates within Google Earth, several test cases were run by entering runway end coordinates into Google Earth and verifying that the locations presented in Google Earth were aligned with the runway ends shown on the aerial image.

Once the accuracy of using Google Earth was confirmed, test plots on an X and Y coordinate system were completed. These test plots revealed that a majority of the accidents were centered on the mid points of the runways.

## **Problems Encountered**

The test plots did not reflect accident locations in the areas as expected. In the instance of aircraft arrivals, it was expected that the majority of accident sites would be preceding the threshold of the runway. Likewise, in the case of departures, it is expected that the majority of accident sites would be located beyond the far end of the runway.

It was discovered that a significant portion of the accident records had a latitude and longitude which reflected the Airport Reference Point (ARP) rather than the actual accident location. Other records had coordinates that did not point to the ARP, but when compared to the location described in the case narrative, were simply inaccurate.

After discovering the inconsistencies with the data, the process of using the NTSB supplied coordinates to calculate an X and Y value could no longer be relied upon.

## **Solution**

In order to create a set of accident records that could be used confidently, each narrative was read and compared to the location indicated by the NTSB database. In some instances, enough information was supplied in the narrative that the previously incorrect accident location could be revised. Using the revised location, X and Y values could be calculated in confidence.

After reading through the narratives and revising the accident locations when able, the result was only 70 records which met the criteria for the study and could be assigned accurate X and Y values. In most cases, the narratives associated with the accident records did not include enough information describing the crash site to allow for manual calculation of the X and Y values. In other instances the narrative revealed that the accident should have been excluded from the study for other reasons such as, the accident occurring on the runway or beyond 5 miles from the airport.

Graphics depicting these accidents on the X and Y coordinate system are attached as Figures E1 and E2.

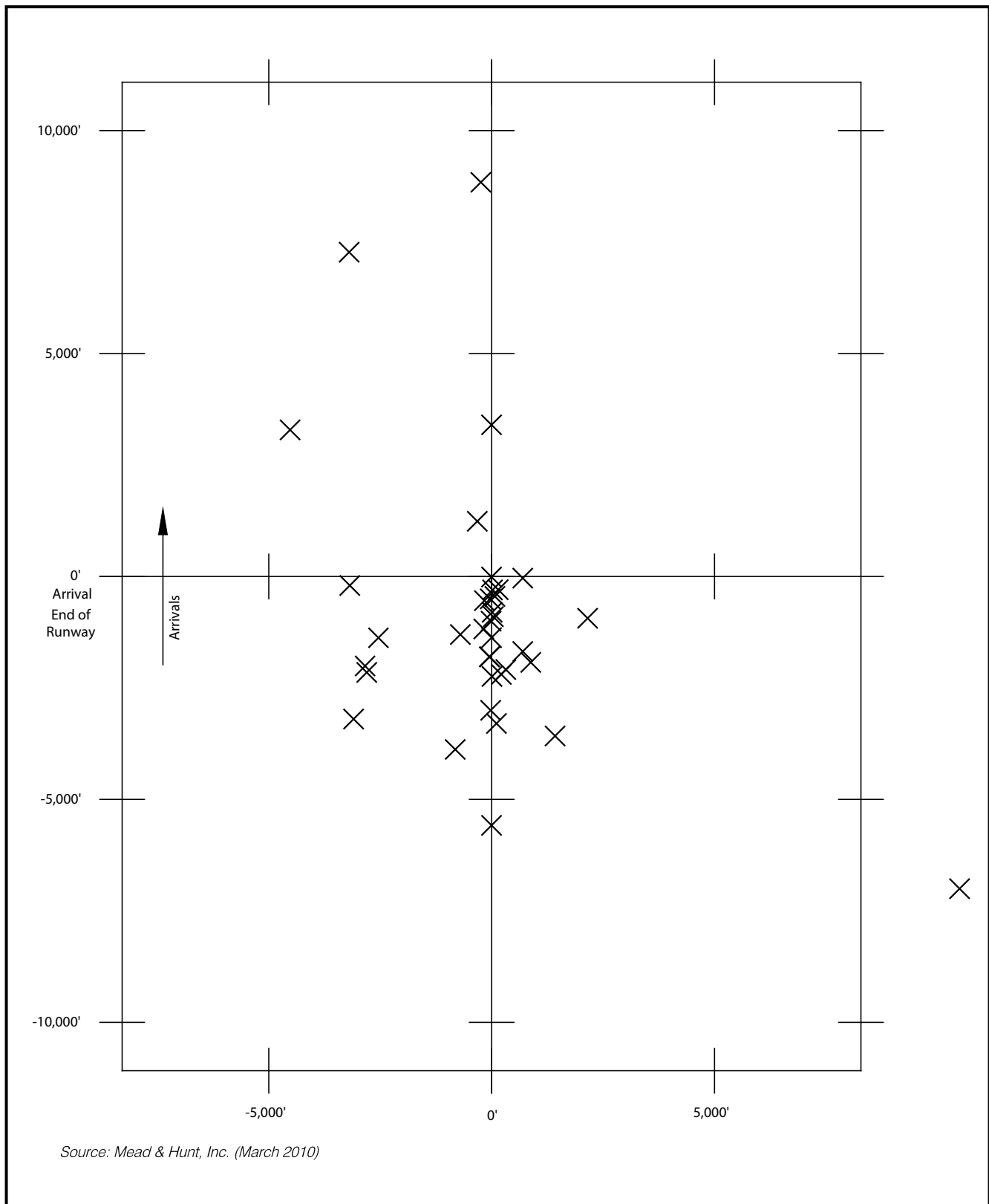


FIGURE E1

## All Categories – Arrival Accidents (2002 Handbook Data)



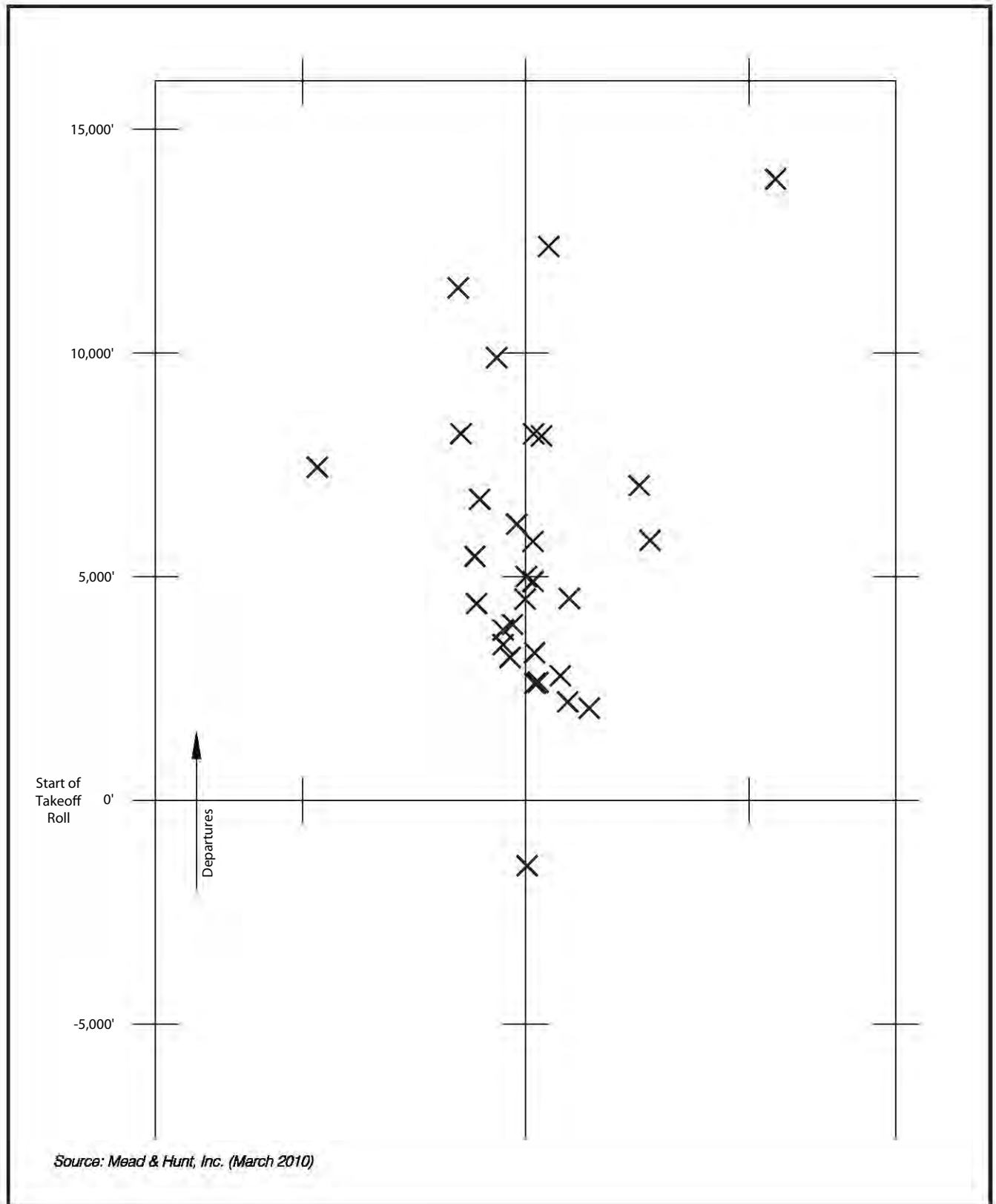


FIGURE E2

## All Categories – Departure Accidents (2002 Handbook Data)

## **Data Analysis**

An important way of looking at aircraft accidents is by the distance the accident occurred relative to the runway end associated with the aircraft operation. The 2002 *Handbook* tabulated these distances in Table 8D. An updated version of this table (Table E1) focuses on the mean and median distances for all categories of accidents, with both the distances from the previous study as well as the current effort. The limited number of records which met the criteria for this study has prevented any valid analysis for the various sub-categories included in the Table 8D of 2002 *Handbook* (Table E6, below).

For arrival accidents, the mean distance from the runway end has decreased by less than 150 feet (-4.8%), while the mean distance for departures has increased by 884 feet (16%).

The median distance for arrival accidents has more than doubled from the 2002 study at 1,000 feet to 2,110 feet (111%) in the current study. The median distance for departure accidents has increased by slightly more than 600 feet (13%), from 4,684 feet in the 2002 study to 5,296 feet in the current study.

## **2002 RESEARCH METHODOLOGY**

### **Data Sources Initially Investigated**

Data regarding virtually all of the characteristics pertinent to analysis of off-airport accidents is contained in the computer-based accident briefs covering all accidents investigated by the National Transportation Safety Board. Information regarding the *precise location* of each accident relative to the runway used is the key exception. To the extent that exact location information is recorded by the NTSB, it is included only in the individual Factual Record assembled for each accident. Depending upon the nature of the accident, the Factual Record may be anywhere from a dozen to hundreds of pages long. This data is maintained on microfiche and is not available in computerized form.

Prior to preparation of the 1993 edition of this *Handbook*, preliminary investigation by the study team into the Factual Records for a test group of accidents revealed that many contain the necessary location data, but most do not. Also, it was recognized that the process of extracting this information from the records would be a time-consuming one.

	Mean Distances (Feet)			
	All Operations	Arrivals	Departures	Normalized Departures
Runway Length				
All Categories	4,938	5,152	4,715	
Accident Location				
All Categories		2,801	5,514	799
All Categories (updated study)		2,667	6,398	
Aircraft Type				
Single-Engine		2,092	4,959	669
Twin-Engine		4,347	7,446	1,320
Pilot Control				
Some		2,422	5,581	1,083
None		2,767	5,404	562
Visibility				
VFR		1,716	5,196	700
IFR		5,844	7,150	1,152
Time of Day				
Dawn / Daylight / Dusk		2,006	5,038	594
Night		4,430	7,681	1,813
Swath Length				
All Accidents	197	236	158	
Pilot Control				
Some	220	186	244	
None	183	231	130	
	Median Distances (Feet)			
	All Operations	Arrivals	Departures	Normalized Departures
Runway Length				
All Categories	4,600	4,997	4,300	
Accident Location				
All Categories		1,000	4,684	600
All Categories (updated study)		2,110	5,296	
Aircraft Type				
Single-Engine		520	4,177	500
Twin-Engine		2,276	6,946	1,131
Pilot Control				
Some		1,320	4,753	779
None		788	4,561	478
Visibility				
VFR		475	4,427	500
IFR		4,200	7,051	1,738
Time of Day				
Dawn / Daylight / Dusk		500	4,417	500
Night		2,798	7,337	1,481
Swath Length				
All Accidents	100	145	75	
Pilot Control				
Some	144	135	147	
None	89	140	54	
Notes:	<ul style="list-style-type: none"> <li>▪ All distances rounded to nearest 10 feet.</li> <li>▪ Accident location distances calculated along runway centerline, ignoring offset to left or right. Arrival distances measured from landing threshold; departure distances measures from start of takeoff roll; normalized departure distances from departure (climb-out) end of runway.</li> <li>▪ Information on the degree of pilot control at the time of aircraft contact with the ground is unknown for many accidents, including some for which swath length data is available. This factor accounts for the "all accidents" swath length exceeding the lengths for both "some" pilot control and "none".</li> </ul>			

TABLE E1

## Accident Characteristics: Distances – General Aviation Aircraft Accident Database

Other possible sources of information were therefore investigated to determine whether any could be more efficiently researched or would yield more complete or more accurate data than the NTSB records. The sources reviewed included:

- ◆ **Managers of Individual Airports**—Direct contact with the management of individual airports was the principal alternative initially considered. A major difficulty with this approach is that the completeness of the accident records maintained by different airports varies greatly. The number of years recorded, the level of detail, and the accuracy of the data from these sources would thus be inconsistent. Time-consuming follow-up letters and phone calls would be necessary in order to clarify the information received or to get any response at all. Also, correlating individual accident information obtained from airport managers with other categories of data readily available only in NTSB records would be difficult.
- ◆ **Local Newspapers**—Information from this source is essentially limited to published reports and pictures. As protection against possible erosion of first amendment rights, unpublished notes and photographs are not released to the public, even under court order. The probability of published stories or photographs adding to the information available from other sources is small.
- ◆ **Local Police and Fire Department Records**—A check with several California emergency agencies regarding specific accidents within their jurisdiction yielded little in the way of official (written) information other than that which is already included in the Factual Report. The only way this source could be useful would be to contact the individuals who went out on call and ask them to try to pinpoint the accident site.
- ◆ **State Aeronautics Offices**—Of the fifty states, only seven (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, Ohio, and Rhode Island) did any of their own investigating in 1992. Even among these seven, the investigations are usually quite limited and often done for a specific purpose (i.e., Massachusetts checks to make sure that the aircraft owner is insured or has sufficient net worth to cover damages).
- ◆ **Aircraft Owners and Pilots Association**—This organization relies almost entirely on the FAA and the NTSB for the information they collect and publish regarding accidents. There is no new or enhanced information available from this source.
- ◆ **Airline Pilots Association**—The union for airline pilots is involved in investigations of commercial air carrier accidents only and would be of no help in general aviation accident locations. Their reports on commercial accidents would shed no new light on location.
- ◆ **Aircraft Insurance Companies**—A check with two of the major general aviation insurance companies (USAIG and Associated Aviation Insurance) yielded little in the way of useful results. Except in cases where location is useful in assessing fault (such as defective navigational aid or cockpit instrument) specific accident location is not of interest, and therefore, not included. Even in cases where accurate site data

is given, two problems arise. First, finding the cases that would be of use would require a hand search through individual accident reports. Second, it would probably be difficult to obtain permission to go through the files as the information is considered proprietary and also could expose the company to lawsuits. The conclusion reached from the review of these alternative data sources was that each could provide some useful information, but—for the purposes of ascertaining accident location data—none would be as complete, accurate, or accessible as the NTSB Factual Reports.

## Summary Of Research Methodology

The task of gathering the desired data was accomplished by the University of California, Berkeley, Institute of Transportation Studies working under contract to the California Department of Transportation Division of Aeronautics. The data-gathering process evolved to some extent even after the basic approach and scope of the research were decided. Three major steps were involved, each with several components:

- ◆ **Review Briefs of All Accidents**—First, a computer listing of all aircraft accident records for the selected time period was obtained from the NTSB in *mini-brief* format. Each brief was then reviewed and an assessment made as to whether its location appeared to fall within the airport-vicinity range defined for the research. This process narrowed the number of accidents fitting the defined parameters to approximately 20% of the total.
- ◆ **Review of Selected Accident Factual Records**—Next, microfiche copies of the complete Factual Record for each of the selected accidents were ordered. These records were then scanned to determine whether the necessary location information was included. Location data could be found in any of several sections of the record including the investigators notes, the pilot's statement, or statements of witnesses or emergency response personnel. Only about one record in six was determined to contain usable data.
- ◆ **Preparation of Database**—Finally, location information on each accident was entered into a computer database along with the data in the other categories which had been selected. Frequently, the Factual Records identify the accident sites with reference to local streets. In order to establish the distance of the accident site from the airport runway involved, local street maps often had to be obtained and measurements taken from them. At that time, the various other categories of data for each accident were also added to the database.

## Scope of Research

Beyond the principal requirement for precise accident location data, various decisions were necessary in order to define the scope of the research effort. Some of these parameters were decided by the Division of Aeronautics and the study team at the outset of the research effort; others were modified in response to the outcome of the early phases of the process.

- ◆ **Definition of Airport Vicinity**—Although the fundamental interest of the study is on off-airport accidents, an accident occurring say 2,000 feet from the end of a runway may be within the boundaries of a large airport, but well beyond the property line of a smaller facility. Therefore, for the purposes of the analysis, *off-airport* was broadened to include any accidents not confined to the immediate vicinity of the runway (generally defined as Federal Aviation Regulations Part 77 primary surface), even if the accident site is on property actually owned by the airport. At the outer edge, a 5 mile radius—measured from the airport center in accordance with the NTSB data format—was selected as the limits of the airport vicinity. It is recognized that, at this distance from an airport, some of the accidents included may more properly be defined as en route rather than airport-related.
- ◆ **Accidents versus Incidents**—The NTSB defines an aircraft *accident* as an occurrence in which people on board or on the ground sustained serious or fatal injuries or in which the aircraft incurred substantial damage to the extent that it could no longer be considered airworthy. Other mishaps are classified as *incidents*. The NTSB and/or the FAA may conduct preliminary investigations into incidents to determine if they qualify as accidents. However, the extensive records maintained and compiled for accidents are not available for incidents. Given that the NTSB was selected as the data source for the research effort, it was necessary to exclude incidents from the database. (See Glossary for a complete definition of *aircraft accident*.)
- ◆ **Aircraft Types**—Initially, all categories of civilian-use airplanes—airline and general aviation—were to be included in the database. Very few airline aircraft accident records were actually found, however. These were eliminated from the completed database because of the statistical bias they could give to some of the data (especially with regard to the number of injuries). Helicopters and other types of aircraft are omitted because of their markedly different operational characteristics. Accidents involving military and other government aircraft are not investigated by the NTSB and therefore are excluded from the database as well.
- ◆ **Data Categories**—Although the data of central interest to the research effort was the accident location information, other categories of data also were determined to be important to the subsequent analysis of the accidents' geographic distribution pattern. Many of the data categories selected for inclusion in the database were chosen with the thought that they might prove to be significant variables affecting where accidents occur. A complete list of the categories included in the database is included in Exhibit E1. A description of each category and the manner in which the data was obtained or determined is noted as well.

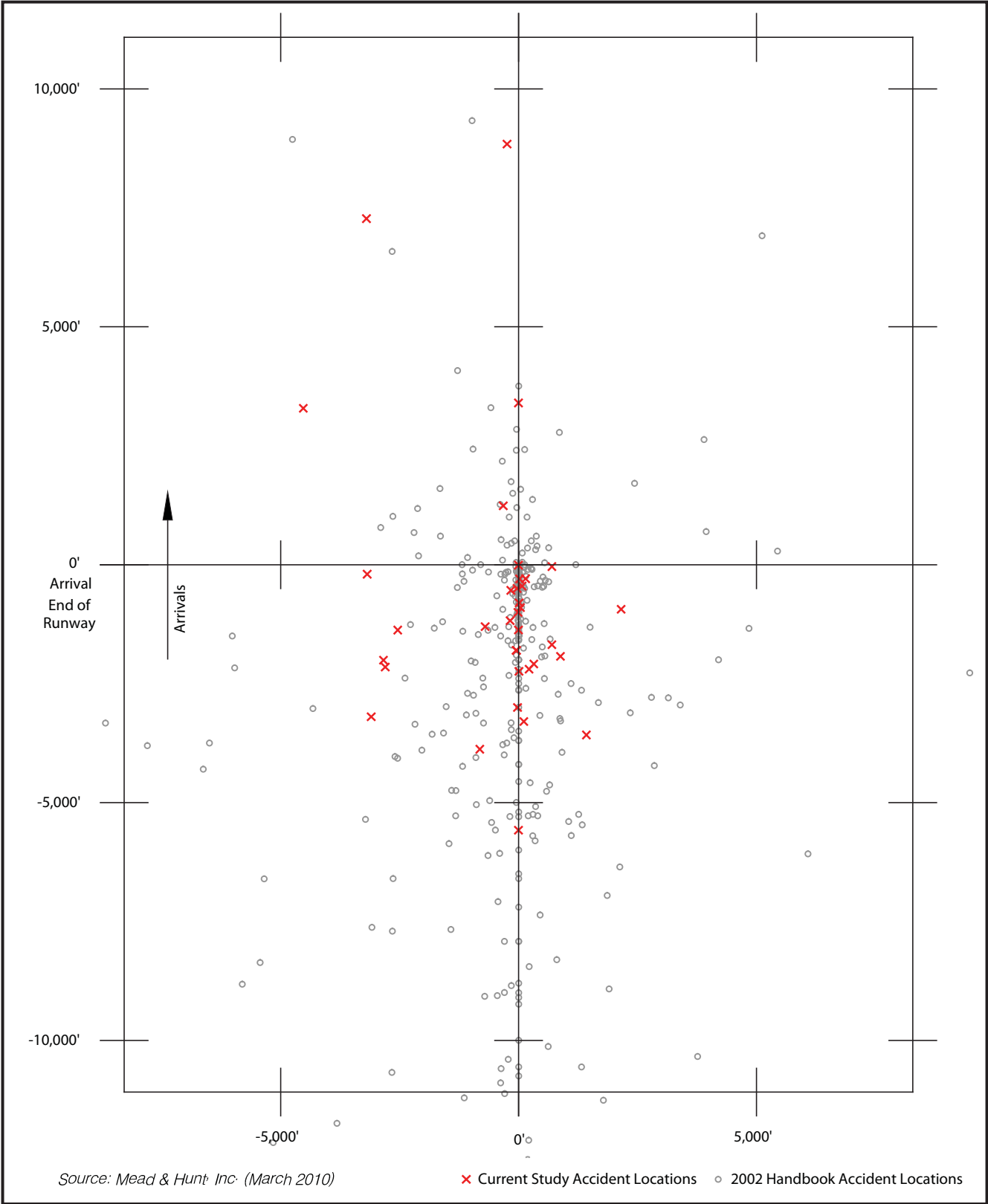


EXHIBIT E1

All Categories – Arrival Accidents

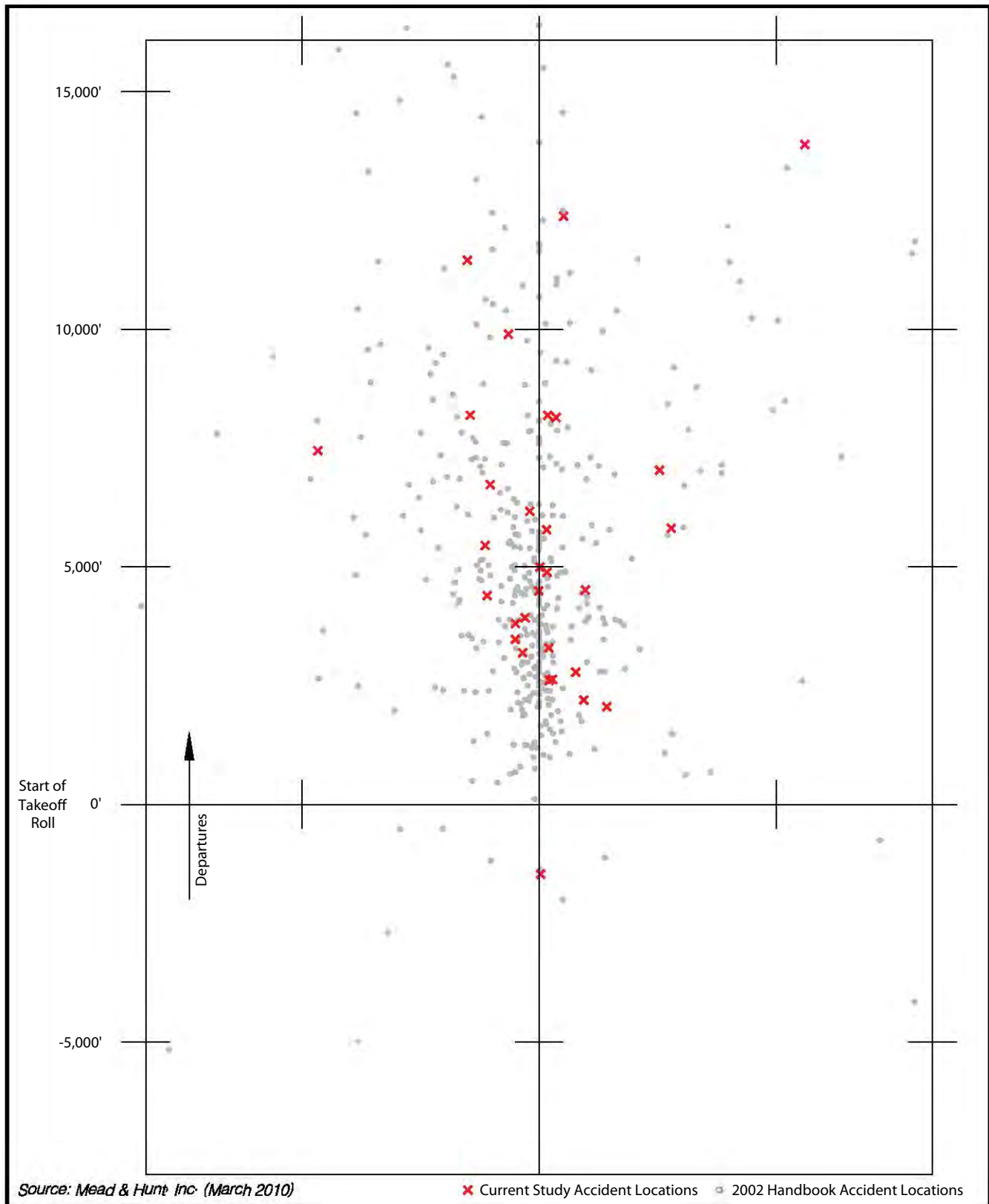


EXHIBIT E2

## All Categories – Departure Accidents



- ◆ **Time Frame Covered**—The time period to be included within the research effort was at first planned to cover a minimum of 10 years, beginning with 1980 and extending to the then most recently available data. However, the format of the NTSB's computer records essential to the initial step of the investigation was changed in 1983 and the earlier format was found to be less readily usable for the purposes of the project. The database was therefore extended to cover the 10-year period from 1983 through 1992.
- ◆ **States Included**—To enable statistically significant analysis of various subsets of accident points, a target of 500 accident records was set as the goal for the initial database development in 1993. It was anticipated that a database of this size could be obtained by review of accidents from just the 4 to 8 *sunbelt* states which generate the highest volumes of aircraft operations. However, a trial run of the process found a high rate of records which do not contain sufficiently accurate locational data. This factor necessitated extending the research scope to include all 50 states. Time and budgetary limitations, however, prevented completion of the research. The original 1993 *Handbook* database thus included records for 11 states for the years 1983–1989, while records for the other 39 states were searched only for the years 1983–1985. In the subsequent research completed in 1998, the remaining records were examined for all 50 states over the full 10-year period. The expanded database now contains records from 43 states.
- ◆ **Total Records**—The original database included a total of 400 records including records from 190 arrival accidents and 210 departure accidents. As used for the analyses presented in this *Handbook*, the expanded database contains 873 records, 445 for arrival accidents and 428 for departure accidents.

## 2002 AIRCRAFT ACCIDENT RESEARCH RESULTS

### OVERVIEW

The work of compiling the 2002 accident data was conducted by the Institute of Transportation Studies at the University of California, Berkeley. The major findings of the research are incorporated into the discussion here.

Neither the National Transportation Safety Board (NTSB), which is the primary repository of aviation accident data in the U.S., nor the Federal Aviation Administration routinely compile data in this manner. For both agencies, accidents are investigated for aeronautical purposes to determine ways of improving the design and operation of aircraft and airports and to foster better pilot skills and techniques. If land use factors are examined at all, it is done only in a manner incidental to the primary purpose of the investigation.

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*Aircraft accidents are defined as events associated with flight which result either in fatal or serious injury to a person (either on board the aircraft or on the ground) or in substantial damage to the aircraft. Events with less serious outcomes are classified as incidents. Taken together, accidents and incidents are referred to as mishaps.*

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The total number of data points examined as part for the 2002 *Handbook* were 873. A statistical analysis of the expanded accident database is summarized in this appendix. Also included here is information describing other characteristics of aircraft operations and accidents.

## **AIRCRAFT LIMITATIONS AND PILOT ACTIONS**

The emphasis in this discussion is on emergency conditions in which the aircraft can be maintained under at least some measure of pilot control. Most of the performance characteristics described here are not applicable in situations where the aircraft is incapable of being controlled (because of mechanical failure or damage resulting from collisions with obstacles or other aircraft, for example).

### **Airplane Emergencies**

Broadly speaking, aircraft operations emergencies can be divided into two groups: situations in which the pilot's control of the aircraft directly creates the emergency and situations in which some other condition causes an emergency to which the pilot must react. Among airport-vicinity, general aviation airplane accidents in the first of these groups, the most common is pilot failure to maintain sufficient flying speed. This usually results in a stall, and potentially a spin and uncontrolled descent. In the second group, common accident factors include adverse wind and weather conditions and loss of power (complete or partial engine failure for either mechanical reasons or due to lack of fuel).

### **Airplane Performance Limitations**

When not prevented by mechanical or structural damage, the capability of an airplane to remain under pilot control while flying is largely dependent upon the plane's airspeed. Even in situations where a complete engine failure has occurred, a plane will not go out of control and drop from the sky if sufficient speed is maintained and enough altitude is available to give the pilot a chance to react. Even large, air carrier jet aircraft have been landed without functioning engines.

Most light airplanes are capable of gliding 500 to 1,000 feet for every 100 feet of altitude (altitude is lost more quickly in turns than when gliding straight ahead, however). At a 1,000-foot traffic pattern altitude, for example, a light airplane could travel one to two miles before reaching the ground.

One major difference among airplanes is between single-engine and multiengine types. An obvious, but very important, distinction between the two is that a multi-engine aircraft can experience an engine failure without having a complete loss of power. Although the asymmetrical thrust plus drag from an inoperative engine(s) reduce performance, most multi-engine aircraft can hold altitude or even continue to climb if one engine fails. For smaller piston twins with less power, the functioning engine may do no more than extend the glide distance, provided that the pilot keeps the aircraft under control.

For a single-engine plane, the critical airspeed is its *stall speed*. A multiengine plane has two additional milestone speeds: *minimum control speed* and *best single-engine rate of climb*

*speed*. These critical airspeeds are significant regardless of the flight mode of the aircraft: taking off, landing, or maneuvering at low speeds. As noted, however, these speeds are particularly important for a pilot to watch when an engine failure occurs, especially on takeoff.

- ♦ **Stall Speed ( $V_s$ )**—This is the minimum steady flight speed at which an airplane, either single- or multi-engine, can fly. At lower speeds, the flow of air over the wing does not generate enough lift to match the aircraft's weight. If an engine failure occurs before this speed is reached during the takeoff run, the airplane would remain on the ground and maximum braking would need to be applied to bring the plane to a stop. If the engine failure occurs while the airplane is airborne, it is essential for the pilot to keep the aircraft above stall speed. The airplane's speed can be controlled by adjusting its pitch and, on a multi-engine aircraft, by use of the remaining engine(s). By staying above stall speed, an airplane can potentially be guided to a successful emergency landing. A significant factor to note is that an airplane's stall speed is higher during a turn (that is, the airplane can stall more readily) than it is in straight flight.
- ♦ **Minimum Control Speed ( $V_{mc}$ )**—Below this speed, a multi-engine airplane cannot be controlled with full power on the remaining engine(s) with the critical engine inoperative. Airflow across the rudder does not generate enough yawing force to overcome the asymmetrical thrust of the remaining engine(s) operating away from the aircraft centerline. Engine failure below this speed requires a reduction in power on the good engine(s) in order to maintain directional control.

$V_{mc}$  is typically attained while the aircraft is either still on the runway or only a few feet above it. During a takeoff, the aircraft would either remain on the ground or would, if properly handled, return immediately to the ground in a controlled manner. Maximum braking would then be applied.

- ♦ **Single-Engine Climb Speed ( $V_{yse}$ )**— $V_{yse}$  is the speed at which a twin-engine airplane operating on one engine can attain the best rate of climb (or, for some aircraft, the slowest rate of descent). If an engine fails below this speed, it is possible to stretch a controlled descent as long as a speed of  $V_{mc}$  or better is maintained. The aircraft will quickly return to the ground, however. Engine failure at a speed above  $V_{yse}$  may not necessitate a forced landing because many twin-engine airplanes are capable of using the remaining engine to climb to an altitude from which a return to the airport for a safe emergency landing can be made.

### **Pilot Actions**

As alluded to above, pilot actions under emergency circumstances are a major determinant of whether an accident will result and, if so, how severe it will be. Pilots are taught a set of procedures to follow if, for example, an engine stops running. Most critical is to keep the aircraft under control. Next, time permitting, is to attempt to determine the problem and, if possible, restart the engine. If an emergency landing becomes inevitable, the pilot should then try to find a reasonable spot to put the aircraft down.

When an engine failure occurs, while approaching or departing an airport, the initial reaction of most pilots is to attempt to land on the runway. For small aircraft, a runway landing should be possible if a landing traffic pattern is flown at a normal altitude and distance from the runway. If larger, multi-engine aircraft lose an engine, most are capable of continuing the flight to a normal landing. Of course, on takeoff, the aircraft is headed away from the runway. For single-engine aircraft, and some piston twins, a runway landing becomes difficult or, at low altitudes, impossible. As mentioned above, an airplane's descent rate and stall speed both increase while turning. This characteristic is the reason why attempting to return to the runway with a single-engine aircraft following an engine failure while on takeoff can have disastrous consequences. In certain respects, maintaining control of a multi-engine airplane, especially a twin-engine airplane, is more difficult following an engine failure than it is with a single-engine airplane. With the latter, a complete engine failure unavoidably results in descent (assuming the engine cannot be restarted) and the pilot has no choice but to respond accordingly. With a twin-engine aircraft, however, many pilots think that they can keep the aircraft in the air even when an engine failure occurs on takeoff at low altitude. Many light twins, though, do not have enough power to continue to remain airborne on one engine. Moreover, because of a twin-engine airplane's asymmetrical thrust characteristics, lack of immediate and proper pilot response during an engine failure on takeoff is more likely to lead to an uncontrolled accident than is the case with a single-engine plane. For many small, twin-engine airplanes, the prudent course of action if an engine fails at low altitude on takeoff is to reduce or shut off power to the good engine and glide back to the ground just like would be done in a single-engine plane. For larger twins and multi-engine aircraft, there is typically sufficient power available from the remaining engine(s) and sufficient control authority to continue the flight.

In the few moments that a pilot may have available in which to select an off-airport emergency landing site, there is no certainty that the best site can be spotted—particularly at night or under IFR weather conditions—or that it can be reached. A large, flat, open area is preferable; but, if one cannot be found, a small open space or a street or parking lot are often the best candidates. Because pilots sit on the left side of the plane, the tendency is to look toward the left for emergency landing sites as the view of the ground from the pilot's seat is better in that direction. Usually, an effort will be made to avoid people, buildings, large trees, and other such objects. Smaller objects, such as ditches and wires, may not be obvious until it is too late to avoid them. Luck consequently plays a significant role in such circumstances.

### **Helicopter Emergencies**

As with airplanes, airspeed and altitude are also critical determinants of whether a pilot can maintain control of a helicopter in the event of an emergency involving an engine failure. Although helicopters cannot glide as far as airplanes can (a typical glide ratio at optimum airspeed is 300 to 500 feet horizontally per 100 feet of altitude lost), neither do they necessarily crash if an engine should fail while in flight. Indeed, because helicopters can safely descend much more steeply than airplanes, the area needed for an emergency off-airport landing can be much smaller. Also many of the newer, moderate-sized helicopters—especially turbine-powered ones—have twin engines driving the main rotor.

The procedure used for emergency helicopter landings following an engine failure is known as *autorotation*. In simple terms, autorotation involves disengaging the main rotor from the engine drive system, thus enabling the blades to rotate freely. Air traveling upward through the blades causes them to continue rotating and producing lift to slow the descent. Also, the rotation of the main rotor drives the tail rotor to allow directional control to be maintained.

The altitude from which an emergency autorotation descent can successfully be conducted is dependent upon several factors with airspeed generally being the most significant. From near cruising speeds, most helicopters can perform an autorotation from an altitude of 100 feet or even slightly less. However, when hovering at zero airspeed, 500 feet of altitude may be needed. In effect, the altitude must be traded for forward speed before successful autorotation can be accomplished.

## AVAILABILITY OF ACCIDENT LOCATION DATA

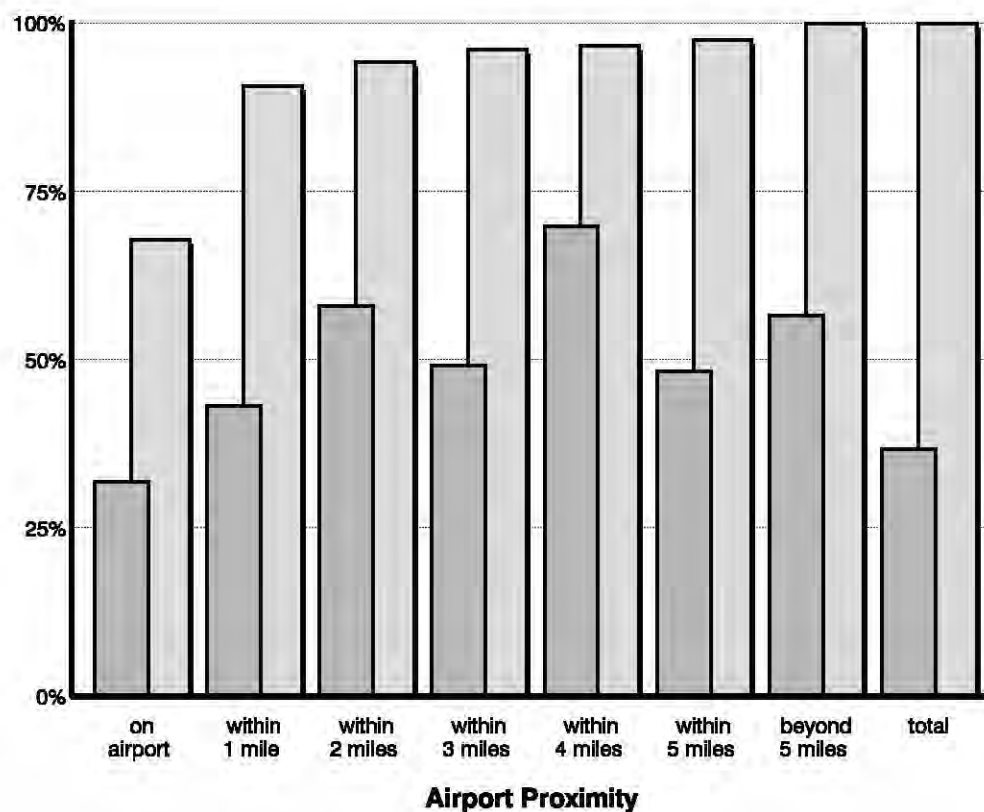
### ***Approximate Location Data***

For each accident which the National Transportation Safety Board investigates, a *Factual Report* (NTSB Form 6120.4) is completed. Included in the report are data entries for *distance from airport center* and *direction from airport*. This information could be valuable for land use compatibility planning purposes if it were precisely documented. Its usefulness is limited, however, because the accident investigation form requires only that the data be given to the nearest statute mile.

A compilation of the NTSB accident proximity data for the years 1990 through 2000 for general aviation accidents is shown in Figure E3. Figure E4 shows similar data for commercial aircraft.

The data reveals that over two-thirds of both general aviation (68%) and commercial (67%) aircraft accidents take place on a n airport. Another 3% of general aviation and 7% of commercial aviation are en route accidents— defined here as ones occurring more than 5 miles from an airport. This leaves 29% of general aviation and 26% of commercial aviation accidents which can be classified as airport-vicinity accidents, potentially including some en route accidents which happened to take place within 5 miles of an airport.

A somewhat more detailed set of data on commercial aircraft accident locations is one recently gathered by researchers in the United Kingdom (NATS–1997). Separate graphs show runway proximity of landing and takeoff accidents in two dimensions: distance from the runway end and distance from the extended runway centerline (see Figure E5).



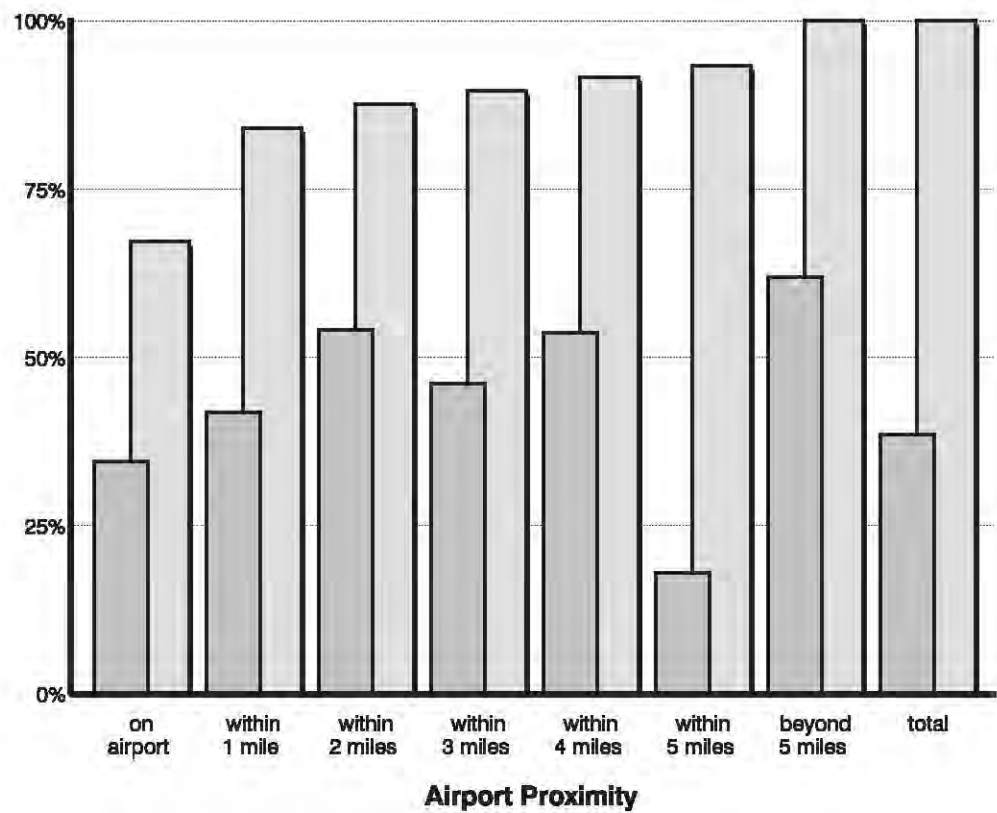
Cumulative percent of accidents  
 Proportion of fatal or serious injury accidents within each category

**Note:** 8,413 total accidents and 3,422 fatal or serious injury accidents.

Source: Data compiled from NTSB Aviation Accident Database: General Aviation — Calendar years 1990–2000

FIGURE E3

## Proximity of General Aviation Accidents to Nearest Airport



Cumulative percent of accidents  
 Proportion of fatal or serious injury accidents within each category

**Note:** 650 total accidents and 251 fatal or serious injury accidents.

Source: Data compiled from NTSB Aviation Accident Database: Air Carrier—Calendar years 1990–2000

FIGURE E4

Proximity of Air Carrier Accidents to Nearest Airport

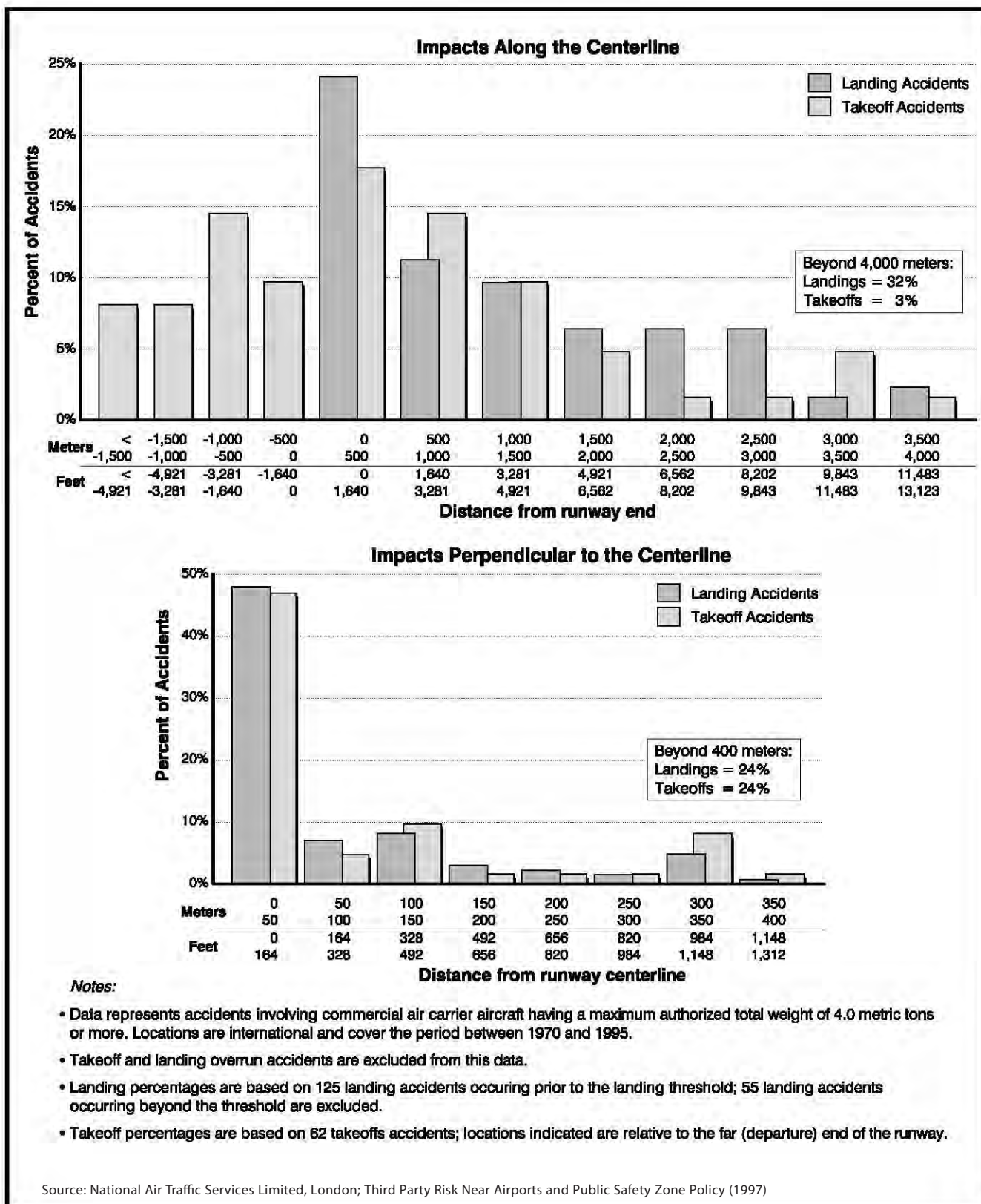


FIGURE E5

## Runway Proximity of Air Carrier Accidents – International



### **Previous Location Data**

Several previous research efforts endeavored to document the type of precise aircraft accident location data which would be pertinent to airport land use compatibility planning. Although each of the studies provides significant information, all are limited in scope.

- ◆ **Report of the President's Airport Commission**—This commission, best known as the Doolittle Commission in honor of its chairman, James Doolittle, conducted one of the first comprehensive studies of the noise and safety relationships between airports and surrounding communities. The commission's 1952 report is valuable today for the historical perspective it gives to current airport compatibility issues. Among other things, the commission plotted the location of over 30 off-airport commercial and military aircraft crashes which caused death or injury to persons on the ground (there is no indication in the report that any data was gathered regarding non-injury accidents). Despite the rather limited database, the commission's report led to the establishment of what became known as clear zones and are now called runway protection zones at the ends of airport runways.
- ◆ **Department of Defense Air Installation Compatible Use Zone (AICUZ) Program**—The AICUZ program was established in 1973 as a joint effort of the several branches of the military. An element of the study leading to the creation of the program entailed assembly and analysis of data regarding the locations of military aircraft accidents around air bases. The data covered the period from 1968 through 1972 and included more than 300 major airfield-related accidents which occurred within 10 nautical miles of the runway. The study served to define areas of significant military aircraft accident potential, known as *Accident Potential Zones (APZs)*.
- ◆ **FAA Commercial Aircraft Accident Study**—A 1990 FAA study (*Location of Aircraft Accidents/Incidents Relative to Runways*) compiled data regarding the location of commercial aircraft accidents relative to the runway involved. Data was gathered by review of National Transportation Safety Board dockets containing the complete record of the board's investigation of each accident. A total of 246 accidents and incidents occurring over a 10-year period (1978-1987) were included in the analysis. Of these, the majority (141) were limited to the immediate vicinity of the runway. Some 87 were classified as being either: a landing accident/incident in which the aircraft impacted with the ground more than 2,000 feet from the runway threshold; or a takeoff crash after the aircraft became airborne, but before it reached the first power reduction or VFR pattern altitude. Another 18 entries were landing undershoots occurring within 2,000 feet of the runway end. Figure E5 depicts the locations of the 16 landing (including 4 undershoots of more than 500 feet) and 23 takeoff accidents/incidents for which adequate locational data was available.

### **Theoretical Areas of High Accident Probability**

By examining the available data on types and locations of accidents in conjunction with information on airplane operational parameters as discussed earlier, it is possible to ascertain

where accidents can theoretically be expected to occur most often. Particularly useful in this regard is data on the phase of operation of aircraft at the time of an accident. Table E2 contains a summary of published NTSB data on this subject.

### ***Approach/Landing Accidents***

The great majority of general aviation aircraft landing accidents take place on or immediately adjacent to the runway. Indeed, NTSB data for the 1990 to 2000 period indicates that some three-fourths (77%) of all general aviation landing accidents occur during touchdown or roll-out (usually hard or long landings, ground loops, etc.). Although frequent in occurrence, these types of accidents seldom (less than 11% of the time) result in serious or fatal injuries.

The remaining 23% of general aviation landing accidents take place in the landing pattern, on final approach, or during a go-around attempt. A common circumstance that can result in an approach accident is pilot misjudgment of the aircraft descent rate and failure to add power soon enough to keep the aircraft in the air. Poor visibility, unexpected downdrafts, or tall objects beneath the final approach course can intensify this problem. Another prospective type of landing accident can occur if a pilot overshoots a turn from base to final and inappropriately cross controls the airplane rudder and ailerons while attempting to return to the runway alignment. The result can be a stall, spin, and uncontrolled crash.

The pattern for commercial aviation is less heavily weighted to the area on or near the runway (Table E3); accidents on or near the runway range from 64% for air carrier operations, to 51% for commuter operations, to 58% for air taxi operations.

These types of events all will tend to place the accident site fairly close to the extended runway centerline. Also, because lower altitude decreases the chances of successful recovery from unexpected conditions, accidents can be expected to be more common closer to the runway end than at points farther away.

### ***Takeoff/Departure Accidents***

Data from the period 1974-1989 indicates that the greatest proportion of general aviation takeoff/departure accidents (some 65%) take place during the initial climb phase. (Equivalent data for commercial aviation is not available.) This finding is consistent with two factors:

- ◆ Aircraft engines are under maximum stress during the initial climb phase and thus somewhat more susceptible to mechanical problems than at other times; and
- ◆ On average-length runways, once an aircraft has begun to climb, it is often too late to make an emergency landing and stop on the runway without overshooting the far end.

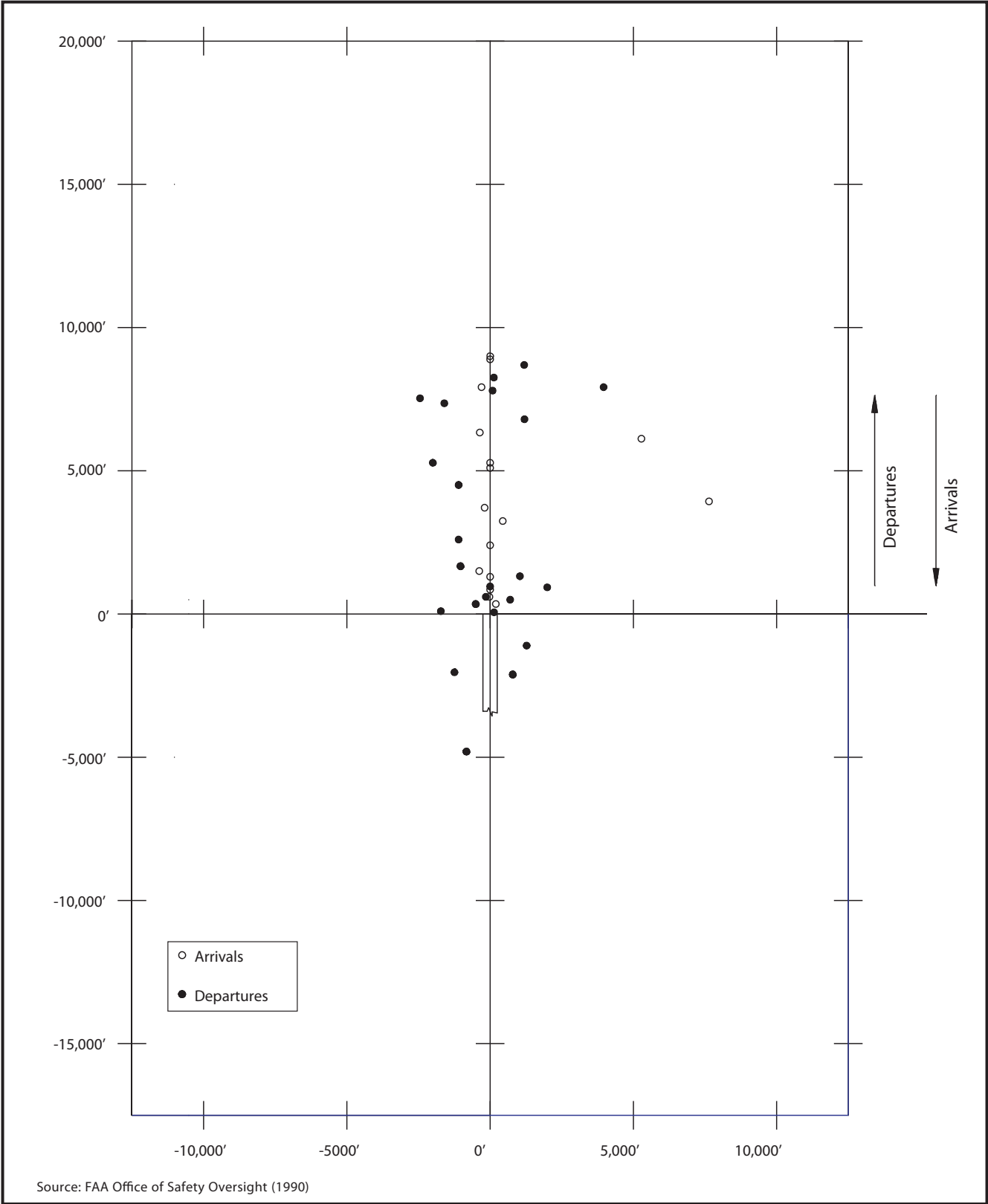


FIGURE E6  
Commercial Aircraft Accident Location Pattern

Phase of Operation	Percent of Total	Proportion Fatal/Serious
Standing	1.1	34.6
Taxi	3.5	11.0
Takeoff	18.2	28.9
In Flight		
Climb	2.8	46.3
Cruise	11.8	41.5
Descent	4.9	58.9
Maneuver	12.6	58.4
Total	32.1	46.3
Landing		
Approach	10.0	42.5
Landing	33.9	11.3
Go-Around	0.3	27.3
Total	44.2	42.5
Other/Unknown	0.9	83.6
All Accidents	100.0	31.4

Note: Data includes all (20,399) U.S. general aviation accidents by all aircraft types for the period 1990–2000.

Source: NTSB Aviation Accident Database—General Aviation, 1990–2000

TABLE E2

## Accidents by Phase of Operation – U.S. General Aviation Aircraft

Phase of Operation	FAR Part 121 Operations		Scheduled FAR Part 135 Operations		Nonscheduled FAR Part 135 Operations	
	Percent of Total	Proportion Fatal/Serious	Percent of Total	Proportion Fatal/Serious	Percent of Total	Proportion Fatal/Serious
Standing	10.3	11.4	7.0	4.3	2.3	2.3
Taxi	16.2	11.4	14.6	0.0	5.1	0.0
Takeoff	12.2	25.0	14.6	8.7	21.0	15.8
In Flight						
Climb	7.4	4.5	3.8	4.3	4.7	6.8
Cruise	18.5	13.6	9.7	23.9	21.8	30.6
Descent	10.3	0.0	5.9	4.3	3.0	4.9
Maneuver	1.1	0.0	5.9	13.0	8.1	12.8
Total	37.3	18.1	25.3	45.5	37.6	55.1
Landing						
Approach	7.0	15.9	16.8	37.0	13.3	21.5
Landing	12.2	4.5	17.8	0.0	18.7	2.6
Total	19.2	20.4	34.6	37.0	32.0	24.1
Other/Unknown	4.8	11.4	3.8	4.3	1.9	2.6
All Accidents	100.0		100.0		100.0	

Source: NTSB Aviation Accident Database — Air Carrier, 1986–1995

TABLE E3

## Accidents by Phase of Operation – U.S. Air Carrier Aircraft

With respect to where takeoff accidents occur, a much greater dispersion of sites can be hypothesized than is the case for landings. Landings all involve aircraft descending at similar angles toward about the same point on the runway. By comparison, more variables affect the three-dimensional path of aircraft takeoffs, even under normal conditions. For one, climb rates and other takeoff performance characteristics differ substantially from one aircraft type to another. Also, even for similar types of aircraft, the flight track and the altitude above any given point along it will vary depending upon the aircraft payload, piloting techniques, and the intended direction of flight after takeoff.

The differences in performance characteristics of single-engine versus twin-engine propeller airplanes is particularly illustrative.

- ◆ **Single-Engine Airplanes**—For single-engine airplanes, a high percentage of accidents can be expected to occur within 7,000 to 9,000 feet of the start of takeoff roll. This distance is calculated based upon an assumed occurrence of an engine failure at an altitude of 500 feet with the aircraft then gliding back down to the ground (and also assuming the ground level to be equal to that of the runway). As previously discussed, at altitudes above 500 feet, it should be possible to return to the runway for an emergency landing and most pilots will attempt to do so rather than continue straight ahead. At lower altitudes, the most prudent pilot action is to seek a landing site as close to straight ahead as practical.
- ◆ **Twin-Engine Airplanes**—With a twin-engine piston airplane, an engine failure on takeoff does not necessarily mean that the aircraft will immediately glide back toward the ground. The altitude at engine failure and the manner in which the remaining engine is operated thus add more variables to where the plane can be most expected to put down. If an engine failure occurs at or below best single-engine rate of climb speed ( $V_{y_{se}}$ ), the aircraft would normally be just airborne and controllable, but sometimes unable to climb. At these low speeds, the proper pilot action should be to reduce or shut off power to the remaining engine and glide back to the ground as would a single-engine airplane. At speeds slightly above  $V_{y_{se}}$ , twin-engines airplanes may theoretically be capable of climbing, but for a pilot to make this happen under emergency conditions is difficult. Sometimes, a pilot will try to maintain power in the functioning engine, but then lose directional control of the aircraft and crash. A relatively wide dispersal of accident sites—both in distance from the start of takeoff and to either side of the extended runway centerline—can thus be predicted in theory.

## Recent Research

In order to obtain accident location data for general aviation aircraft, basic new research was conducted for the 1993 edition of this *Handbook*. After investigating several possible data sources—principally direct contact with individual airports versus review of the NTSB *Factual Reports*—the latter method was found to provide the most complete and consistent data. The research was conducted by the Institute of Transportation Studies at the University of California, Berkeley. For the 2002 edition of the *Handbook*, this database was expanded. The current database resulting from this research:

- ◆ Encompasses all 50 states (although several have no accidents represented);
- ◆ Covers a time period from 1983 into 1992;
- ◆ Contains data only on accidents, not incidents;
- ◆ Contains a total of 873 aircraft accident records (445 arrivals and 428 departures); and
- ◆ Includes all types of general aviation airplanes, but not airline aircraft, helicopters, or other aircraft types (ultralights, blimps, etc.), or military aircraft.

A somewhat broad definition of airport vicinity was used for the purposes of this research. Airport size was recognized as being a significant determinant of whether an accident site a certain distance beyond the runway is on or off the airport property. Consequently, all accidents not confined to the immediate vicinity of the runway or its associated safety zones are included in the database. For the outer boundary of the airport vicinity, a 5-mile radius—measured from the airport center in accordance with the NTSB data format—was selected.

## AIRCRAFT ACCIDENT LOCATION PATTERNS

The following paragraphs highlight notable findings from the expanded general aviation accident database. Comparative data from other sources is indicated where applicable. Table E4 presents a numeric summary of the percentages of various categories of accidents represented in the database. Selected distance data is listed in Table E5. Table E6 summarizes some comparative NTSB accident data for all U.S. general aviation aircraft accidents, both on-airport and off. Similar NTSB data for air carrier accidents is contained in Table E7.

The spatial distribution of general aviation aircraft arrival and departure accidents is illustrated in Figures E7, E8, and E9. As described below, the departure accident location patterns are presented in two different formats.

### Arrival versus Departure Difference

The first question assessed in review of the accident location data was to determine how the pattern of aircraft landing accidents differs from the pattern for takeoff accidents. An important issue in this analysis is what point to use as a common reference within each of these accident categories.

- ◆ **Arrivals**—For landing accidents, this decision is easy. The landing threshold, whether it be the actual runway end or a displaced threshold, is the relevant point. Figure E7 illustrates the spatial distribution of all arrival accidents occurring within 25,000 feet of the runway landing threshold.

## E AIRCRAFT ACCIDENT CHARACTERISTICS

Category	All		Arrival		Departure	
Accidents Involving:	Accidents		Accidents		Accidents	
Total Database	873	100.0%	445	100.0%	428	100.0%
Runway Length						
Less than 4,000 ft.	344	39.4%	153	34.4%	191	44.6%
4,000 ft. to 5,999 ft.	281	32.2%	150	33.7%	131	30.6%
6,000 ft. or more	248	28.4%	142	31.9%	106	24.8%
Unknown	0	0.0%	0	0.0%	0	0.0%
Approach Type						
Visual Approaches			343	77.1%		
Nonprecision Approaches			27	6.1%		
Precision Approaches			70	15.7%		
Unknown			5	1.1%		
Time						
Dawn	10	1.1%	7	1.6%	3	0.7%
Day	603	69.1%	262	58.9%	341	79.7%
Dusk	37	4.2%	29	6.5%	8	1.9%
Night	222	25.4%	147	33.0%	75	17.5%
Unknown	1	0.1%	0	0.0%	1	0.2%
Weather Conditions						
VFR	688	78.8%	328	73.7%	360	84.1%
IFR	182	20.8%	117	26.3%	65	15.2%
Unknown	3	0.3%	0	0.0%	3	0.7%
Aircraft Type						
Single-Engine Propeller	636	72.9%	305	68.5%	331	77.3%
Twin-Engine Propeller	235	26.9%	140	31.5%	95	22.2%
Business Jet	2	0.2%	0	0.0%	2	0.5%
Pilot Control						
Some	164	18.8%	71	16.0%	93	21.7%
None	665	76.2%	357	80.2%	308	72.0%
Unknown	44	5.0%	17	3.8%	27	6.3%
In-Flight Collision with Object						
Yes	280	32.1%	148	33.3%	132	30.8%
No	593	67.9%	297	66.7%	296	69.2%
Aircraft Damage						
Destroyed	568	65.1%	260	58.4%	308	72.0%
Substantial	303	34.7%	185	41.6%	118	27.6%
Unknown	2	0.2%	0	0.0%	2	0.5%
Consequences						
Onboard Fatalities	463	53.0%	212	47.6%	251	58.6%
Ground Fatalities	6	0.7%	2	0.4%	4	0.9%
Onboard Serious Injury	228	26.1%	104	23.4%	124	29.0%
Ground Serious Injury	6	0.7%	2	0.4%	4	0.9%
Traffic Pattern Direction						
Left	684	78.4%	353	79.3%	331	77.3%
Right	117	13.4%	59	13.3%	95	22.2%
Unknown	72	8.2%	33	7.4%	2	0.5%

Note: Numbers in each category may not add to 100% because of mathematical rounding or missing data in some records.

TABLE E4

### Accidents Characteristics: Proportions – General Aviation Aircraft Accident Database



	Mean Distances (Feet)			
	All Operations	Arrivals	Departures	Normalized Departures
Runway Length				
All Categories	4,938	5,152	4,715	
Accident Location				
All Categories		2,801	5,514	799
Aircraft Type				
Single-Engine		2,092	4,959	669
Twin-Engine		4,347	7,446	1,320
Pilot Control				
Some		2,422	5,581	1,083
None		2,767	5,404	562
Visibility				
VFR		1,716	5,196	700
IFR		5,844	7,150	1,152
Time of Day				
Dawn/Daylight/Dusk		2,006	5,038	594
Night		4,430	7,681	1,813
Swath Length				
All Accidents	197	236	158	
Pilot Control				
Some	220	186	244	
None	183	231	130	
	Median Distances (Feet)			
	All Operations	Arrivals	Departures	Normalized Departures
Runway Length				
All Categories	4,600	4,997	4,300	
Accident Location				
All Categories		1,000	4,684	600
Aircraft Type				
Single-Engine		520	4,177	500
Twin-Engine		2,276	6,946	1,131
Pilot Control				
Some		1,320	4,753	779
None		788	4,561	478
Visibility				
VFR		475	4,427	500
IFR		4,200	7,051	1,738
Time of Day				
Dawn / Daylight / Dusk		500	4,417	500
Night		2,798	7,337	1,481
Swath Length				
All Accidents	100	145	75	
Pilot Control				
Some	144	135	147	
None	89	140	54	
Notes:	<p>All distances rounded to nearest 10 feet.</p> <p>Accident location distances calculated along runway centerline, ignoring offset to left or right. Arrival distances measured from landing threshold; departure distances measured from start of takeoff roll; normalized departure distances from departure (climb-out) end of runway.</p> <p>Information on the degree of pilot control at the time of aircraft contact with the ground is unknown for many accidents, including some for which swath length data was available. This factor accounts for the "all accidents" swath length exceeding the lengths for both "some" pilot control and "none."</p>			

TABLE E5

## Accident Characteristics: Distances – General Aviation Aircraft Accident Database

	Percent of Total Accidents	Proportion Fatal/Serious
Time of Day		
Dawn/Daylight/Dusk	85.6 <sup>a</sup>	28.5 <sup>a</sup>
Night	14.4	45.0
Weather Conditions		
VFR	55.5 <sup>a</sup>	26.4 <sup>a</sup>
IFR	45.5	46.7
Aircraft Damage		
Destroyed	25.3 <sup>a</sup>	
Substantial	72.5	
Minor/None	2.2	
Type of Injuries		
Fatal	19.7 <sup>a</sup>	
Serious	11.3	
Minor/None	69.0	
Aircraft Damage		
Single-Engine Airplanes	89.1 <sup>b</sup>	17.2 <sup>b</sup>
Twin-Engine Airplanes	8.9	29.9
Turboprop	0.5	32.0
Business Jet	8.3	15.0
Helicopter	2.8	11.5
Other	1.5	34.4

**Notes:**

Comparable data not available for all years. Data shown is tabulated for the following years:

<sup>a</sup> 1990–2000

<sup>b</sup> 1975–1997

Data includes all general aviation accidents, both on- and off-airport.

Source: <sup>a</sup> Data compiled from NTSB, Aviation Accident Database (1990–2000) and  
<sup>b</sup> Annual Review of Aircraft Accident Data (1997) — General Aviation

TABLE E6

## Selected NTSB Accident Data – U.S. General Aviation Aircraft

	Percent of Total Accidents	Proportion Fatal/Serious
Time of Day		
Dawn/Daylight/Dusk	60.7	29.7
Night	39.3	29.6
Weather Conditions		
VFR	33.4	29.4
IFR	66.6	28.3
Aircraft Damage		
Destroyed	16.7	
Substantial	42.2	
Minor/None	41.1	
Type of Injuries		
Fatal	15.6	
Serious	14.4	
Minor/None	70.7	

**Notes:**

Comparable data not available for all years. Data shown is tabulated for the years 1990–2000.

Data includes all air carrier accidents, both on- and off-airport.

Source: Data compiled from NTSB, Aviation Accident Database (1990–2000)

TABLE E7

## Selected NTSB Accident Data – U.S. Air Carrier Aircraft

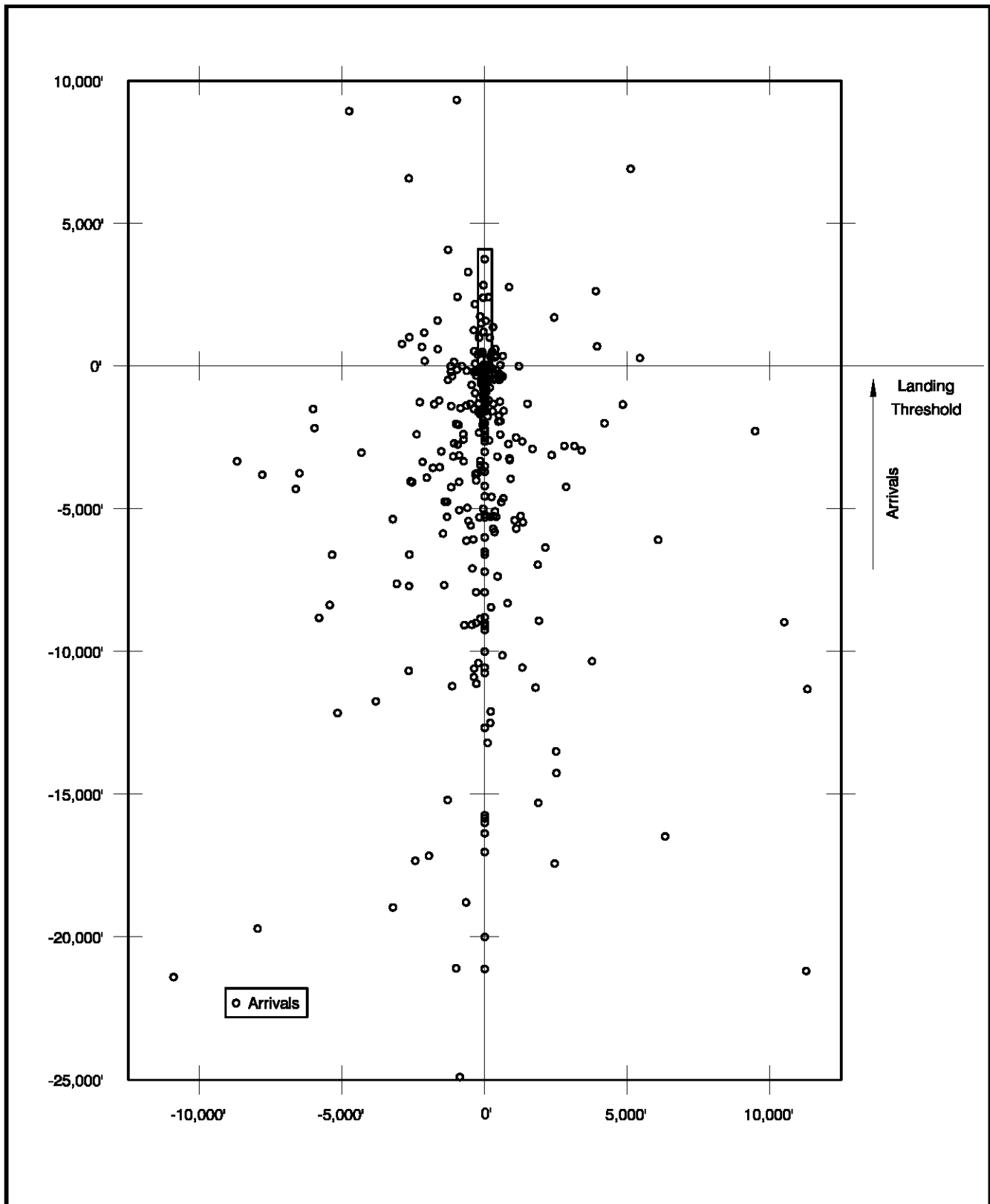


FIGURE E7  
Arrival Accidents

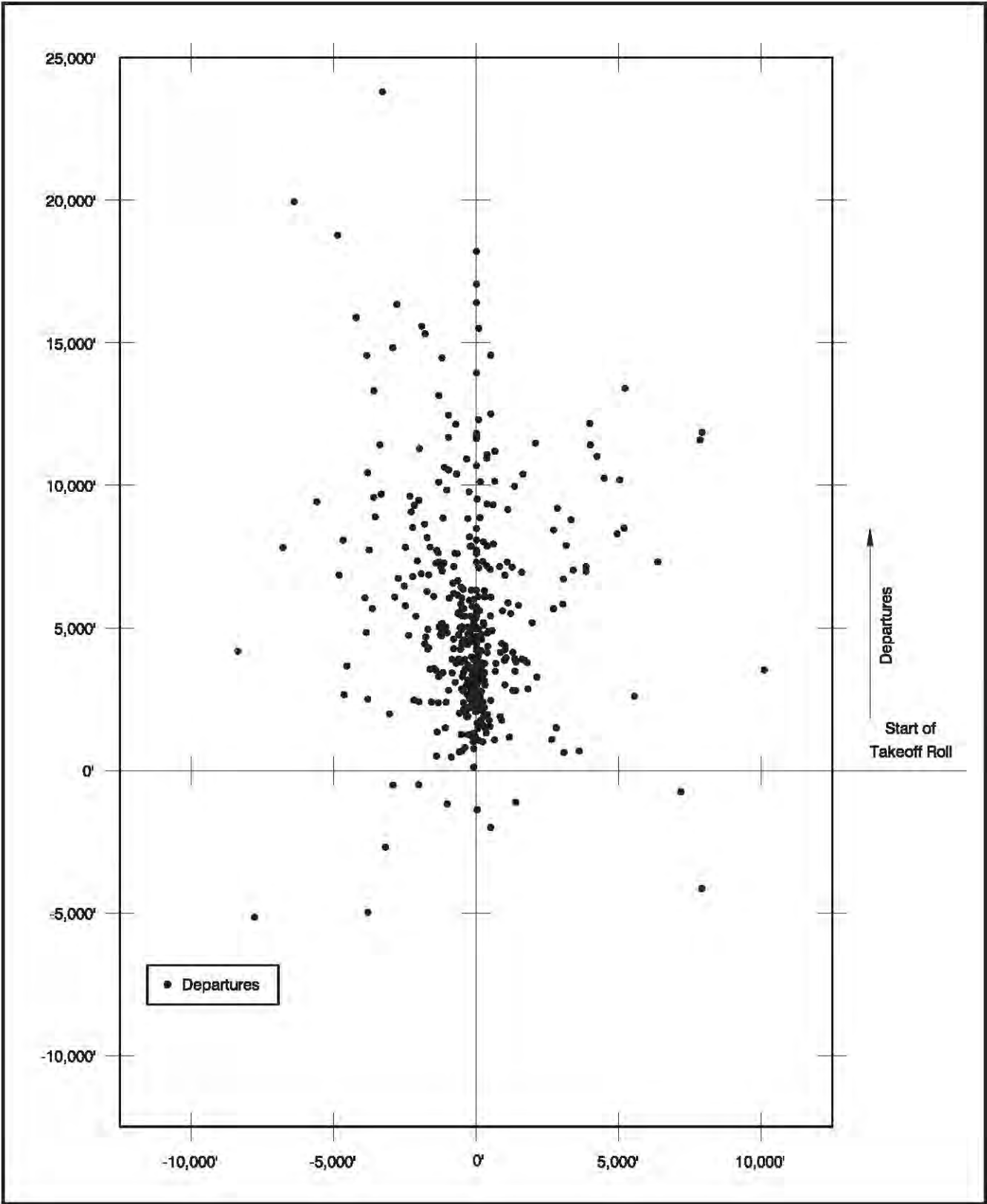


FIGURE E8  
Departure Accidents

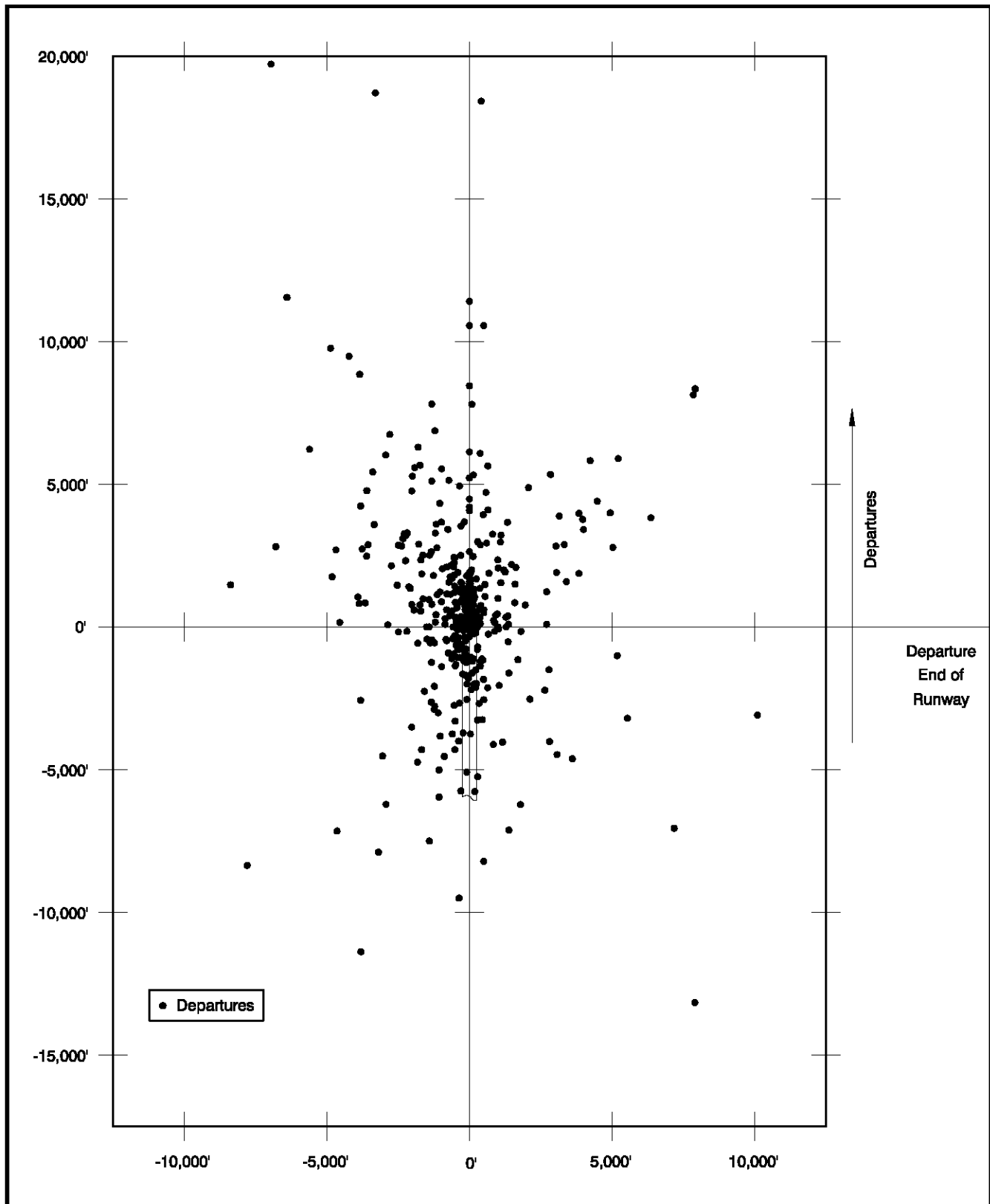


FIGURE E9

## Departure Accidents – Normalized

- ◆ **Departures**—For takeoffs, two choices of common reference point are apparent: the beginning point of the takeoff roll and the departure end of the runway. Except for touch-and-goes and intersection departures, the runway length represents the difference between the two points. Each of these choices has theoretical merits as to the utility of the information provided.

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*As used herein, the departure end of the runway is the end which the aircraft passes on takeoff and climb-out.*

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- Measuring from the start of takeoff roll recognizes the fact that, once an aircraft is airborne, the location of many accidents is independent of the runway length.
- On the other hand, circumstances resulting in an accident 2,000 feet beyond the end of a 5,000-foot runway might result in nothing more than an emergency landing on a 10,000-foot runway. *Normalizing* the data by measuring from the departure end of the runway thus takes into account the significance of runway length in many departure accidents.
- ◆ Figure E8 plots the departure accidents relative to the start of takeoff roll. Figure E9 shows the normalized location pattern. As can be expected, the clustering of points is much tighter when measured from the departure end of the runway.

The total number of accidents in the database is split almost equally between arrivals and departures. By comparison, NTSB data indicates that general aviation landing accidents occur about twice as often as takeoff accidents (Table E2); the substantial number of landing accidents, which take place on or near the runway, accounts for most of this difference. Since these accidents do not have land use compatibility implications, they are not included in the *Handbook* database.

## Effects of Runway Length

Another means of factoring out the runway length variable for departure accidents is to individually assess the location distributions associated with different length runways.

One finding apparent from previous analysis is that the longer the runway, the greater the spread of departure accident locations. Nevertheless, the locations tend to be most closely bunched around the end of the median length runway in each of these groups. Another, perhaps somewhat surprising, variable revealed by the three charts is that arrival accidents also are more spread out for longer runways than for shorter ones. A review of the data suggest several possible explanations for this phenomenon:

- ◆ Almost half (49%) of all accidents on runways of 6,000 feet or more are by twin-engine aircraft compared to only 12% on runways under 4,000 feet.
- ◆ Long runways have more IFR accidents—44% for runways of 6,000 feet or more, 4% for runways of less than 4,000 feet.

- ◆ Similarly, for nighttime accidents, more occur on long runways (45%) than on short ones (16%).

### Aircraft Type Variables

#### ***Single-Engine Propeller Airplanes***

As hypothesized above, the accident locations for single-engine propeller planes tend to be clustered close to the runway ends and also relatively near the extended centerline. For approach/landing accidents, the median distance is 520 feet from the landing threshold. For takeoffs/departures, the median distance is 500 feet from the departure end of the runway and 4,177 feet from the start of takeoff roll. Also, almost 90% of the departure accident points lie within 9,000 feet of the start of takeoff roll.

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*Not certain from the accident records is whether accident locations reported as being on the extended runway centerline might actually be several hundred feet off to the side, especially for accidents occurring some distance from the runway end. It is apparent from NTSB reports that precision in terms of accident site location was not a high-priority objective. Every effort was made in the review of the records to determine the accident location as precisely as possible, but the actual number of points truly on centerline is probably less than shown in the database.*

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#### ***Multi-Engine Airplanes***

The database indicates that the accident locations for twin and other multiengine airplanes, including jets, are comparatively more stretched out than those for single-engine airplanes. The majority of the approach/landing accidents are within 500 feet of the extended runway centerline, but the median distance is more than 2,200 feet from the landing threshold. The takeoff/departure accidents are widely scattered as conjectured in the earlier discussion of aircraft and pilot performance during emergencies. Although the median accident site distance is some 1,100 feet from the departure end of the runway, the sites are spread about evenly in the 5,000 to 10,000-foot range measured from the start of takeoff roll.

#### ***Airline Aircraft***

The project database does not include airline aircraft accidents. For an assessment of these accidents, reference should be made to the FAA commercial aircraft accident study cited earlier in this appendix.

#### ***Helicopters***

Data comparable to that presented here for airplanes may exist in NTSB *Factual Records*, but has not been compiled in any published source. The most detailed assessment of helicopter accident locations currently available is one documented in two reports prepared for the Federal Aviation Administration—*Analysis of Helicopter Mishaps at Heliports, Airports, and Unimproved Sites* and *Analysis of Helicopter Accident Risk Exposure near Heliports, Airports, and Unimproved Sites* (SCT–1991 and SCT–1992). This study found that (between 1977 and 1986) some 37% of helicopter accidents took place on or within 1 mile of a landing site whether it be at an airport, a heliport, or other location. Among all types of helicopter



mishaps (accidents plus incidents), 60% involved obstruction strikes—38% at the landing site and 22% within 1 mile. The majority of the latter group were wire strikes and in each case the wires were unmarked. This finding led the authors of the study to recommend the marking of wires and other objects within a buffer zone below the standard 8:1 approach/departure surface slope of helicopter facilities. Three additional observations are worth noting regarding helicopter accident locations:

- ◆ Because helicopter landing sites are small, a substantial proportion likely occur, or affect locations, beyond the landing site boundaries.
- ◆ Helicopters can take off and land in almost any direction from a heliport, obstacles and wind direction permitting.
- ◆ Beyond the immediate vicinity of the landing site, helicopter flight tracks may be widely divergent unless specific procedures are established for a given airport or heliport (the FAR Part 77 approach/ departure surface for helicopter landing pads is 4,000 feet in length).

## **PILOT CONTROL VARIABLES**

In the discussion of emergency procedures earlier in this appendix, the point was made that a pilot will, if possible, normally attempt to steer the aircraft to an open area when an emergency landing is unavoidable. A general assumption has been that most aircraft are under some control when forced down. The extent of pilot control was therefore one of the variables assessed in the review of the accident Factual Records.

The results of the research were surprising: in over three-fourths of the cases included in the database, the aircraft was not under control when it hit the ground. A probable explanation for this number being so high is that the database includes only accidents, not incidents. Thus, if a pilot makes a successful emergency landing without causing serious injuries or substantial damage, the event is classified as an incident and does not appear in NTSB records even if the landing site is not an airport runway.

### **Other Variables**

#### ***Weather Conditions***

A comparison of accident distributions which took place during visual flight rules (VFR) weather conditions versus those occurring during instrument flight rules (IFR) indicates that IFR arrival accidents tend to occur farther from the end of the runway than VFR accidents do—a median distance of nearly 4,200 feet from the runway approach end for IFR arrivals versus 475 feet for VFR landings.

#### ***Time of Day***

NTSB data (for 1990 to 2000) reveals that approximately 86% of all general aviation accidents and 61% of commercial aircraft accidents take place during dawn, daylight, or dusk, with about 14% general aviation accidents and 39% of commercial aviation accidents

occurring in hours of darkness (officially, one hour after sunset to one hour before sunrise). No definitive data is available on the percentage of aircraft takeoffs and landings made at night. A reasonable estimate is 7% to 10%, although the number varies substantially from one airport to another. The higher incidence of commercial aviation accidents at night is consistent with the expected greater number of commercial operations at night.

Of all the accidents in the *Handbook* database, approximately 25% took place at night. Moreover, nighttime accounted for over 30% of the arrival accidents in the database. If these figures are representative of all off-airport accidents, they suggest that nighttime increases the propensity for accidents to occur beyond the runway environment. Furthermore, nighttime accident sites are generally farther from the runway than are the daytime accident sites—the median is some 2,300 feet greater for arrivals and 980 feet more for departures.

### ***Single-Sided Traffic Patterns***

For most runways, aircraft make left-hand turns as they approach for landing or when they takeoff and remain in the traffic pattern. On some runways, any of a variety of factors may dictate a right-hand pattern. Accidents in the *Handbook* database include a mixture of both situations. A reasonable expectation is that the distribution of accident sites would look somewhat different around runways which have the traffic pattern only on one side.

Surprisingly, though, no significant difference is apparent from a comparison between accidents for runways indicated to have left-hand patterns and without a single-sided traffic pattern.

## **NATURE OF IMPACT**

The nature of the impact that occurs when a small aircraft comes down off airport can vary from a nearly normal landing to a catastrophic crash. When the aircraft remains under control and a reasonably open emergency landing site can be found, the impact can be relatively minor—the potential for injury to people on the ground is small and the aircraft occupants have a strong probability of surviving. The most serious accidents, in terms of risks to people on the ground as well as to the aircraft occupants, are those in which the pilot either:

- ◆ Loses control of the aircraft and, because of damage, low altitude, or improper procedures, is unable to regain control; or
- ◆ Is unable to select a reasonable forced landing spot because of darkness, fog, or the nonexistence of such a spot.

The following discussion examines available data and theoretical findings regarding the nature of the impact from an aircraft accident.

### **Severity**

As can be expected, off-airport aircraft accidents tend to be more severe than those occurring on or near a runway. The accident database summary (Table E4) indicates that the aircraft is destroyed in some 65% of off-airport accidents. Moreover, fatal injuries occur about half of

the time—48% for arrival accidents and 59% for departure accidents. By comparison, NTSB data (Table E6) shows that for all accident locations, the rates for destroyed aircraft and fatal injuries have been only 25% and 20%, respectively. In commercial aviation accidents, the rates are slightly lower: in 17% of accidents the aircraft is destroyed and in 16% a fatality occurs (Table E5).

It must be remembered, however, that these figures are relative to the total number of *accidents*. No information is available regarding how often aircraft make an emergency landing on or off of an airport without incurring substantial damage or resulting in serious or fatal injuries. Nevertheless, the percentage involving severe consequences is undoubtedly much less when all mishaps (incidents as well as accidents) are taken into account.

Darkness and poor weather both adversely affect the severity of accidents. According to NTSB data, about 29% of dawn/daylight/dusk accidents involving general aviation aircraft result in serious or fatal injuries, compared to nearly 45% of the night accidents. About 30% of commercial aviation accidents during the dawn/daylight/dusk period result in fatalities or serious injuries with about the same percentage at night. Likewise, general aviation IFR accidents have serious or fatal results about half (47%) of the time, whereas only a quarter (26%) of VFR accidents have such severe consequences.

### **General Aviation Aircraft Accident Swath**

One of the variables examined during the review of NTSB accident records was the swath length associated with each accident. Adequate information with which to assess this factor was available in only about 53% of the Factual Records. Among the conclusions reached regarding the accidents represented in the database are:

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*Swath length is defined as the distance between where an aircraft first touched the ground or an object on the ground and where it subsequently came to a rest.*

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- ◆ The median swath length for all general aviation accidents is only about 100 feet.
- ◆ Accidents in which the aircraft was under some pilot control typically have longer swath lengths (144 feet on average) than those where the aircraft was out of control (an average of 89 feet).

### **Accidents Involving Collisions with Objects**

Aircraft collisions with objects on the ground can be the cause of accidents or simply a secondary factor in the consequences of the event. Historically, the NTSB's annual reviews of general aviation accident data included counts of accidents in which objects were a cause or factor. Unfortunately, the NTSB discontinued the detailed documentation of this information in 1990. Therefore, the most current data available have been used (1982-1989). Table E7 presents a summary of this data.

In evaluating the data's significance, several points should be recognized:

- ◆ The data includes accidents involving all types of aircraft (helicopters, hot air balloons, etc.), not just airplanes.
- ◆ The location of the objects involved may be either on or off airport.
- ◆ The counts include accidents during all phases of aircraft operation—taxiing accidents, as well as those during approaches, departures, or en route.
- ◆ No distinction is made between accidents in which the objects listed were the cause versus ones in which they were only involved in a secondary manner.
- ◆ The severity of the accidents is not reflected in the data.

A particularly noteworthy finding of the data is the relative rarity of accidents involving residences or other buildings. For an 8-year period (1982–1989), the annual average was only 8.1 for residences and 9.9 per year for other buildings. These numbers represent 0.3% and 0.4% of total accidents, respectively. An earlier study by the Aircraft Owners and Pilots Association (AOPA–1985) for the years 1964–1982 showed a higher average number of collisions with residences and other buildings—a total of 29.6 per year (also summarized in Table E6). However, more aircraft operations, as well as nearly 65% more accidents, took place annually during that period compared to the more recent data. The percentage of annual accidents involving residences and buildings thus averages only about 0.65% in both data sets.

Considering that the *Handbook* database contains only near-airport accidents and only those for which precise location data was available, the results are consistent with the NTSB data. Over the 10-year period covered by the database, some 30 of the 873 accidents involved a collision with a residence (3.0 per year) and 18 involved other buildings (1.8 per year).

### **Effects of an Aircraft Collision with a Building**

Data regarding the probable effects of a small aircraft colliding with a typical house or other small building is documented in a 1985 study (H&S–1985). The research entailed a search for previous studies on the subject, review of historical accident records, and interviews with building demolition experts and aircraft salvage companies. Consideration was also given to what effects might theoretically be predicted.

#### ***Variables***

The consequences of an aircraft collision with a building were found to be affected by many variables. Among the primary ones are:

- ◆ The aircraft weight;
- ◆ The amount of fuel on board;
- ◆ The speed of the aircraft, both horizontally and vertically, at the time of the collision;

- ◆ The angle of contact with the structure (i.e., glancing or head-on);
- ◆ The aircraft attitude when the collision occurs;
- ◆ The extent of aircraft disintegration upon impact;
- ◆ The type of building construction, particularly the composition of the surface struck by the aircraft; and
- ◆ The occurrence and extent of fire after the impact.

### **Conclusions**

The study determined that the combination of these variables is so great as to preclude definitive conclusions. The effects can only be estimated within a wide range of possibilities. To the extent that any meaningful conclusions can be reached from the data obtained, they can be summarized as follows:

- ◆ **Significance of Aircraft Size**—Other factors being equal (which, for any two accidents, they never are), more damage will be produced by larger, faster aircraft than by smaller and slower ones. The amount of kinetic energy produced by a small, but fully loaded, single-engine airplane flying at minimum speed is equivalent to that of a small automobile traveling at about 55 miles per hour. By comparison, a cabin-class twin would generate kinetic energy similar to that of a loaded 10-ton truck traveling 60 miles per hour (McElroy–1973).
- ◆ **Aircraft Design Factors**—Unlike automobiles, aircraft are not designed to remain intact in collisions. The disintegration of the wings and fuselage of a small, general aviation aircraft as it collides with a building dissipates much of the kinetic energy that would otherwise be delivered to the structure.
- ◆ **Frequency of Occurrence**—As stated above, general aviation aircraft collisions with buildings of any kind, and residences in particular, happen infrequently.
- ◆ **Range of Consequences**—*When* an aircraft collides with a small building, the results can range from insignificant to catastrophic. Neither data nor analyses can predict the actual effects of a particular incident.

### **Non-Occupant Injuries**

Injuries to people on the ground (i.e., people who are not occupants of the aircraft) as a result of general aviation aircraft accidents occur even less frequently than collisions with buildings. Most such incidents take place on-airport. National data on injuries to people in residences and other buildings over a 19-year period is summarized in the previously referenced Table E8. Over the period examined, only 3.1 accidents per year resulted in fatal or serious injuries to people in a building.

A direct comparison with accidents in the *Handbook* database cannot be made because the database includes only off-airport accidents and does not distinguish between people in buildings and elsewhere on the ground. Nevertheless, the results show a similarly infrequent occurrence of people on the ground being seriously or fatally injured by an aircraft accident. Only 12 such accidents are in the database.

	Average Number/Year	% of Category	% of All Accidents
Accidents Involving Objects on the Ground (1982–1989) <sup>a</sup>			
Type of Object Involved			
Residences	8.1	1.4	0.3
Other Buildings	9.9	1.7	0.4
Fences/Walls	88.0	15.1	3.2
Poles/Towers	26.4	4.5	1.0
Wires	108.3	18.6	3.9
Trees	242.5	41.7	8.8
Other Objects	98.3	16.9	3.6
Total - All Objects	581.4	100.0	21.2
All Accident Types	2,742.0		100.0
Accidents Involving Buildings and Residences (1964–1982) <sup>b</sup>			
Phase of Flight			
On-Ground	9.1	30.8	0.20
Traffic Pattern	17.8	60.1	0.40
In-Flight	2.7	9.1	0.06
Total	29.6	100.0	0.66
Type of Injuries On-Board or On-Ground			
Fatal	3.7	12.5	0.08
Serious	4.4	14.9	0.10
Minor/None	21.5	72.6	0.48
Total	29.6	100.0	0.66
Type of Injuries to People On-Ground			
Fatal	0.5	27.8	0.011
Serious	0.6	33.3	0.013
Minor/None	0.7	38.9	0.016
Total	1.8	100.0	0.040
All Accident Types (1964–1982)	4,510.0		100.0
Type of Injury			
Fatal	1.8	28.7	
Serious	1.3	20.5	
Minor/None	3.3	50.8	
Total	6.4	100.0	

Source: <sup>a</sup> NTSB, Annual Review of Aircraft Accident Data—General Aviation, 1982–1989<sup>b</sup> Aircraft Owners and Pilots Association (1985)

TABLE E8

## Accidents Involving Objects or People on the Ground





# Risk Concepts

## INTRODUCTION

Maintaining a high degree of safety as lands near airports are developed is clearly an important planning objective. Frequently, planners face issues that have a potential for compromising safety and look for guidance on how best to proceed. Established federal and state regulations are among the resources often examined. However, as outlined in the summary of safety policy foundations in Chapter 3, the narrow focus of official federal and state airport land use safety compatibility policies is apparent. Particularly lacking is guidance regarding protection of people and property on the ground in the event of aircraft accidents in the vicinity of airports. To adequately address this concern, ALUCs and local land use jurisdictions need to go beyond the basic policy foundations.

This task is not simple. While the basic concerns are clear, the extent to which the use of land around airports should be restricted in response to these concerns is not as evident. Defining appropriate safety compatibility policies based upon the available aircraft accident data thus represents a major challenge. To attempt this task requires an understanding of the concepts of *risk*.

Experts in the field of risk have done extensive amounts of research on the topic in general and on certain types of risks in particular. However, very little of this research is specifically concerned with the risks to people and property on the ground in the environs of airports. Even so, there is much of relevance to airport land use compatibility issues that can be gleaned from these broader analyses. Toward that end, the first portion of this appendix examines risk concepts as they concern hazards in general; the latter portion then focuses on how these concepts can specifically be applied to airport land use compatibility planning.

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*In simple terms, risk can be defined as “the chance of injury, damage, or loss.” More technically, risk is “the potential for realization of unwanted, adverse consequences to human life, health, property, or the environment” (Society for Risk Analysis). In mathematical terms, risk equals the probability of occurrence of an unwanted event times the adverse consequences. Risk can be considered as the inverse of safety; the latter being defined as “relative protection from adverse consequences.”*

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The discussion here focuses on risks which have two common characteristics. First, the associated activities are physical in nature (as opposed to being strictly financial, for example). Secondly, the adverse consequences of concern are measured in terms of a specific event (rather than the incremental effects of prolonged exposure). These both are characteristics common to aircraft accident risks.

## **RISK ASSESSMENT**

The assessment of risks and determination of appropriate actions to be taken in response to those risks is a complex and often imprecise process. Some elements of risk can be quantitatively measured and delineated. Risk assessment done in this way is often referred to as technical risk assessment, probabilistic risk assessment, or quantitative risk assessment. These forms of risk assessment are generally equivalent and are most useful for comparing various alternatives in a decision problem, such as, for example, which of two engineering solutions or land use plans has the lower risk.

Most risks, though, also have equally significant qualitative components. Moreover, subjective judgment plays an especially important role in formulation of responses to risks. These characteristics exist even for risks involving only one individual or a small group of people, but are particularly evident when the effects extend to large segments of a community or to society as a whole. Risk assessment that is done from a qualitative perspective is useful in determining why and how risks differ in ways that are not captured or represented by their quantitative or statistical characteristics. This type of risk assessment also helps with understanding what makes some risks appear acceptable and others unacceptable even though they do not differ appreciably in quantitative terms.

### **Measurement of Risk**

The beginning point for any efforts to develop public policies to address most risks is to measure the extent to which a particular risk exists. Risk measurement or analysis is concerned with the question of what might happen.

As noted in the definition above, the two fundamental components of risk measurement are frequency and consequences. *Frequency* measures when or how often an adverse event might occur. The *consequences* component describes what the effects of such an event might be (in terms of fatalities, injuries, property damage, service interruption, etc.).

For most risks involving physical hazards (and certainly those related to airport area land uses), it is useful to consider a third component. Accident frequency can be thought of not just in terms of how often accidents occur, but also in terms of their *distribution*. The distribution component of risk identifies where or for whom there is an exposure to accidents (geographically or to certain segments of the population).

While the frequency and distribution components of risk are measured in quantitative (even if sometimes only relative or rank order) terms, the consequences of accidents can have important qualitative characteristics. Depending upon the perspective taken with respect to the potential

consequences of accidents, the overall risk can be measured with respect to three fundamentally different metrics.

- ◆ **Accident Risk**—Most basic among these metrics is the accident risk rate (sometimes also referred to as crash or failure risk). This number simply measures the annual number of events predicted to occur within a specified unit of area. The consequences component is held constant—that is, the potential consequences are assumed to be the same regardless of where and how often the accidents might occur. The number of general aviation accidents projected to take place in the U.S. in a year is an example of accident risk. By combining the projected accident rate data with historical data on accident locations, the probability of an accident occurring in a given location can be calculated. With respect to aircraft accidents, the resulting information can be presented in the form of contours defining locations having the same probability of accident occurrence.
- ◆ **Individual Risk**—The individual risk rate changes the focus from events to people. Individual risk thus takes into account both the frequency of accidents as measured by the accident risk and the severity or consequences of the accident. Typically, only the most serious consequences to an individual are considered—the risk of death—although sometimes serious injuries are also taken into account. The risk is usually calculated on the basis of a person exposed to the hazard on a constant basis, 24 hours per day, 365 days per year.
- ◆ **Societal Risk**—The most broadly based form of risk metric is societal or collective risk. Societal risks are concerned with consequences that are wider than the discrete effects on individuals. Repercussions of certain events go beyond the immediate casualties and damage to the extent of provoking socio-political response. The need to avoid these types of accidents or events may thus be greater than statistical measurements would suggest. Indeed, societal risk often takes into account non-quantitative elements and can particularly be influenced by public perceptions.

Regardless of the precision to which a risk can be measured, a factor to be recognized is that even scientific measures of risk are inherently subjective in one respect. Scientists and experts typically measure risk in terms of mortality rates or probability of harm. There are many ways in which this information can be portrayed, however. This choice can affect how the data is judged. For example, in the context of transportation, the chance of someone being killed in an accident can be measured relative to total population (deaths per million population), passenger-miles for the transportation mode, or the number of trips. The way in which the data is numerically presented also makes a difference: 1 death per  $x$  people versus  $y$  deaths per million people. The point is that there is no right or wrong frame of reference—no universal set of characteristics—for measuring risk.

## **Risk Perceptions**

While measurement of risks provides essential input to the making of public policy, it is not the only consideration. In our society, decisions about how to respond to many risks—particularly ones affecting many people or whole communities—are not the sole purview of experts. Moreover, such decisions are not based simply on technical analyses and data. The public's *perception* of risks plays a major role as well. Perception is a key component in any assessment of societal risk.

To those experts or others who evaluate risk in a strictly quantitative manner, public perceptions may seem to be irrational or even ignorant. While some component of public reaction may be attributable to these human qualities, other more definable factors are also apparent. Studies have shown that risks are usually perceived to be high when factors such as the following are prevalent:

- ◆ The general public has limited understanding of how the technology or system operates;
- ◆ After a failure in the technology or system, no one, including experts in the field, seems to know and understand the cause (as opposed to events for which the cause is clear);
- ◆ The possible consequences of the hazard evoke feelings of dread, especially concerns about death;
- ◆ The possible consequences seem unbounded (in magnitude or persistence over time) or are believed to be potentially catastrophic;
- ◆ The activity is not under one's own control (the risks are not affected by one's own skills);
- ◆ The risk exposure is not on a voluntary basis (the exposure cannot readily be reduced by changes in one's lifestyle);
- ◆ The hazard is unnatural (not an act of nature);
- ◆ The potential personal or societal benefits to be gained from the activity involved appear to be minimal or nonexistent;
- ◆ The distribution of risks and benefits among groups or geographically is inequitable;
- ◆ The groups at risk include children, elderly, the infirm, or others regarded as having comparatively little control over their own lives; and/or
- ◆ Highly negative imagery about the technology or system is widespread in the media (especially pictures on television, in newspapers, and on the internet).

To a significant extent, the manner in which we judge the importance of these factors depends upon our attitudes toward the underlying technology or system. Our attitudes, in turn, have their basis in social values. These judgments are inherently subjective—there is no right or wrong responses. Thus, at least from the perspective of social science, risk is not an objective concept. Danger is real, but there is no such thing as real risk—risk is socially constructed.

Because of these subjective elements, risk perceptions are frequently not consistent with statistical expectations. Risks are often misjudged, sometimes overestimated and sometimes underestimated. Moreover, judgments about the facts associated with risks may be held with unfounded confidence. As a consequence, technical risk analyses and statistics prepared by experts often do little to change people's attitudes and perceptions. Even news that studies of a potential risk are being conducted can add to public concerns. The rapidity with which information—both accurate and inaccurate—is transmitted today further adds to the challenge of placing risks in a proper perspective within society as a whole.

Another factor which affects how a risk is perceived is the scale on which the risk is measured. Experts typically measure risk in terms of fatalities. To most people, though, riskiness means more than the number of deaths per year. The manner in which the presence of the risk affects one's daily life also influences how the risk is viewed.

Even when annual fatalities is the accepted risk measure, statistically equivalent risks may be perceived differently. For example, a technology or system on which one accident with 100 fatalities has occurred is likely to be judged more risky than a system which has experienced 100 accidents having one fatality each. In effect, there is a penalty function which gives added weight to events with large consequences. On the other hand, our familiarity with particular technologies or systems can also affect how their associated risks are perceived. The apparent seriousness of an unfortunate event is determined in part by what the event signals or portends—what its potential social impact may be. An accident on an unfamiliar system, even if small in size, may be viewed as a harbinger of more catastrophic events and thus deemed to be worse than a large accident on a familiar system.

A final, not often acknowledged, element of risk perception is hindsight. Knowing that something has happened increases its perceived inevitability. What is more, not only do such occurrences seem in retrospect to have been inevitable, the judgment often is that they should have been anticipated in advance. “On the other hand, perhaps the handwriting on the wall was written in ink visible in hindsight alone” (Fischhoff–1975).

As one author summarized the topic: “...there is wisdom as well as error in public attitudes and perceptions. Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments” (Slovic–1987).

## **Risk Comparisons**

Another approach to risk assessment is to compare a new or uncertain risk with risks which are better known and understood. Both the general public and risk experts engage in making these comparisons. Although such comparisons must be made with caution, they can be informative.

One situation in which risk comparisons can be useful is with respect to infrequently occurring events. For frequent events, risks can be measured with a great deal of precision. However, the probability of events which take place infrequently—even though they may be of high consequence—is very difficult to predict with any high degree of statistical accuracy. For many technologies, the very success of hazard reduction efforts has led to relatively few events from which to calculate the level of risk.

In general, observed data cannot lead to confident estimates of extremely rare events. The probability of events with 50-to-100-year intervals can be estimated with a reasonable degree of confidence, but not those with 10,000-year intervals. In such situations, an alternative approach is to measure risk levels in a relative rather than probabilistic manner. Experts in a particular technology often can identify the locations or circumstances which present higher-than-usual risks, even if they cannot estimate the probability of an event.

The danger of risk comparisons is that differences among risks can be oversimplified if both the quantitative and qualitative attributes are not considered. The general public may overlook important measurable factors. On the other hand, experts may gauge the acceptability of risk solely in terms of the probability of fatalities or other loss, but ignore the *context* within which the risk occurs. Context helps us to gain perspective on the size and scope of a risk and to determine what response may be appropriate.

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*It is because of the difference in context that comparisons between the chance of a person on the ground being injured or killed as a result of an aircraft accident and the chance of a similar result from being struck by lightning are not valid. Hazards from technological and natural events are not perceived the same.*

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## RESPONDING TO RISKS

Ultimately, the decisions we—as individuals or as a society—make in response to hazards come down to a question of our tolerance for or acceptance of the risks which are known or believed to be involved. This is not a question which can be answered in an absolute sense, however. Society’s allocation of resources must be taken into account. It is always possible to reduce risk, but the cost of doing so increases as the risk becomes smaller.

One approach risk experts have taken to answering this question is to divide risk into three categories separated by two key boundary lines.

The three risk levels are described as follows:

- ◆ Intolerable risks;
- ◆ Significant but tolerable risks; and
- ◆ Acceptable risks.

The three levels of risk are then divided by the following boundary lines:

- ◆ The upper boundary line is the threshold of intolerable risk. Risks exceeding this threshold must be reduced below the line regardless of cost. From an individual perspective, these are risks which are not tolerable regardless of the amount of money offered in compensation.
- ◆ The lower boundary line is the threshold of acceptable risk. Risks below this level merge into the background risks of life and require no action. We generally do not concern ourselves with these risks as we go about our daily lives.

Given this categorization, the next question which might be asked is where any specific risk falls within the overall spectrum.

## Judging Risk Acceptability

As indicated earlier, accident risks can be assessed as a combination of two things: the anticipated *frequency* of an occurrence at any given location and the potential magnitude of adverse *consequences*. One qualitative method of judging risk acceptability thus is to divide the

full range of frequencies and consequences into discrete increments and then evaluate the implications of each possible combination of the two components. The result will be a matrix such as the one shown below. The matrix illustrates the conceptual relationship between accident frequency, potential consequences, and judgments as to the overall risk acceptability. Frequency is calculated in terms of the number of events within a specific time period and location. Consequences are typically defined in terms of injuries, particularly fatalities and serious (life-threatening) injuries. Property damage can also be included, however.

Conceptual Relationship of Risk Components						
		Potential Consequences				
		Negligible	Minor	Major	Severe	Disastrous
Anticipated Frequency of Occurrence	Frequent					
	Occasional					
	Uncommon					
	Rare					
	Extraordinary					
Legend		Acceptable Risk		Significant Risk		Intolerable Risk

This matrix suggests a variety of possible risk responses. For example:

- ◆ Risks which have negligible consequences do not warrant specific action regardless of how frequently the events occur. Even minor consequences do not make the risk significant unless the frequency is such as to be almost predictable.
- ◆ Activities with potentially major adverse consequences generally necessitate investigation into possible risk reduction measures unless the events rarely occur.
- ◆ A combination of relatively frequent occurrence and potentially high consequences means that action to reduce the risks to a tolerable level must be taken.
- ◆ While potentially disastrous consequences are always significant and the risk reduction measures need to be evaluated, action still may not be warranted when the events are rare or extraordinary.

Several additional points regarding this matrix are worth noting. First is that it pertains only to risks for which exposure is *involuntary*. People generally accept higher risks when they engage in an activity voluntarily and have a high degree of self control over its outcome. Greater risks also are tolerated when more *benefit* is to be gained from the activity. Thus, the public tends to accept higher risks from voluntary activities (such as driving a car) than from equally beneficial involuntary risks (food preservatives, for example). Another factor in judgment of risk acceptability is public perception. As a result, for certain risks, adjustments to the matrix may be necessary to reflect the influences noted earlier as having an effect on risk perception.

One further point is that both individual and collective risks are relevant to the assessment of acceptability. For some activities or circumstances, individual risk may be low either because accidents are rare or because the likelihood of severe consequences (death or serious injury) is

minimal even if more minor mishaps are comparatively common. Nevertheless, even when measurable individual risk is low, governmental regulations to prevent some harm may be warranted simply because a large number of people are exposed.

Lastly, no attempt to quantify either the frequency or consequences components of the matrix has been made here. Such a step may be possible although the ranges would vary depending upon the type of risk involved. Again, the only intent of the matrix is to illustrate the conceptual relationships among risk components and risk acceptability.

Of interest, though, is that—despite the variability in how frequency and consequences would need to be quantified depending upon the hazard involved—the combination of the two components has a quantifiably consistent relationship to acceptability regardless of the type of risk. That is, the measured level of risk which defines the boundaries between intolerable, significant, and acceptable risks has been found to remain relatively constant across a wide range of hazards. To be specific:

- ◆ The upper limit of tolerability for involuntary risks has been concluded to be on the order of one death per 10,000 people, or  $10^{-4}$  chance of death to an individual, per year. Risks exceeding this level essentially mandate government intervention.
- ◆ Society also seems to have achieved a general consensus that governmental action to protect public health and safety is usually warranted if a hazard results in an annual death rate of more than 1:100,000 ( $10^{-5}$ ).
- ◆ Risks of death as low as 1:1,000,000 ( $10^{-6}$ ) per year are also commonly of sufficient concern to justify further investigation into possible actions.
- ◆ Lower levels of risk generally do not merit an explicit response unless the risk presents broader societal implications or is widely perceived in a manner which heightens its significance.

To emphasize the point, these numbers refer to risks to which people are exposed on an involuntary basis. As indicated above, people will accept a much greater risk when the exposure is on a voluntary basis. Indeed, risk researchers have concluded that acceptance of voluntary risks is roughly 1,000 times greater than for equally beneficial involuntary risks (Fischhoff–1979).

## **Weighing Responses to Risks**

Risks which fall into the middle (significant) range—ones which are tolerable, but not particularly acceptable—represent the greatest challenge for determining appropriate responses. Intolerable risks must be dealt with in all cases and acceptable risks require no action. The mid-level risks, while significant, may or may not warrant a response depending upon the circumstances. In general, the objective in dealing with these risks is to make them as low as reasonably practical.

Various approaches have been devised as means of evaluating actions to be taken in response to the mid-range risks. Perhaps most common are cost-benefit analyses. The difficulty with cost-benefit analyses, though, is that they necessitate having data which is both meaningful and can



be quantified. This often requires judgments—determining the value of human life, for example.

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*The 1952 Report of the President's Airport Commission comments on this topic that: "...'calculated risk' is an American concept which gives mobility to the whole social structure. The phrase simply means a willingness to embark deliberately on a course of action which offers prospective rewards outweighing its estimated dangers."*

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A further consideration is that a safety measure that seems appropriate on a cost-benefit basis may not be reasonable in a cost-effectiveness sense. That is, even if the benefits outweigh the costs, other measures may be available which could achieve greater benefits for the same cost or the same benefits for less cost. The range of possible safety measures thus generally also needs to be evaluated on a cost-effectiveness scale. The objective of cost-effectiveness analyses is to help set priorities among different risk reduction measures so as to achieve maximum safety for the amount spent. Cost-effectiveness analyses also can help to sort out the interactions among hazards. A risk reduction measure which may not manifest the highest benefit-cost ratio with respect to one particular hazard, may nevertheless be the most overall cost-effective measure because it can reduce multiple risks.

Another factor to be considered in cost-benefit or cost-effectiveness analyses of risk reduction measures is who bears the costs and who attains the benefits. For most risks which affect a large number of people, costs and benefits are seldom distributed equally. Governments, particularly the federal government, are usually better able to bear the costs of risk reduction measures than are private individuals or businesses, but even governments must balance the investment against the benefits. Economic feasibility has further implications where the costs are to be borne privately. When government-imposed measures are not affordable, the rules may be circumvented and enforcement can then become a problem.

Determining appropriate responses to risks associated with events which are extraordinarily rare but potentially catastrophic presents a particularly difficult test. An example of this type of hazard is a volcanic eruption. One study of this risk pondered whether anything at all should be done to protect against such an event given its extreme rarity (William Spangle and Associates—1987). On the other hand, the report notes that "the potential for a major catastrophe which could be averted begs for some kind of public response." As for where to strike the balance between acceptable risk and affordable protection, the report concludes:

"Do what you can, politically and fiscally, to reduce the exposure and provide for effective emergency response and that becomes, by definition, acceptable risk. An official who proposes to go farther than his constituents want will find out quickly what the limits are."

Lastly, it is important to recognize that, whether accurate or not, public perceptions about risks play an influential role in determining the priorities of legislative and regulatory bodies. These entities, in turn, must exercise their own judgments about both the quantified risk data and the public perceptions of the risks. The amounts spent to reduce various types of risk can thus vary greatly and with little apparent rationality when viewed in light of the measured risks. For example, U.S. society has spent some 75 times as much to prevent each death due to

environmental toxin exposure as it has to prevent each death from transportation accidents (Tengs–1994).

One risk expert sums up this tendency toward inconsistency by noting that good analysis may be insightful, but need not be conclusive. “Uncertainty about facts and values in a disorderly social world means the various decision making approaches must be viewed as tools rather than ends in themselves.” Thus, perhaps “the best we can hope for is some intelligent muddling through” (Fischhoff–1979).

## **PUTTING AIRPORT LAND USE RISKS INTO PERSPECTIVE**

Assessing and responding to the risks which aircraft accidents pose for land uses around airports is a difficult process. Compared to aircraft noise, there is little data from which to work—risks cannot simply be measured with a “risk level” meter. Even if better data were available, the problem would remain as to how to determine appropriate responses. Again, there is relatively little with which to compare. A variety of studies address the topic of accident-related risks. Most of these studies focus on evaluating actions which can be taken to reduce the frequency with which the accidents occur. With land use compatibility planning around airports, however, reducing the frequency of accidents is not the objective—except for airspace obstructions, land uses have little effect on whether aircraft accidents occur. Rather, the purpose is to minimize the consequences of accidents when they happen.

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*From a risk reduction perspective, a fundamental objective of airport land use compatibility planning is to minimize the consequences of aircraft accidents when they happen.*

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### **Measuring the Risk**

Conceptually, calculation of the risks associated with potential aircraft accidents near airports is easy. The risk consists of a combination of the three earlier described components: frequency, consequences, and distribution. The difficulty, though, lies in the fact that each of these components is complex to measure particularly with regard to any single airport. Errors and inaccuracies can easily be introduced into the equation. The following are some insights into factors which affect measurement of each of these components.

- ◆ **Frequency of Occurrence**—While the historical number of aircraft accidents nationwide has varied to some extent from year to year, future trends can nevertheless be predicted with a fair degree of accuracy. Even with respect to specific classes of aviation (air carrier, general aviation, military) or types of aircraft (business jets, helicopters, etc.), the frequency of accident occurrence is fairly constant and predictable. The difficulty with prediction arises when the focus is on a single airport rather than nationwide data. Even for busy airports, the frequency of occurrence may be once per some multiple number of years. As discussed earlier, predictions become less certain as the number of events becomes less frequent. A further complication with measuring frequency of occurrence lies in defining the types of events that are of interest. Clearly, accidents are the most significant events for airport land use planning purposes, but lesser mishaps are also relevant. Even though aircraft sometimes successfully land off airport—and thus the event is not treated as an accident—the potential exists that any such occurrence could have more serious consequences.

- ◆ **Potential Consequences**—The consequences of an aircraft accident on land uses near an airport can basically be described in terms of the number of people killed or injured and the size and value of the property damaged. However, as described in Appendix E, the consequences of any particular accident depends upon numerous variables involving the aircraft characteristics, the manner of its descent, and the nature of the terrain and land uses at the site. Because of the wide range of each of these variables, the outcome is highly uncertain. Therefore, even though the vast majority of near-airport aircraft accidents do not result in serious land use consequences, the emphasis in any analysis needs to be on the potential consequences—that is, on what could happen. Moreover, in terms of airport land use compatibility planning, the issue is what could happen if incompatible development is allowed to occur.

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*An important point to realize with respect to near-airport aircraft accidents is that the consequences have historically most often been minimal because of the extent of undeveloped or low-intensity uses near many airports. Allowing more intensive nearby development can only increase the frequency with which more severe consequences occur.*

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- ◆ **Spatial Distribution**—Although not huge by many standards, the aircraft accident data described in Appendix E is sufficient to enable the spatial distribution of accidents to be well defined for each category of airport (air carrier, general aviation, and military). This distribution is broadly applicable to most airports within each category. Nevertheless, to more accurately predict where future accidents are most likely to occur at a particular airport, the physical characteristics and usage patterns of the airport need to be considered. The risks will generally be most concentrated along the flight routes which aircraft use most frequently.

To summarize measurable airport land use risks in the context of the preceding discussion of risk concepts, near-airport aircraft accidents are events which occur infrequently, but have potentially high consequences. Moreover, despite the relative rarity of the events, the spatial distribution of aircraft accidents near airports can be delineated quite well as indicated by the data presented in Appendix E and the potential consequences can be directly related to the characteristics of land use in the areas of concern.

## **Risk Perceptions and Comparisons**

Proponents of land use development near airports sometimes attempt to quantitatively assess the risks of an aircraft accident and then dismiss the risk on the basis of comparison with other types of risks. Caution should be exercised in the preparation and review of such analyses.

One factor to be recognized is that, while the spatial distribution of aircraft accidents is quite predictable close to the ends of runways, it is less so at greater distances. This is particularly true for general aviation airports because their aircraft flight tracks are comparatively more spread out than at major air carrier airports. Analyses thus need to be done with respect to relatively broad-scale areas. Otherwise, by defining a sufficiently small site of interest, the accident probability can be calculated as near zero (the probability of an accident occurring somewhere in the airport vicinity is much greater than the probability of an accident occurring on a particular one-acre site).

Several studies have sought to take the step of broadly quantifying the individual risk which aircraft accidents represent for people on the ground. The results from two of these studies (NATS–1997; Shutt Moen Associates–1999) are useful in putting airport land use risks into a context with other types of risks.

- ◆ The level of individual risk for a given location near an airport is dependent to a significant extent upon the number of aircraft operations and to a lesser degree upon the type of aircraft. The greater potential consequences of a large air carrier aircraft accident compared to that of a small general aviation aircraft is balanced by the fact that the larger aircraft have fewer accidents per a given number of operations.
- ◆ Not surprisingly, the data shows the highest level of risk occurs immediately beyond the runway ends. These risks are on the order of 1:10,000 ( $10^{-4}$ ) per year and are typically contained within the limits of the airport's runway protection zones (RPZs).
- ◆ The extent of risks at the 1:100,000 ( $10^{-5}$ ) level is more dependent upon the volume of aircraft operations on a runway, but generally is within an area immediately surrounding the RPZs.
- ◆ The 1:1,000,000 ( $10^{-6}$ ) risk level, although also dependent upon aircraft operations numbers, is much more extensive. Even for a moderately busy general aviation airport, risks of this magnitude can extend two miles from the runway. For major air carrier airports, the distance is greater, but the risk is more concentrated along the extended runway centerline than is the case at general aviation airports. The risk tends to be more dispersed for general aviation airports because aircraft follow more varied flight tracks than do larger aircraft.

Another consideration with regard to comparisons between airport land use and other risks is that subjective characteristics must be similar. In the context of the previously mentioned factors which influence public perceptions, the risks of off-airport aircraft accidents can be characterized as:

- ◆ Not voluntary except to the extent that people choose to live near an airport;
- ◆ Not controllable as a function of the individual's skills;
- ◆ Generally not well understood;
- ◆ Including consequences which are unpredictable;
- ◆ Not an act of nature;
- ◆ Giving no advance warning of an impending event; and
- ◆ Usually not balanced by potential personal benefits of the activity.

Because of these factors, comparisons with the chance of fatal injury as an occupant in an automobile accident or from being struck by lightning, for example, are not directly relevant to the issue of airport land use compatibility planning.

## Responding to the Risk

Regardless of the method used to assess the risks, a decision still must be made as to what the public-policy response should be. The basic question to be asked is *how much risk is acceptable?* As discussed earlier in this appendix, acceptability can be evaluated as a function of the frequency and consequences of undesirable events. The chart on page F-6 is helpful in showing the conceptual relationship between these two components. When applying this chart to the defining of safety compatibility criteria, though, two factors should be kept in mind:

- ◆ To be of value to airport land use compatibility planning, the frequency scale needs to be considered primarily in terms of the relative concentration of aircraft accidents near airport runways. If the scale is set relative to the wide range of physical risks, then aviation-related risks to land uses near airports would probably all fall in the rare category.
- ◆ For most airports, the risks to nearby land uses are dominated by the consequences side of the risk equation. Even a small airplane could cause major to severe harm if it were to strike an exposed, densely populated site. Only in essentially unoccupied locations such as range lands or wilderness areas can the potential consequences to people on the ground be considered negligible or minor.

As also indicated in the earlier discussion of risk concepts, the acceptability of a risk is not the only consideration in the establishment of public policy in response to that risk. An additional question to be weighed is *how much protection can society afford to provide?* Or, to put the issue another way, *how safe is safe enough?*

To answer these questions, the benefit-cost ratio of the risk reduction measures must be taken into account. When an airport is situated in a rural area, well away from development pressures, the cost—to the landowner, the community, and the airport—for a high degree of protection may be low. Important land use development can usually be redirected toward areas where the prospects of an aircraft accident are minimal. At the other end of the spectrum, the need for developable land around urban area airports typically is such that avoidance of only very risky forms of development—those in the most accident-prone locations or ones which greatly increase the potential severity—may be affordable. It is for this reason that some ALUCs allow infill development to occur in established urban areas even though the development would typically not conform to compatibility criteria.

Also an element of any cost-benefit evaluation of acceptable land uses near airports is that the outcome is different for existing development than it is for proposed new construction. While the benefits of having compatible land uses are the same whether development already exists or not, the cost of eliminating incompatible uses is usually much greater than the cost of avoiding them in the first place. Safety compatibility policies developed for use in Great Britain acknowledge this distinction (NATS–1997). Specifically, the British policy is:

- ◆ To eliminate existing incompatible development, if any, within areas where the individual risk exceeds 1:10,000 ( $10^{-4}$ ).
- ◆ Except for low-intensity nonresidential uses, new development should be avoided in locations where the risk exceeds 1:100,000 ( $10^{-5}$ ). However, existing development—other

than highly risk-sensitive uses such as schools, hospitals, and places of assembly—can remain.

- ◆ In locations where the risk level is less than 1:100,000 ( $10^{-5}$ ), the only necessary restrictions on new development are to avoid schools, hospitals, and places of assembly.

## Accident Distribution Contours

One approach to identifying accident location patterns is to group the accident data points according to their relative degrees of geographic concentration. A particularly illustrative perspective on the distribution of accidents near runways is the three-dimensional view shown in Figure F1. The vertical dimension to the graph represents the number of accident sites within each of the cells in the grid (the grid spacing used was 300 feet by 300 feet). The approach end of the runway is at the center of the graph and the runway extends up and to the right from there. Clearly evident is the concentration of accident sites—primarily arrivals—near the runway’s approach end. The second hump lies along the runway and its extended centerline and is mostly comprised of departure accidents. (Note that this chart is derived from the accident database contained in the 1993 *Handbook*. Although smaller in size than the database analyzed in the 2002 edition, the spatial distribution of accident sites is similar to that of the expanded database.)

While informative in a visual sense, the three-dimensional chart is not very useful for analytical purposes. More valuable is to depict the data in the form of a set of accident distribution contours.

Figures F2 through F9 portray contours for various subsets of the general aviation aircraft accident location data from Appendix E. (No comparable analyses of air carrier and military aircraft accidents have been conducted.) Any number of contours can be defined. In this case, the contours divide the accident data sets into five equal groups of 20% each. The contours encompass the most highly concentrated 20%, 40%, 60%, and 80% of the data points. The remaining 20% occur beyond the outermost contour, including some points beyond the limits of the diagrams. The contours are irregular in shape. No attempt has been made to create geometric shapes.

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*The accident distribution contours depict where an aircraft accident is most likely to happen when one occurs. Because these contours do not take into account either the accident frequency over time or the consequences of the accidents, they technically are not risk contours.*

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Various computer programs potentially can be used to create contours from scattered, individual x/y data points such as those represented by the accident location data. The results may vary depending upon the type of program used and the assumptions applied to measuring the degree to which a group of points is concentrated. The contours shown here were developed using geographic information system software to count the number of other points within a certain radius of each specific point, then ranking the results.

## All Runway Lengths

Figure F2 depicts the accident distribution contours for all general aviation arrival accidents in the database; Figure F3 shows the contours for departure accidents. In both instances, all runway lengths are represented. Several geometric patterns are evident from a look at the two graphs:

- ◆ Arrival Accident Patterns (The zero/zero point on the axes is the landing end of the runway.)
  - Arrival accident sites tend to be located close to the extended runway centerline.
  - Some 40% fall within a narrow strip, approximately 500 feet wide and extending some 2,000 feet from the runway end.
  - Over 80% of the arrival accident sites are concentrated within just 2,000 feet laterally from the extended runway centerline, but extending outward to approximately 11,000 feet (about 2.0 miles) of the runway end.
- ◆ Departure Accident Patterns (The zero/zero point on the axes is the takeoff end of the runway.)
  - Departure accident sites also tend to be clustered near the runway end, but are not as concentrated close to the runway centerline as are the arrival accident sites.
  - The most tightly bunched 40% of the points lie within an area 1,500 feet wide, extending approximately 2,000 feet beyond the runway end, but also adjacent to the edges of the runway.
  - The 80% contour extends some 6,000 feet beyond the runway end plus along the sides of the runway and spreads laterally approximately 2,000 feet from the runway centerline.
  - Two factors account for the substantial number of departure accident sites lateral to the runway.
    1. As defined for the purposes of the database, departing aircraft that crash while attempting to return to the runway are counted as departure accidents unless the aircraft became established in the traffic pattern or on final approach.
    2. On long runways, aircraft may begin to turn before reaching the far end of the runway.

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*Another variable for which an accident location pattern diagram is included in Appendix F is for single-sided traffic patterns. Intuitively, the distribution of accidents at airports with a pattern on only one side can be expected to differ from that at airports with dual traffic patterns. However, as discussed in Appendix E, the information in the database is insufficient to adequately assess the differences.*

---

## Variations by Runway Length

From the data and discussions in Appendix E, it is evident that the patterns of general aviation aircraft accident locations near runways differ substantially depending upon characteristics of the runway and aircraft involved in each instance. Particularly notable in this regard are the

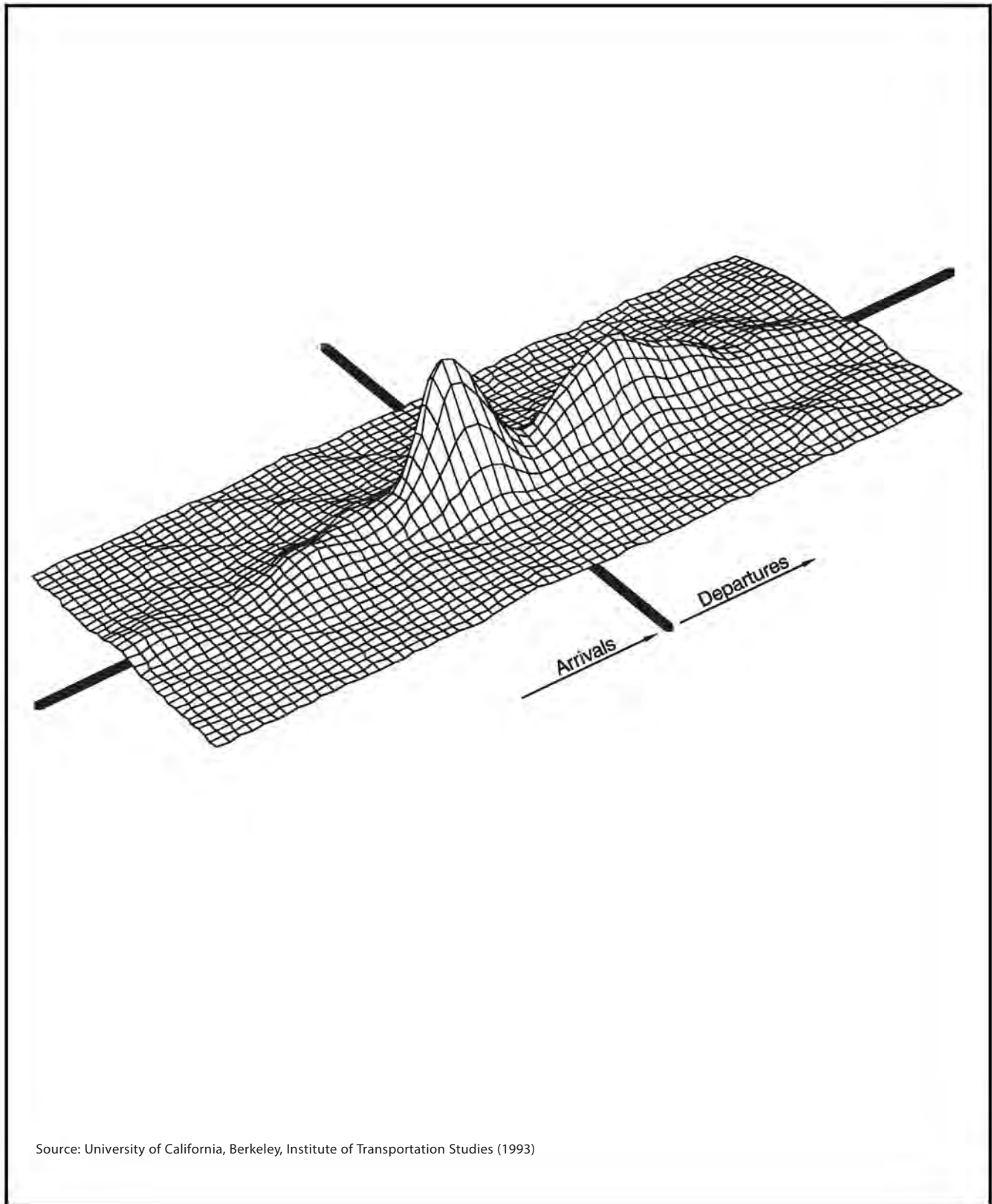


FIGURE F1

## Three-Dimensional Plot of Accident Distribution Pattern – General Aviation Aircraft Accident Database



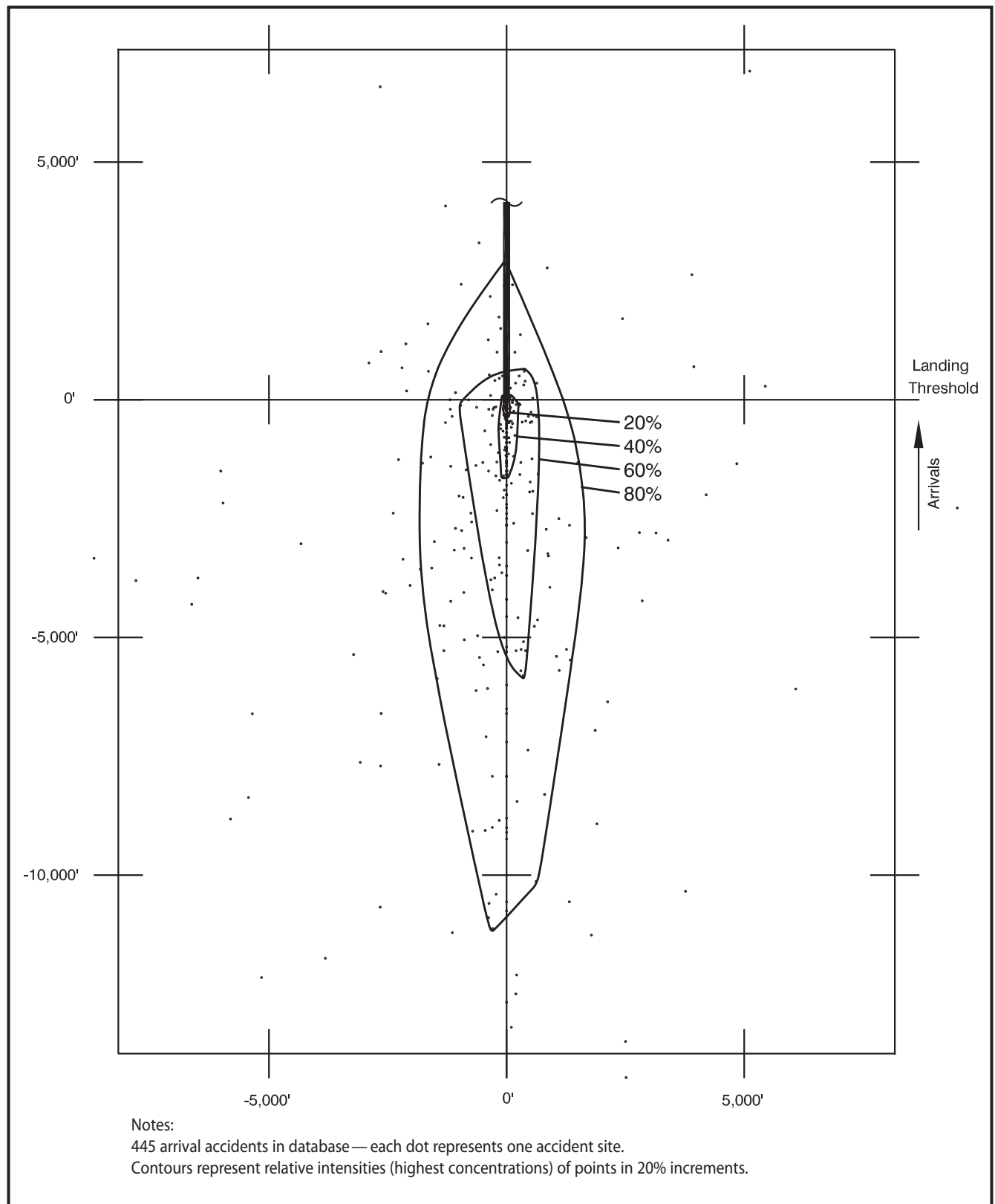


FIGURE F2

## General Aviation Accident Distribution Contours – All Arrivals

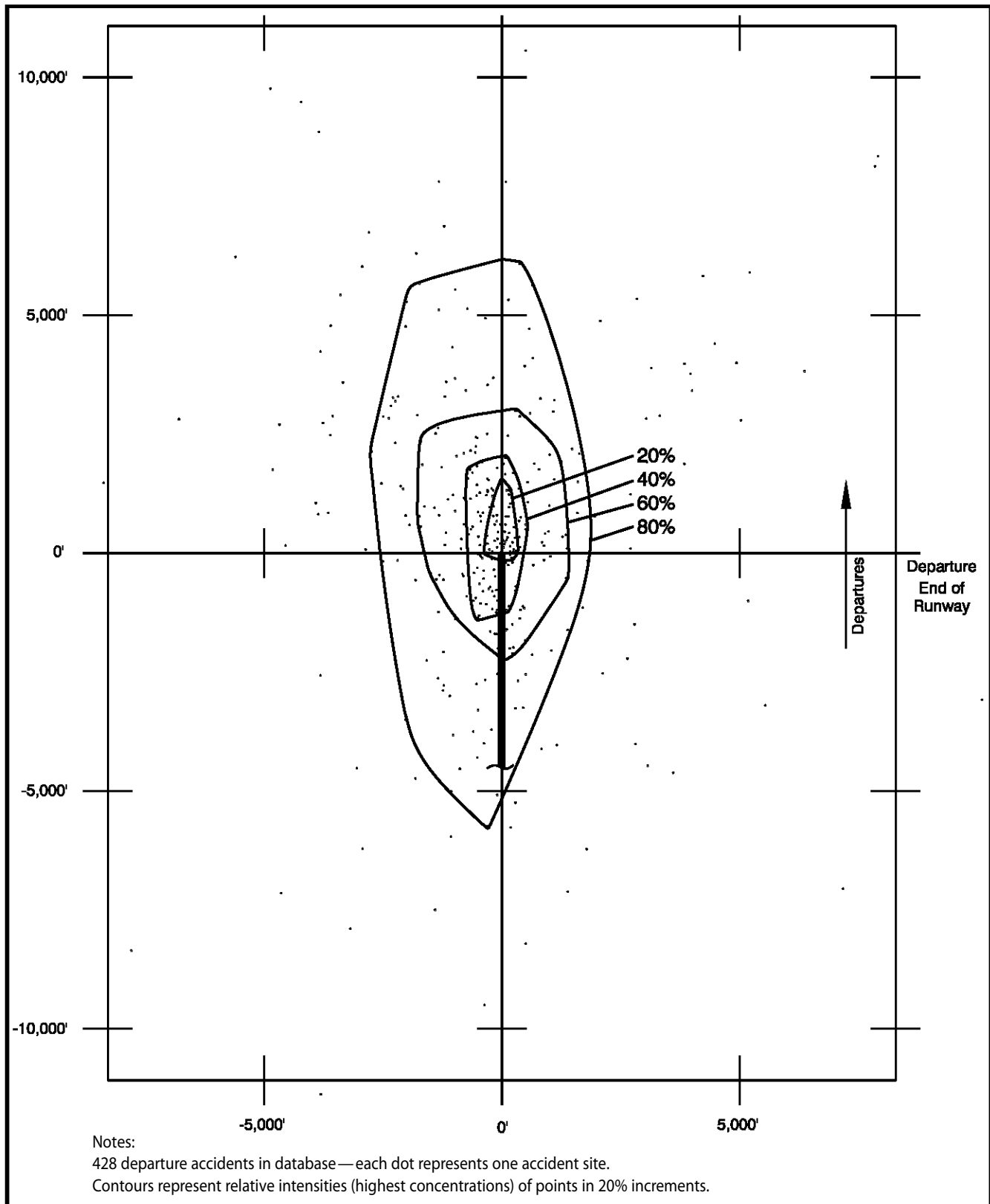


FIGURE F3

## General Aviation Accident Distribution Contours – All Departures

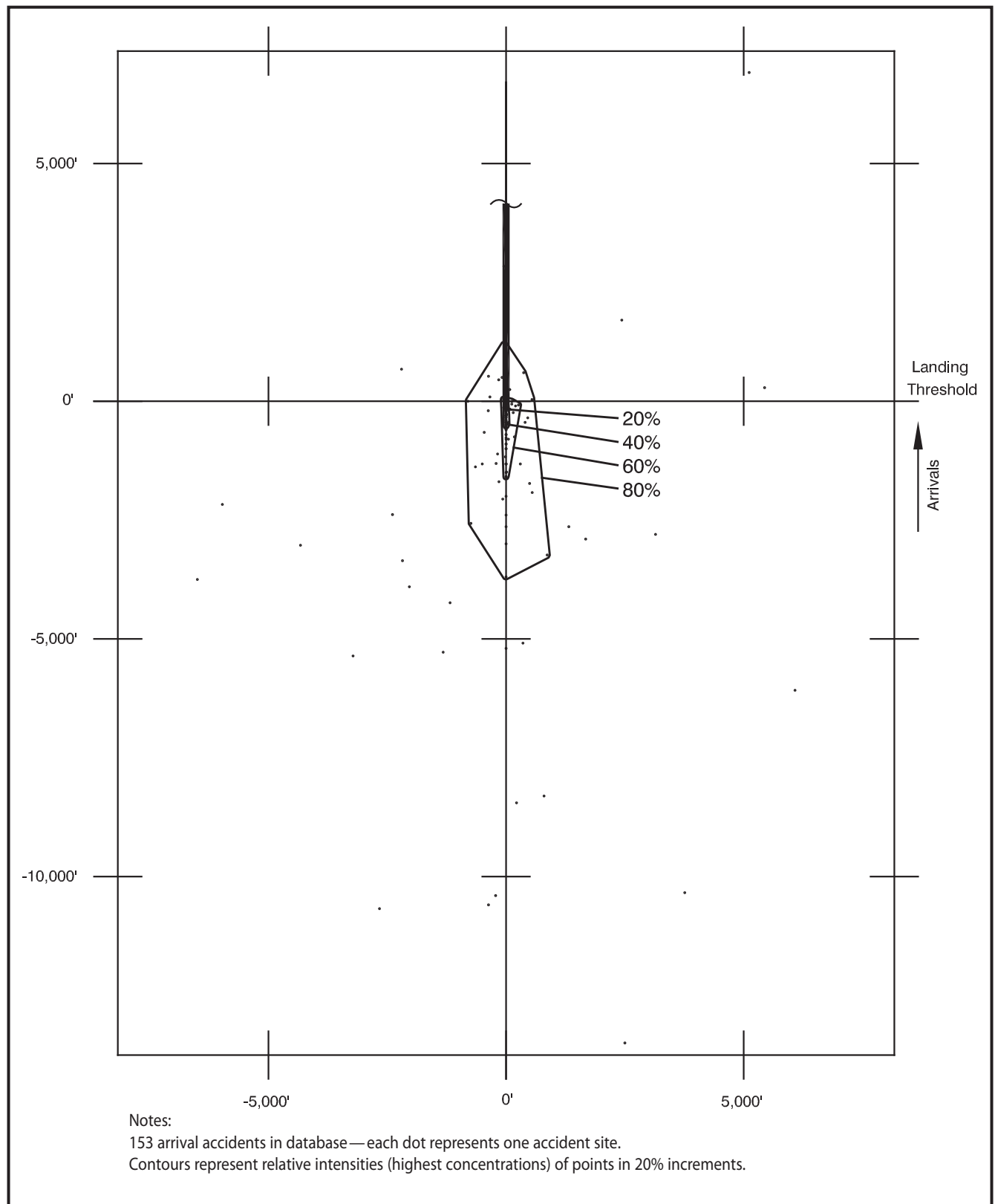


FIGURE F4

## General Aviation Accident Distribution Contours – Arrival Accidents on Runways of Less than 4,000 Feet

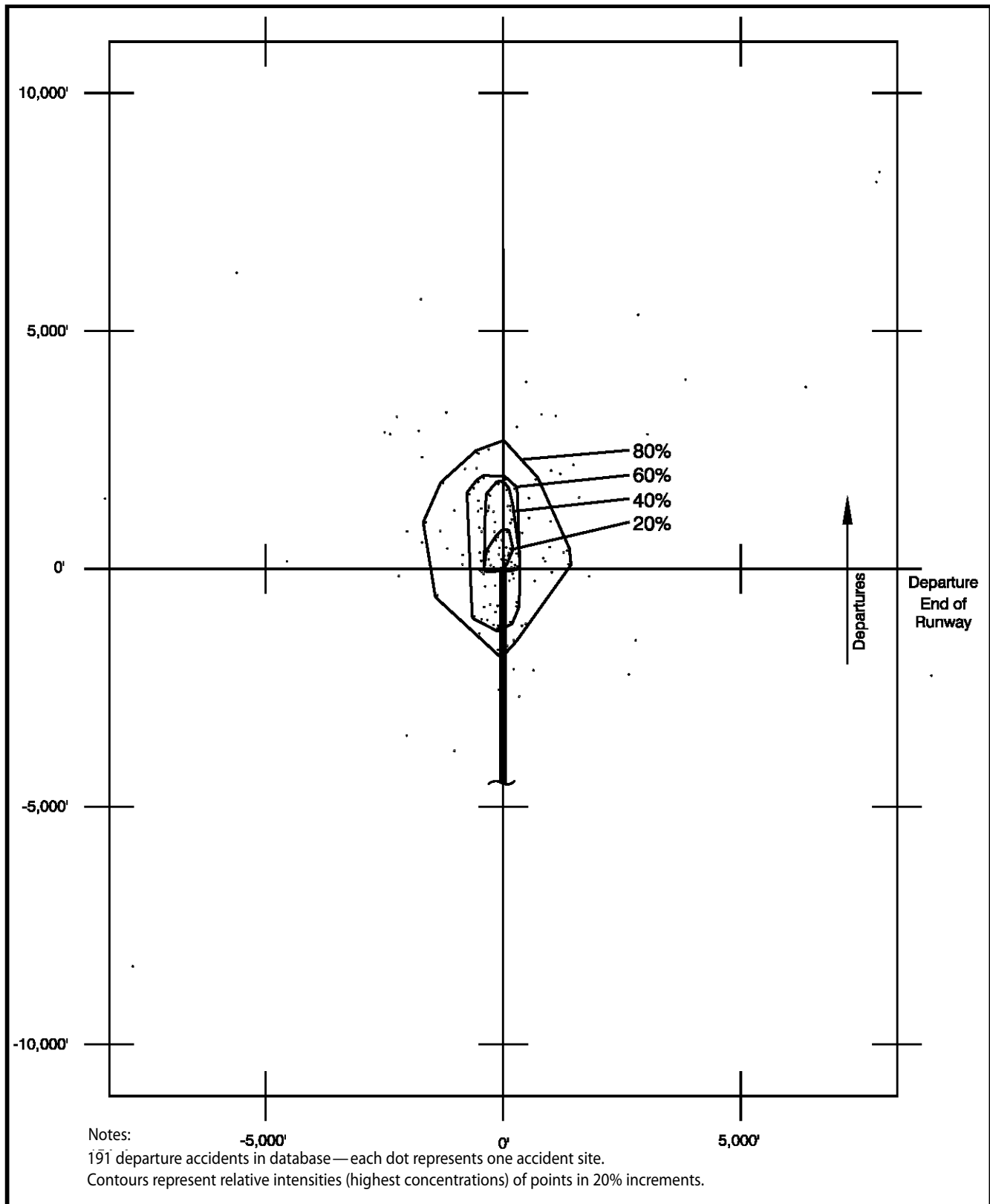


FIGURE F5

## General Aviation Accident Distribution Contours – Departure Accidents on Runways of Less than 4,000 Feet

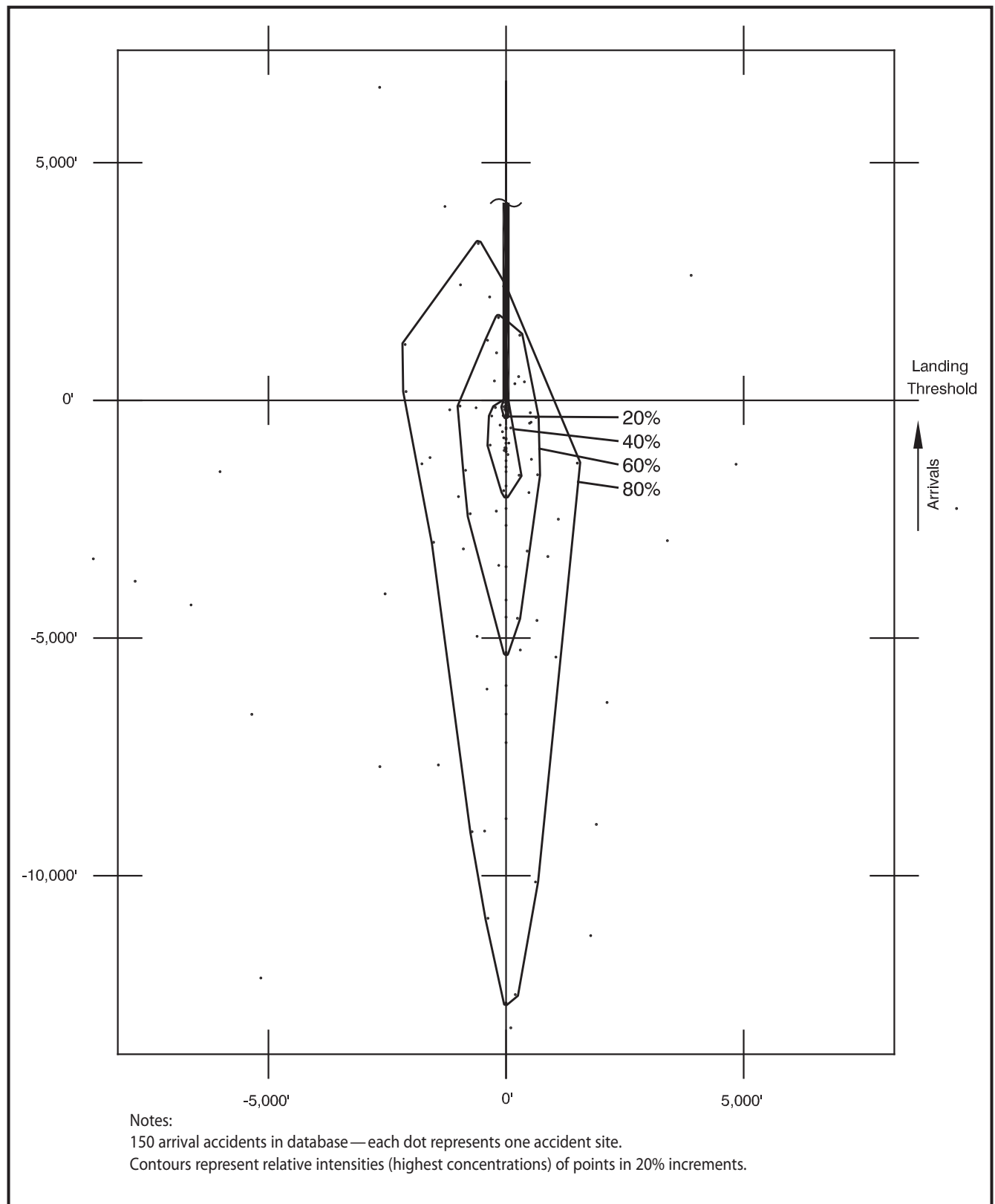


FIGURE F6

## General Aviation Accident Distribution Contours – Arrival Accidents on Runways of 4,000 Feet to 5,999 Feet

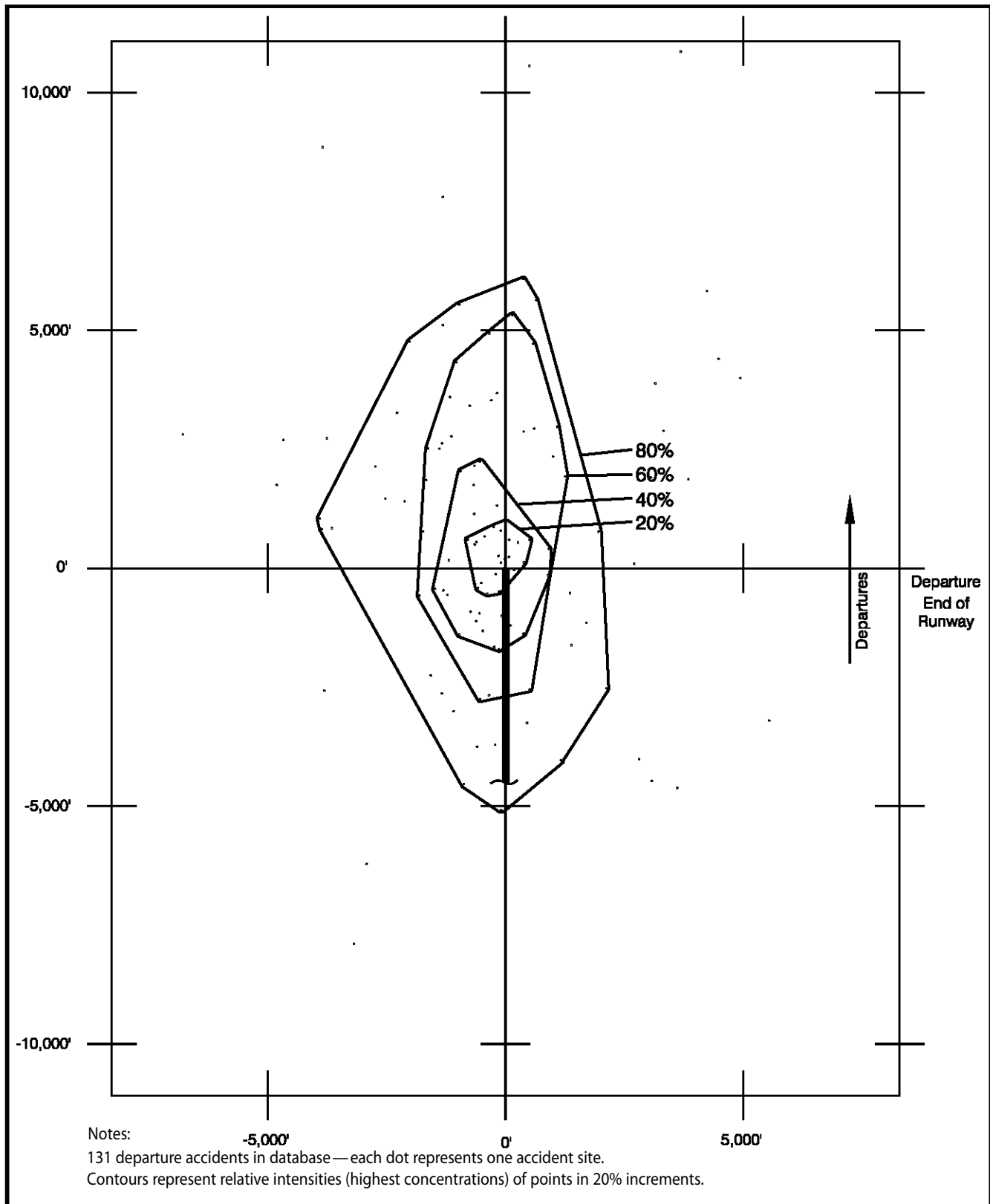


FIGURE F7

## General Aviation Accident Distribution Contours – Departure Accidents on Runways of 4,000 to 5,999 Feet

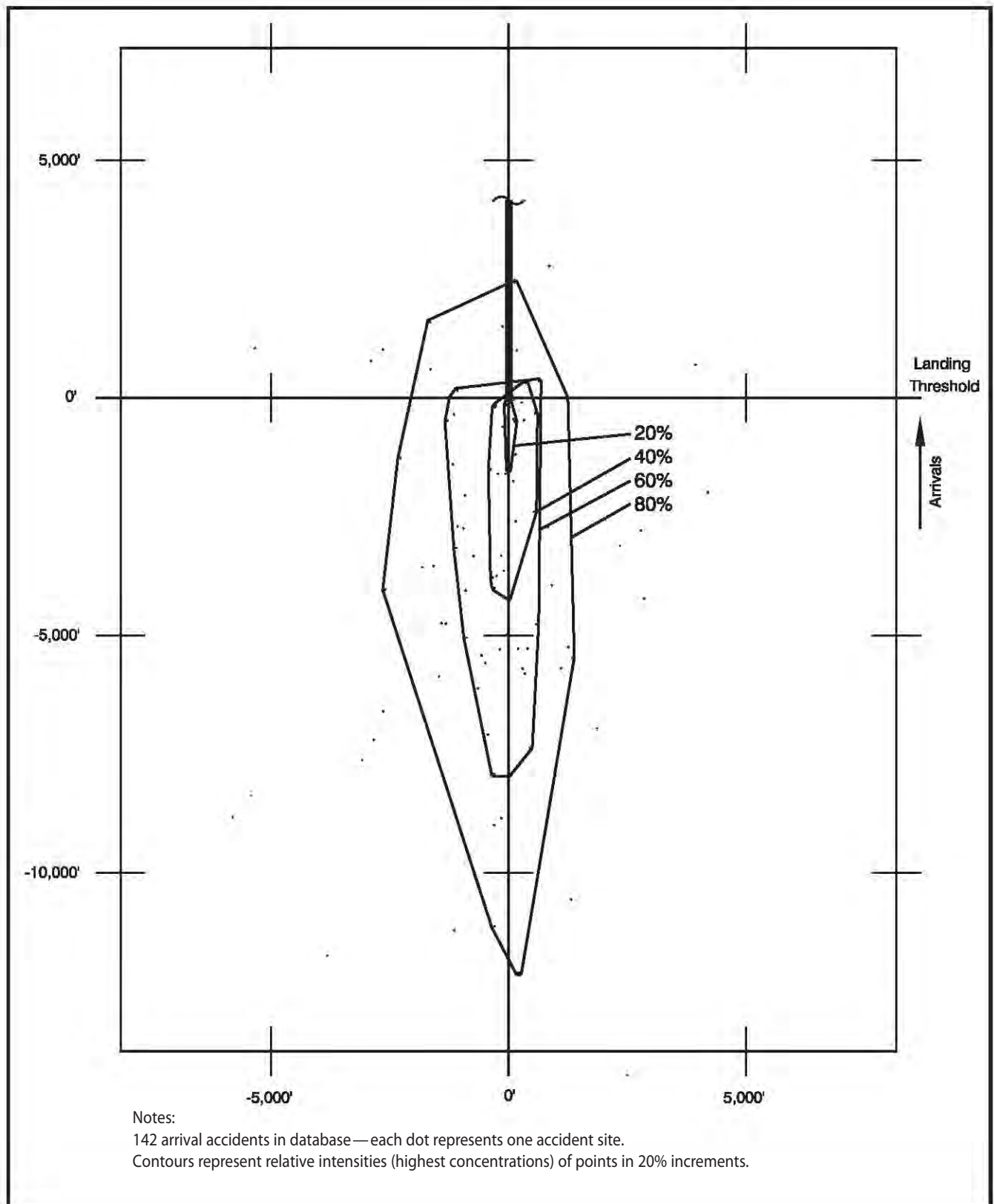


FIGURE F8

## General Aviation Accident Distribution Contours – Arrival Accidents on Runways of 6,000 Feet or More

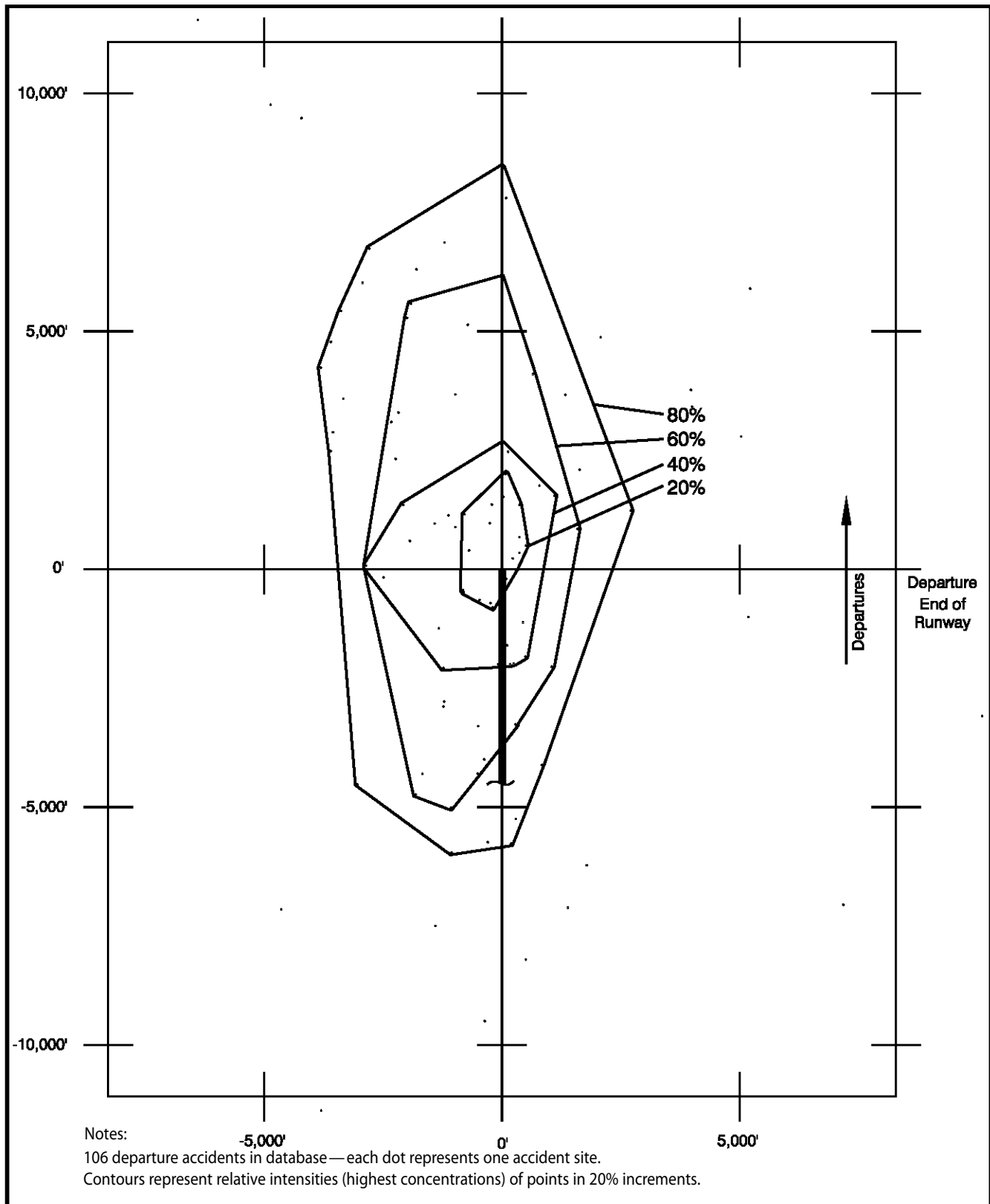


FIGURE F9

## General Aviation Accident Distribution Contours – Departure Accidents on Runways of 6,000 Feet or More



differences based on runway length. To portray these differences, the database was divided into three groups according to the length of the runway associated with the accident and accident distribution contours like those described above were developed.

- ◆ Runway lengths of less than 4,000 feet: Figures F4 (arrivals) and F5 (departures).
- ◆ Runway lengths of 4,000 to 5,999 feet: Figures F6 (arrivals) and F7 (departures).
- ◆ Runway lengths of 6,000 feet or more: Figures F8 (arrivals) and F9 (departures).

Note that some of the contours, particularly the outer ones, are quite lopsided in shape. This irregularity can at least partially be attributed to the limited numbers of data points in these subsets (only 100 to 150 in most cases). Remaining unknown is whether an extensive expansion of the database would result in more uniformly shaped contours. It could well be that there truly is a geographic bias in the distribution of accident sites reflecting, for example, the left-hand traffic pattern of most runways. Given this uncertainty, no attempt is made here to produce more refined contours.

Because of the data limitations, the accident distribution contours presented here are considered to be more useful in support of regular, geometrically shaped, safety zones than directly representing the size and shape of the zone. Also, the contours are purely statistical and do not reflect where aircraft fly at a specific airport.



## Appendix G

# Methods for Determining Concentrations of People

One criterion used in many compatibility plans is the maximum number of people per acre that can be present in a given area at any one time. If a proposed use exceeds the maximum density, it is considered inconsistent with compatibility planning policies. This appendix provides some guidance on how the people-per-acre determination can be made.

The most difficult part about making a people-per-acre determination is estimating the number of people likely to use a particular facility. There are several methods which can be utilized, depending upon the nature of the proposed use:

**Parking Ordinance**—The number of people who could be present in a given area can be calculated based upon the number of parking spaces required by the zoning ordinance. Some assumption regarding the number of people per vehicle needs to be developed to calculate the number of people on-site. The number of people per acre can then be calculated by dividing the number of people on-site by the size of the parcel in acres. This approach is appropriate where the use is expected to be dependent upon access by vehicles. Conversely, this approach may not be appropriate for more urban developments, including transit-oriented development, where fewer parking spaces are provided to discourage single occupancy vehicle trips. Depending upon the specific assumptions utilized, this methodology typically results in a number in the low end of the likely intensity for a given land use.

**Maximum Occupancy**—The California Building Code (CBC) can be used as a standard for determining the maximum occupancy of certain uses. The chart provided as Exhibit G1 indicates the required number of square feet per occupant. The number of people on the site can be calculated by dividing the total floor area of a proposed use by the minimum square feet per occupant requirement listed in the table. The maximum occupancy can then be divided by the size of the parcel in acres to determine the people per acre. Surveys of actual occupancy levels conducted by various agencies have indicated that many retail and office uses are generally occupied at no more than 50% of their maximum occupancy levels, even at the busiest times of day. Therefore, the number of people calculated for office and retail uses should usually be adjusted (50%) to reflect the actual occupancy levels before making the final people-per-acre determination. Even with this adjustment, the CBC-based methodology typically produces intensities at the high end of the likely range.

**Other Methodologies**—Some uses (such as theaters or churches) may be calculated based on the number of fixed seats. This is likely to produce a range between the two methods described above. Certain uses may require an estimate based upon a survey of similar uses. This approach is more difficult, but is appropriate for uses which, because of the nature of the use, cannot be reasonably estimated based upon parking or square footage.

Exhibit G1 provides standard floor area per occupant (in square feet) for a variety of spaces, while Exhibit G2 shows sample calculations.

**EXHIBIT G1: MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

<b>Function of Space</b>	<b>Floor area per occupant (sq. ft.)</b>
Accessory storage areas, mechanical equipment room	300 gross
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Baggage claim	20 gross
Baggage handling	300 gross
Concourse	100 gross
Waiting areas	15 gross
Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Assembly with fixed seats	See Section 1004.7
Assembly without fixed seats	
Concentrated (chairs only-not fixed)	15 net
Standing space	5 net
Unconcentrated (tables and chairs)	7 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	100 gross
Courtrooms-other than fixed seating areas	40 net
Day care	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise rooms	50 gross
H-5 Fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient treatment areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Laboratory	
Educational	50 net
Laboratories, non-educational	100 net
Laboratory suite	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mercantile	
Areas on other floors	60 gross
Basement and grade floor areas	30 gross
Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools	
Rink and pool	50 gross
Decks	15 gross
Stages and platforms	15 net
Warehouses	500 gross

Source: California Building Code (2007), Table 1004.1.1

**EXHIBIT G2 : OCCUPANCY LEVELS—CALIFORNIA BUILDING CODE**

**Example 1**

*Proposed Development:* Two office buildings, each two stories and containing 20,000 square feet of floor area per building. Site size is 3.0 net acres. Counting a portion of the adjacent road, the gross areas of the site is 3.5± acres.

**A. Calculation Based on Parking Space Requirements**

For office uses, assume that a county or city parking ordinance requires 1 parking space for every 300 square feet of floor area. Data from traffic studies or other sources can be used to estimate the average vehicle occupancy. For the purposes of this example, the number of people on the property is assumed to equal 1.5 times the number of parking spaces.

The average usage intensity would therefore be calculated as follows:

- 1) 40,000 sq. ft. floor area x 1.0 parking space per 300 sq. ft. = 134 (rounded from 133.3) required parking spaces
- 2) 134 parking spaces x 1.5 people per space = 201 maximum people on site
- 3) 200 people / 3.5 acres gross site size = 57.4 people per acre average for the site

Assuming that occupancy of each building is relatively equal throughout, but that there is some separation between the buildings and outdoor uses are minimal, the usage intensity for a single acre would be estimated to be:

- 1) 20,000 sq. ft. bldg. / 2 stories = 10,000 sq. ft. bldg. footprint
- 2) 10,000 sq. ft. bldg. footprint / 43,560 sq. ft. per acre = 0.23 acre bldg. footprint
- 3) Building footprint < 1.0 acre; therefore maximum people in 1 acre = bldg. occupancy = 100 people per single acre

**B. Calculation Based on California Building Code**

Using the CBC as the basis for estimating building occupancy yields the following results for the above example:

- 1) 40,000 sq. ft. bldg. / 100 sq. ft. per occupant = 400 people max. bldg. occupancy
- 2) 400 max. bldg. occupancy x 50% adjustment = 200 people maximum on site
- 3) 200 people / 3.5 acres gross site size = 57 people per acre average for the site.

*Conclusions:* In this instance, both methodologies give the same results. For different uses and/or assumptions, the two methodologies are likely to produce different numbers. In most such cases, the CBC methodology will indicate a higher intensity.

**Example 2**

*Proposed Development:* Single-floor furniture store containing 24,000 square feet of floor area on a site of 1.7 net acres. Counting a portion of the adjacent road, the gross area of the site is 2.0 acres.

**A. Calculation Based on Parking Space Requirements**

For furniture stores, the county requires 1 parking space per 400 square feet of use area. Assuming 1.5 people per automobile, the average usage intensity would be:

- 1) 24,000 sq. ft. bldg. x 1.0 parking space per 400 sq. ft. = 60 required parking spaces
- 2) 60 parking spaces x 1.5 people per space = 90 people maximum on site
- 3) 90 people / 2.0 acres gross site size = 45 people per acre average for the site

Again, assuming a relatively balanced occupancy throughout the building and that outdoor uses are minimal, the usage intensity for a single acre would be estimated to be:

- 1) 24,000 sq. ft. bldg. footprint / 43,560 sq. ft. per acre = 0.55 acre bldg. footprint
- 2) Building footprint < 1.0 acre; therefore maximum people in 1 acre = bldg. occupancy = 90 people per single acre

**B. Calculation Based on California Building Code**

For the purposes of the CBC-based methodology, the furniture store is assumed to consist of 50% retail sales floor (at 30 square feet per occupant) and 50% warehouse (at 500 square feet per occupant). Usage intensities would therefore be estimate as follows:

- 1) 12,000 sq. ft. retail floor area / 30 sq. ft. per occupant = 400 people max. occupancy in retail area
- 2) 12,000 sq. ft. warehouse floor area / 500 sq. ft. per occupant = 24 people max occupancy in warehouse area
- 3) Maximum occupancy under CBC assumptions = 400 + 24 = 424 people
- 4) Assuming typical peak occupancy is 50% of CBC numbers = 212 people maximum expected at any one time
- 5) 212 people / 1.26 acres gross site size = 168 people per acre average for the site

With respect to the single-acre intensity criteria, the entire building occupancy would again be within less than 1.0 acre, thus yielding the same intensity of 168 people per single acre.

*Conclusions:* In this instance, the two methods produce very different results. The occupancy estimate of 30 square feet per person is undoubtedly low for a furniture store even after the 50% adjustment. The 72 people-per-acre estimate using the parking requirement methodology is probably closer to be realistic. As part of the general plan consistency process, ALUCs and local jurisdictions should decide which method or combination of methods is to be used in reviewing development proposals.

## Appendix H

# Sample ALUC Documents

This appendix is divided into two parts. The first part contains several examples of implementation documents, including sample avigation easements, deed restrictions, and project review tools. Project review tools include information on fee structures and several forms for application and review of projects by the ALUC.

The second part is a simplified template for creation of an airport land use compatibility plan. Obviously, the format, content, and complexity of an ALUCP will vary tremendously. The sample template provided here is intended to assist ALUC staff preparing a plan for a general aviation airport in a rural or suburban (as opposed to highly urbanized) area. The sample template is meant to complement the information in Chapters 2 through 4 of the *Handbook*.

## Sample Implementation Documents

**Avigation Easement**—Avigation easements transfer certain property rights from the owner of the underlying property to the owner of an airport. ALUCs may require avigation easement dedication as a condition for approval of development on property subject to high noise levels or a need to restrict heights of structures and trees to less than might ordinarily occur on the property. A sample of a standard avigation easement is included in Exhibit H-1.

**Recorded Deed Notice**—Deed notices are a form of buyer awareness measure whose objective is to ensure that prospective buyers of airport area property, particularly residential property, are informed about the airport's impact on the property. Unlike easements, deed notices do not convey property rights from the property owner to the airport and do not restrict the height of objects. They only document the existence of certain conditions which affect the property—such as the proximity of the airport and common occurrence of aircraft overflights at or below the airport traffic pattern altitude. ALUCs may make recording of deed notices a requirement for project approval within portions of the airport influence area where avigation easements are not essential. Exhibit H-2 contains a sample of a deed notice.

An additional type of implementation document available to local jurisdictions is an airport combining zone ordinance. This is discussed further in Chapter 5.

**EXHIBIT H1**  
**Typical Avigation Easement**

This indenture made this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, between \_\_\_\_\_ herein after referred to as Grantor, and the [Insert County or City name], a political subdivision in the State of California, hereinafter referred to as Grantee.

The Grantor, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, does hereby grant to the Grantee, its successors and assigns, a perpetual and assignable easement over the following described parcel of land in which the Grantor holds a fee simple estate. The property which is subject to this easement is depicted as \_\_\_\_\_ on “Exhibit A” attached and is more particularly described as follows:

[Insert legal description of real property]

The easement applies to the Airspace above an imaginary plane over the real property. The plane is described as follows:

The imaginary plane above the hereinbefore described real property, as such plane is defined by Part 77 of the Federal Aviation Regulations, and consists of a plane [describe approach, transition, or horizontal surface]; the elevation of said plane being based upon the \_\_\_\_\_ Airport official runway end elevation of \_\_\_\_\_ feet Above Mean Sea Level (AMSL), as determined by [Insert name and Date of Survey or Airport Layout Plan that determines the elevation] the approximate dimensions of which said plane are described and shown on Exhibit A attached hereto and incorporated herein by reference.

The aforesaid easement and right-of-way includes, but is not limited to:

1. For the use and benefit of the public, the easement and continuing right to fly, or cause or permit the flight by any and all persons, or any aircraft, of any and all kinds now or hereafter known, in, through, across, or about any portion of the Airspace hereinabove described; and
2. The easement and right to cause or create, or permit or allow to be caused or created within all space above the existing surface of the hereinabove described real property and any and all Airspace laterally adjacent to said real property, such noise, vibration, currents and other effects of air, illumination, and fuel consumption as may be inherent in, or may arise or occur from or during the operation of aircraft of any and all kinds, now or hereafter known or used, for navigation of or flight in air; and
3. A continuing right to clear and keep clear from the Airspace any portions of buildings, structures, or improvements of any kinds, and of trees or other objects, including the right to remove or demolish those portions of such buildings, structures, improvements, trees, or other things which extend into or above said Airspace, and the right to cut to the ground level and remove, any trees which extend into or above the Airspace; and
4. The right to mark and light, or cause or require to be marked or lighted, as obstructions to air navigation, any and all buildings, structures, or other



improvements, and trees or other objects, which extend into or above the Airspace;  
and

5. The right of ingress to, passage within, and egress from the hereinabove described real property, for the purposes described in subparagraphs (3) and (4) above at reasonable times and after reasonable notice.

For and on behalf of itself, its successors and assigns, the Grantor hereby covenants with the [Insert County or City name], for the direct benefit of the real property constituting the \_\_\_\_\_ Airport hereinafter described, that neither the Grantor, nor its successors in interest or assigns will construct, install, erect, place or grow in or upon the hereinabove described real property, nor will they permit to allow, any building structure, improvement, tree or other object which extends into or above the Airspace, or which constitutes an obstruction to air navigation, or which obstructs or interferes with the use of the easement and rights-of-way herein granted.

The easements and rights-of-way herein granted shall be deemed both appurtenant to and for the direct benefit of that real property which constitutes the \_\_\_\_\_ Airport, in the [Insert County or City name], State of California; and shall further be deemed in gross, being conveyed to the Grantee for the benefit of the Grantee and any and all members of the general public who may use said easement or right-ofway, in landing at, taking off from or operating such aircraft in or about the \_\_\_\_\_ Airport, or in otherwise flying through said Airspace.

Grantor, together with its successors in interest and assigns, hereby waives its right to legal action against Grantee, its successors, or assigns for monetary damages or other redress due to impacts, as described in Paragraph (2) of the granted rights of easement, associated with aircraft operations in the air or on the ground at the airport, including future increases in the volume or changes in location of said operations. Furthermore, Grantor, its successors, and assigns shall have no duty to avoid or mitigate such damages through physical modification of airport facilities or establishment or modification of aircraft operational procedures or restrictions. However, this waiver shall not apply if the airport role or character of its usage (as identified in an adopted airport master plan, for example) changes in a fundamental manner which could not reasonably have been anticipated at the time of the granting of this easement and which results in a substantial increase in the impacts associated with aircraft operations. Also, this grant of easement shall not operate to deprive the Grantor, its successors or assigns, of any rights which may from time to time have against any air carrier or private operator for negligent or unlawful operation of aircraft.

These covenants and agreements run with the land and are binding upon the heirs, administrators, executors, successors and assigns of the Grantor, and, for the purpose of this instrument, the real property firstly hereinabove described is the servient tenement and said \_\_\_\_\_ Airport is the dominant tenement.

DATED: \_\_\_\_\_

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, before me, the undersigned, a Notary Public in and for said County and State, personally appeared \_\_\_\_\_, and \_\_\_\_\_ known to me to be the persons whose names are subscribed to the within instrument and acknowledged that they executed the same.

WITNESS my hand and official seal.

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Notary Public

**EXHIBIT H-2**  
**Sample Deed Notice**

A statement similar to the following should be included on the deed for any real property subject to the deed notice requirements set forth in the [Insert ALUC name] Airport Land Use Compatibility Plan. Such notice should be recorded by the county of [Insert County name]. Also, this deed notice should be included on any parcel map, tentative map, or final map for subdivision approval.

The [Insert ALUC name] Airport Land Use Compatibility Plan and [Insert County/City name] Ordinance (Ordinance No. \_\_\_\_\_ ) identify a [Insert Airport name] Airport Influence Area. Properties within this area are routinely subject to overflights by aircraft using this public-use airport and, as a result, residents may experience inconvenience, annoyance, or discomfort arising from the noise of such operations. State law (Public Utilities Code Section 21670 et seq.) establishes the importance of public-use airports to protection of the public interest of the people of the state of California. Residents of property near such airports should therefore be prepared to accept the inconvenience, annoyance, or discomfort from normal aircraft operations. Residents also should be aware that the current volume of aircraft activity may increase in the future in response to [Insert County name] County population and economic growth. Any subsequent deed conveying this parcel or subdivisions thereof shall contain a statement in substantially this form.

**Fee Structures**—As discussed in Chapter 6, the legal basis giving ALUCs the authority to charge fees for review of land use proposals and airport plans comes from Section 21671.5(f) of the State Aeronautics Act. A commission is only permitted to charge fees if it has adopted a compatibility plan for the airport involved. The fees charged cannot exceed the estimated reasonable cost of providing the review.

The fees charged for project reviews vary substantially from one ALUC to another. Some commissions charge a flat fee for any type of review. Others distinguish between different types of actions—for example, actions initiated by a public agency (e.g., a new general plan) versus ones which are privately initiated (e.g., individual development projects). Other commissions charge an hourly rate for review in order to cover the full cost of the staff time. A flat fee is easier to implement because the cost is known and fixed, however, an hourly fee rate more accurately reflects to actual cost of review time. Table H-1 provides some examples of fees charged by various ALUCs.<sup>1</sup>

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<sup>1</sup> The fees in Table H-1 were reported by responding ALUCs in a 2009 survey conducted by the Division of Aeronautics.

<b>Table H-1. Airport Land Use Commission Fee Schedules</b>								
					<b>Review Type</b>			
<b>ALUC</b>	<b>Zone Change, Use Permit, Site Plan Review</b>	<b>Tract Map Review</b>	<b>General Plan Element Review</b>	<b>Environmental Assessment Review</b>	<b>Specific Plan Review</b>	<b>Community Plan Review</b>	<b>EIR Review</b>	<b>Building Permit Review</b>
Amador	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bakersfield	\$1,955 - 6,171.75	\$800 + \$31/lot	\$7,071.75 - \$9,931.75	\$255 / Administrative Cost	\$695 - \$5,601.75	\$695 - \$5,601.75	\$255 / Administrative Cost	\$50 + Project Valuation
Butte	\$3,912 Deposit and \$163/hr with 40 hour maximum							
Colusa	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Contra Costa	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
El Dorado	\$55 - \$500	\$150 - \$400	\$400	\$400	\$250	\$250	\$400	\$55 - \$500
Fresno	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Glenn	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Humboldt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Imperial	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Inyo	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Los Angeles	Minor Project Review - \$997, Major Project Review - \$3,000							
Madera	\$3,500 for review and a consistency report							
Needles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Placer	Minor Project Review - \$35, Major Project Review - \$70, Subdivision/EIR Review - \$150							
Plumas	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Riverside	\$792 - \$1,188	\$908 - \$1,353	\$2,195 - \$3,300	\$990 - \$1,492	\$1,947 - \$2,911	\$2,145 - \$3,300	\$1,815 - \$2,723	\$347 - \$512
SACOG	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
San Bernardino	Flat Rate Charges of \$130/hr for Planner III Review and \$160 for Supervising Planner Review							
San Mateo	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Santa Barbara	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Santa Clara	Minor Project Review - \$600, Major Project Review \$2,500							
San Diego	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SoCal Logistics	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Solano	\$200 + \$110/hr professional time and \$29/hr support staff time							
Sonoma	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tuolumne	The County does not charge a separate ALUC review fee; the County's cost for review is incorporated into applications fees which range from \$290.75 - \$9,326.00.							

**ALUC Project Review Documents**—Several example documents are included to assist the ALUC in the project review process. The process, timing, and informational needs for compatibility reviews are discussed in Chapter 6. The first step is to receive an application. A sample “application form,” with instructions, is included here. The ALUC staff will review the application for adequacy and issue the “completeness letter” indicating the application is either complete or identifying the missing items. Following review by the ALUC, staff can then issue a letter with the results of the compatibility determination—the “determination letter.”

### EXHIBIT H-3

#### Application Form and Instructions

<b>Land Use Compatibility Determination Application Form</b>		ALUC Identification No. _____
<b>Project Proponent</b> (TO BE COMPLETED BY APPLICANT)		
Date of Application _____		
Property Owner _____		Phone Number _____
Mailing Address _____		
_____		
_____		
Agent (if any) _____ Phone Number _____		
Mailing Address _____		
_____		
_____		
<b>Project Location</b> (TO BE COMPLETED BY APPLICANT)		
<i>Attach an accurately scaled map showing the relationship of the project site to the airport boundary and runways</i>		
Street Address _____		
_____		
Assessor's Parcel No. _____		Parcel Size _____
Subdivision Name _____		Lot Number _____
Zoning Classification _____		
<b>Project Description</b> (TO BE COMPLETED BY APPLICANT)		
<i>Attach applicable plans, elevations, and other pertinent details</i>		
Existing Land Use _____		
(describe) _____		
Proposed Land Use _____		
(describe) _____		
For Residential Uses Number of Parcels of Units on Site _____		
For Other Land Uses Hours of Use _____		
Number of People on Site _____ Maximum Number _____		
Height Data Height above Ground or Tallest Object (including antennas and trees) _____ ft.		
Highest Elevation (above sea level) of Any Object or Terrain on Site _____ ft.		
Flight Hazards Does the project involve any characteristics which could create electrical interference, YES _____		
confusing lights, glare, smoke, or other electrical or visual hazards to aircraft flight? NO _____		
If yes, describe _____		
_____		
Applicant Signature: <u>  X  </u> Date: _____		

## Land Use Compatibility Determination Application Instructions

### Introduction

The purpose of this application is to implement provisions of the Airport Land Use Compatibility Plan (ALUCP) as adopted by the Airport Land Use Commission (ALUC). The ALUC is a separate agency enabled by the State of California pursuant to the provisions of the State Aeronautics Act (PUC Section 21670). Certain projects are under the jurisdiction of the ALUC and require that a determination be made that the project is consistent with applicable Airport Land Use Compatibility Plans. Application is made upon referral by a local agency reviewing the project, to the ALUC, in order to determine whether a proposed project is consistent with the provisions of the applicable airport land use plan.

The following is an example from one ALUC, and does not necessarily represent Caltrans guidance or recommendation; it only serves as one possible approach to this process.

### Application Review Instructions

#### Step 1: File Application

The following information must be submitted as a minimum requirement:

<input type="checkbox"/>	Complete compatibility application form for determination of project consistency with Airport Land Use Plans.
<input type="checkbox"/>	Local agency environmental documentation for the project (initial study, draft environmental impact report, etc.) that may have been prepared for the project.
<input type="checkbox"/>	Property location, street address, location map.
<input type="checkbox"/>	Assessor's parcel map with project property identified, assessor's parcel number, subdivision lot number.
<input type="checkbox"/>	An accurately scaled map showing the relationship of the project site to the airport boundary, runways, and compatibility zone boundaries.
<input type="checkbox"/>	Completed site plan drawn to scale and fully dimensioned including topographical information. Topographical information should include ground elevations, the location of structures, open spaces and water bodies, and the heights of structures, trees, and other topographic features. In addition, please submit an 8½ x 11 inch reduction of site plan.
<input type="checkbox"/>	Elevations showing height of all structures above both sea level and ground level. In addition, please submit an 8½ x 11 inch reduction of elevations.
<input type="checkbox"/>	Description of existing and proposed land uses. If project is located wholly or partly within safety zones, project description shall include percentage of lot coverage by structures and estimated maximum persons per acre at any one time and supporting documentation showing basis for calculation of persons per acre. The project description shall also identify and discuss any characteristics that could create electrical interference, interference with aircraft communications or navigation, radio signals, confusing or distracting lights, glare, dust, smoke, steam, attraction of an increased number of birds, or other electrical or visual hazards to aircraft or aircraft operations.
<input type="checkbox"/>	Description of the type of land use action being sought from the local jurisdiction (e.g., zoning amendment, general plan amendment, tentative map, building permit, etc.).

<input type="checkbox"/>	For residential uses, an indication of the potential or proposed number of dwelling units per acre (including any secondary units on a parcel); or, for non-residential uses, the maximum number of people potentially occupying individual buildings and/or the total site and/or portions thereof at any one time.
--------------------------	--

**Step 2: Environmental Documents**

While the ALUC is not a responsible agency under the California Environmental Quality Act, the ALUC requires the submission of the local agency's CEQA documents along with the application materials identified above. While not requiring a final certified version, the ALUC does require the latest copy that has been circulated for public review before finding the ALUC's Application complete.

**Step 3: Payment of Fees**

Applicable fees for processing a Land Use Compatibility Determination must be paid at the time of submittal. These fees help pay for processing, advertising, and reviewing the application. If review of the proposed project requires that outside consulting or other needed contract services be obtained, the estimated amount of associated fees and costs must be deposited before the application can be considered complete. After project review is completed, the applicant will either receive a bill for additional payment due or a refund depending on actual fees and costs.

**Step 4: Application Completeness**

The application will be reviewed for completeness. State law requires staff to determine whether or not the application is complete within 30 days from submittal. The applicant will be sent a notice informing them whether their application is complete or incomplete and, if incomplete, what items must be submitted before processing can begin. Additionally, plans and any other pertinent materials will be sent to relevant public agencies and airports for review and comment.

**Step 5: Project Review**

After an application is found complete, the ALUC reviews applications for compliance with the criteria and policies set forth in the applicable ALUCP. The application will be scheduled for hearing before the ALUC within thirty days. A written staff report will be prepared providing an analysis of the proposed project and a recommended action for the ALUC's consideration.

**Step 6: Public Hearing Phase**

One advertised public hearing is required for each application. At least fifteen days prior to the hearing, a public notice must be published in a newspaper of general circulation and/or posted in the vicinity of the project location. This public notice is to inform the public of their right to appear and be heard on the matter. The applicant or a designated representative should be present at the public hearing.

**Step 7: Project Determination**

The applicant and local agency will be notified in writing of the determination made by the ALUC.



**Step 8: Appeal/ Override**

A local agency may overrule an ALUC consistency determination pursuant to California Public Utilities Code §21670 by taking the following mandatory steps: (i) provide the ALUC and the Division a copy of the proposed decision and findings at least 45 days prior to any decision to overrule the commission.; (ii) hold a public hearing; (iii) make specific findings that the action proposed is consistent with the purposes of the ALUCP; and (iv) approve the proposed action by a two-thirds vote of the agency's governing body.

**EXHIBIT H-4  
Completeness Letter**

Month-Day-Year

Applicant Name  
Street Number / Name  
City, State Zipcode

Re: ALUC Land Use Compatibility Determination Application Completeness

Dear Applicant Name,

The ALUC would like to thank you for submitting your application for a land use compatibility determination. Your application was received DATE. The following materials were submitted:

- Land Use Compatibility Determination Application Form
- Plans, elevations, descriptions, etc.
- 
- 
- 

In order for staff to make a compatibility determination, please provide the following items:

- Missing application items...
- Additional required information...
- Missing fees, etc.
- 
- 

Once the application is found complete, it will be scheduled for hearing before the ALUC within thirty days. If you have any questions or require additional information, please contact the ALUC at (XXX) XXX-XXXX.

Sincerely,

ALUC Contact

**EXHIBIT H-5**  
**Determination Letter**

Land Use Compatibility Determination  
ALUC Staff Evaluation

1. Noise. ALUCP Noise consistency discussion.
2. Safety. ALUCP Safety Zone compatibility discussion.
3. Airspace Protection. ALUCP Airspace Protection zone compatibility discussion.
4. Overflights. ALUCP overflight provisions discussion.

Staff Determination :

A. Compatible

☐

B. Compatible subject to Conditions (see ALUC staff comments)

☐

C. Incompatible because of:

☐

- ☐ Noise
- ☐ Safety
- ☐ Height
- ☐ Density/Intensity

Reviewed by: X

Date:

## **Sample ALUCP Template**

### **Overview of the Plan**

This section may include the following:

- Introduction. [Example] The basic function of airport land use compatibility plans is to promote compatibility between airports and the land uses that surround them to the extent that these areas are not already devoted to incompatible uses. With limited exceptions, the California State Aeronautics Act (Public Utilities Code Sections 21670 et seq.) required the preparation of a compatibility plan for each public-use and military airport in the state.
- An overview of the plan, including the geographic area (and whether it is a county-wide plan or for a specific airport);
- A description of the ALUC preparing the plan (type of organization, composition, etc.);
- A history of previous compatibility plans; and
- An overview of the document (describing the chapters or sections).

### **Policies: General**

#### ***Purpose***

Define the basic purpose of the plan.

#### ***Geographic Scope***

Describe the area covered, referring to the airport influence area map. Provide the map here or include reference to a compatibility map that shows the airport influence area.

#### ***Definitions***

Include relevant definitions. Appendix L of the *Handbook* can be used as a starting point for the definitions list. Terms that do not apply to this particular ALUCP can be removed.

#### ***Types of Impacts***

The four compatibility concerns covered by the ALUCP will include:

- exposure to aircraft noise;
- land use safety with respect both to people and property on the ground and the occupants of aircraft;
- protection of airport airspace; and
- general concerns related to aircraft overflights.

### ***Relationship to Local General Plans and Zoning***

Identify the current general plans, specific plans, zoning ordinances and other development codes that cover the ALUCP area. Identifying potential conflicts and recommendations on updating the local plans to be consistent with the ALUCP should be discussed.

### ***Review of Individual Development Actions***

Land use proposals requiring ALUC review (mandatory review projects) should be identified (see Chapter 6 of the *Handbook*). The information required for the review should be identified. If the local agency will be referring certain non-mandatory types of land use project to the ALUC for review, those project types should be clearly identified.

### ***Relationship to Airport Plans***

This section should identify the airport master plan (or plans, if multiple airports) that was used in preparing the ALUCP. Furthermore, this section can also identify the types of actions related to airport planning that must be reviewed by the ALUC. These plans include updates to the master plan, construction plans, and expansion plans (see Chapter 6 of the *Handbook*).

## **Policies: Basic Compatibility Criteria**

### ***Noise***

The following sample policies are provided. These policies should be adapted to the ALUCs unique circumstances.

1. Objective: The purpose of noise compatibility policies is to avoid establishment of noise-sensitive land uses in the portions of airport environs that are exposed to significant levels of aircraft noise.
2. Evaluating Acceptable Noise Levels for New Development: The noise compatibility of proposed land uses within the influence area of [airport] shall be evaluated in accordance with the policies set forth in this section, including the criteria listed in Table 1 and the noise contours depicted on Map 1.
  - a. The noise contours shall depict the greatest annualized noise impact, measured in terms of Community Noise Equivalent Level (CNEL), anticipated to be generated by the airport over the planning time frame. The planning time frame shall extend at least 20 years into the future.
  - b. The noise contours depicted in Map 1 are as set forth in the [date] Airport Master Plan. The ALUC should periodically review the projected noise level contours and update them if appropriate.
3. Measures of Noise Compatibility: The criteria in Table 1 indicate the maximum acceptable CNEL exposure for new residential and a range of nonresidential land uses.
  - a. Factors considered in setting the criteria include the following:

- i. Established federal and state regulations and guidelines.
    - ii. The ambient noise levels in the community. Ambient noise levels influence the potential intrusiveness of aircraft noise upon a particular land use and vary greatly between rural, suburban, and urban communities.
    - iii. The extent to which noise would intrude upon and interrupt the activity associated with a particular use.
    - iv. The extent to which the activity itself generates noise.
    - v. The extent of outdoor activity associated with a particular land use.
    - vi. The extent to which indoor uses associated with a particular land use may be made compatible with application of sound attenuation in accordance with the Interior Noise Level Policy.
  - b. Land uses not specifically listed shall be evaluated using the criteria for similar listed uses together with the above factors.
4. Single-Event Noise Levels: Single-event noise levels resulting from aircraft overflight should be considered when evaluating the compatibility of highly noise-sensitive land uses such as residences, schools, libraries, and outdoor theaters. Noise from individual aircraft overflights can be especially important in areas that are regularly overflown by aircraft, but that do not produce significant CNEL contours (helicopter overflight areas are a particular example). Flight patterns for the [airport name] or any proposed heliport should be considered in the review process. Acoustical studies or on-site noise measurements may be required to assist in determining the compatibility of sensitive uses.
5. Interior Noise Levels: Land uses for which interior activities may be easily disrupted by noise shall be required to comply with the following interior noise level criteria.
  - a. The maximum, aircraft-related, interior noise level that shall be considered acceptable for land uses near airports is:
    - i. CNEL 45 dB in:
      - Any habitable room of single- or multi-family residences;
      - Hotels and motels;
      - Hospitals and nursing homes;
      - Churches, meeting halls, theaters, and mortuaries; and
      - Schools, libraries, and museums.
    - ii. CNEL 50 dB in offices and office areas of industrial facilities.
  - b. The noise contours depicted in Map 1 s hall be used in calculating compliance with these criteria. The calculations should assume that windows are closed.

- c. When a proposed building lies within multiple CNEL ranges, the 5 dB range within which 75% or more of the building is located shall apply for the purposes of determining sound attenuation requirements.
  - d. When structures are part of a proposed land use action, evidence that proposed structures will be designed to comply with the criteria in Paragraph (a) of this policy shall be submitted to the applicable local jurisdiction under the following circumstances:
    - i. Any mobile home situated where the projected exposure to airport noise is 55-dB CNEL or greater. [A typical mobile home has an average exterior-to-interior noise level reduction (NLR) of approximately 15 dB with windows closed.]
    - ii. Any single- or multi-family residence situated where the projected exposure to airport noise is 60-dB CNEL or greater (note that these uses are allowed only as infill or on existing residential lots). [Wood frame buildings constructed to meet current standards for energy efficiency typically have an average NLR of approximately 20 dB with windows closed.]
    - iii. Any hotel or motel, hospital or nursing home, church, meeting hall, office building, mortuary, school, library, or museum situated where the projected exposure to airport noise is 60 dB CNEL or greater.
  - e. Exceptions to the interior noise level criteria in Paragraph (a) of this policy may be allowed where evidence is provided that the indoor noise generated by the use itself exceeds the listed criteria.
6. Avigation Easement Dedication Requirements: Dedication of an avigation easement for aircraft noise is required as a condition for approval of any proposed development situated within the CNEL 60 dB contour. See Easement Dedication Policy.

## **Safety**

The following sample policies are provided. These policies should be adapted to the ALUCs unique circumstances.

1. Policy Objective: [Example] The intent of land use safety compatibility criteria is to minimize the risks associated with an off-airport aircraft accident or emergency landing.
  - a. Risks both to people and property in the vicinity of an airport and to people on board the aircraft shall be considered.
  - b. The most stringent land use controls shall be applied to the areas with the greatest potential risks.
2. Evaluating Safety Compatibility for New Development: The safety compatibility of proposed land uses within the airport influence area of [airport

name] shall be evaluated in accordance with the policies set forth in this section, including Table 2 and the safety zones depicted on Map 2.

3. Measures of Safety Compatibility: To minimize risks to people and property on the ground and to people on board aircraft, the safety compatibility criteria in Table 2 set limits on:
  - a. The intensity of nonresidential development measured in terms of the number of people concentrated in areas most susceptible to aircraft accidents.
  - b. The density of residential development, fundamentally measured in terms of dwelling units per acre. The residential density limitations cannot be equated to the usage intensity limitations for nonresidential uses. Consistent with pervasive societal views and as suggested by the *California Airport Land Use Planning Handbook* guidelines, a greater degree of protection is warranted for residential uses.
  - c. Development or expansion of certain uses that represent special safety concerns regardless of the number of people present.
  - d. The extent to which development covers the ground and thus limits the options of where an aircraft in distress can attempt an emergency landing.
4. Factors Considered in Setting Safety Compatibility Criteria: The principal factors considered in setting criteria applicable within each safety zone are:
  - a. The airport proximity within which aircraft accidents near general aviation airports typically occur and the relative concentration of accidents within these locations. The most stringent land use controls shall be applied to the areas with the greatest potential risks. The risk information utilized is the general aviation accident data and analyses contained in the *California Airport Land Use Planning Handbook*.
  - b. For each runway at [airport name], the runway length, approach categories, normal flight patterns, and aircraft fleet mix. These factors are reflected in the safety zone shapes and sizes. The safety zones depicted in Map 2 are based upon zones suggested in the *California Airport Land Use Planning Handbook*.
5. Residential Development Criteria: In determining compliance with the residential density limits in Table 2, the following factors shall be considered.
  - a. For projects that are solely residential, the acreage evaluated equals the project site size which may include multiple parcels. See Mixed-Use Policy with regard to mixed-use development.
  - b. Secondary units, as defined by state law, shall be excluded from density calculations.
  - c. As indicated in the Development by Right Policy, construction of a single-family home, including a second unit as defined by state law, on a legal lot of record as of the date of adoption of this Compatibility Plan is



allowed in all safety zones except Safety Zone 1 if such use is permitted by local land use regulations.

6. **Nonresidential Development Criteria:** In determining compliance with the nonresidential intensity limits in Table 2, the following factors shall be considered.
  - a. The number of people expected to occupy a nonresidential development may be calculated through any of several methods including relationships to International Building Code occupancy levels, parking space requirements, floor area ratios, or actual counts at other similar facilities.
  - b. Usage intensity calculations shall include all people (e.g., employees, customers/ visitors) who may be on the property at any single point in time, whether indoors or outdoors.
  - c. Local jurisdictions may make exceptions for rare special events (e.g., an air show at an airport) for which a facility is not designed and normally not used and for which extra safety precautions can be taken as appropriate.
7. **Land Uses of Special Concern:** Certain types of land uses represent special safety concerns irrespective of the number of people associated with those uses. Land uses of particular concern and the nature of the concern are listed below. Table 2 indicates the criteria applicable to these uses. In some cases, these uses are not allowed in portions of the airport environs regardless of the number of occupants associated with the use. In other instances these uses should be avoided—allowed only if a site outside the zone would not serve the intended function. When allowed, special measures should be taken to minimize hazards to the facility and occupants if the facility were to be struck by an aircraft.
  - a. **Uses Having Vulnerable Occupants:** These uses are ones in which the majority of occupants are children, elderly, and/or disabled—people who have reduced effective mobility or may be unable to respond to emergency situations. The primary uses in this category are:
    - i. Children’s schools (grades K–12).
    - ii. Day care centers (facilities with 15 or more children, as defined in the California Health and Safety Code).
    - iii. Hospitals, health care centers, and similar facilities, especially where patients remain overnight.
    - iv. Nursing homes.
    - v. Inmate facilities.
  - b. **Hazardous Materials Storage:** Materials that are flammable, explosive, corrosive, or toxic constitute special safety compatibility concerns to the extent that an aircraft accident could cause release of the materials and thereby pose dangers to people and property in the vicinity. Facilities in this category include:

- i. Facilities such as oil refineries and chemical plants that manufacture, process, and/or store bulk quantities of hazardous materials generally for shipment elsewhere.
    - ii. Facilities associated with otherwise compatible land uses where hazardous materials are stored in smaller quantities primarily for on-site use.
  - c. Critical Community Infrastructure: This category pertains to facilities the damage or destruction of which would cause significant adverse effects to public health and welfare well beyond the immediate vicinity of the facility. Among these facilities are:
    - i. Emergency services facilities such as police and fire stations.
    - ii. Emergency communications facilities; power plants, and other utilities.
- 8. Mixed-Use Development: For projects involving a mixture of residential and nonresidential uses, the following policies apply.
  - a. Where the residential and nonresidential uses are proposed to be situated on separate parts of the project site, the project shall be evaluated as if it were two separate developments. The residential density shall be calculated with respect to the area to be devoted to residential development and the nonresidential intensity calculated with respect to the area proposed for nonresidential uses. This provision means that the residential density cannot be averaged over the entire project site when nonresidential uses will occupy some of the area and the same limitation applies in reverse.
  - b. Development in which residential uses are proposed to be located in conjunction with nonresidential uses in the same or nearby buildings on the same site must meet both residential density and nonresidential intensity criteria. The number of dwelling units shall not exceed the density limits indicated in Table 2. Additionally, the normal occupancy of the residential portion shall be added to that of the nonresidential portion and the total occupancy shall be evaluated with respect to the nonresidential usage intensity criteria cited in Table 2.
  - c. Mixed-use development shall not be allowed where the residential component would be exposed to noise levels above the limits set in Table 1.
- 9. Open Land: In the event that a small aircraft is forced to land somewhere other than at an airport, the risks to the people on board can best be minimized by providing as much open land area as possible within the airport vicinity. This concept is based upon the fact that the majority of aircraft accidents and incidents occurring away from an airport runway are controlled emergency landings in which the pilot has reasonable opportunity to select the landing site.
  - a. To qualify as open land, an area should:

- i. Be free of most structures and other major obstacles such as walls, large trees or poles (greater than 4 inches in diameter, measured 4 feet above the ground), and overhead wires.
    - ii. Have minimum dimensions of approximately 75 feet by 300 feet (0.5 acres).
  - b. Open land areas should be oriented with the typical direction of aircraft flight over the location involved.
  - c. Roads and automobile parking lots are acceptable as open land areas if they meet the above criteria.
  - d. Open land criteria for each safety zone are most appropriately applied with respect to the entire zone. Individual parcels may be too small to accommodate the minimum-size open area requirement. Consequently, the identification of open land areas must initially be accomplished at the general plan or specific plan level or as part of large (10 acres or more) development projects.
  - e. Clustering of development, subject to the limitations noted in Policy 10 below, and providing contiguous landscaped and parking areas is encouraged as a means of increasing the size of open land areas.
  - f. Building envelopes and the airport safety zones should be indicated on all development plans and tentative maps for projects located within the [airport name] influence area. Portraying this information is intended to ensure that individual development projects provide the open land areas identified in the applicable general plan, specific plan, or other large-scale plan.
10. Limits on Clustering: As used in this Compatibility Plan, “clustering” refers to the concentration of development (measured in terms of dwellings or people per acre) into a portion of the site, leaving other portions of the site relatively less developed or as open land. To a degree, clustering of development is desirable from an airport land use safety compatibility perspective in that more places where an aircraft can attempt an emergency landing would then potentially remain. However, clustering poses the risk that an out-of-control aircraft could strike the location where the development is clustered. To guard against this risk, limitations on the maximum concentrations of dwellings or people in a small area of a large project site are appropriate.
- a. For residential land uses, the number of dwelling units in any single acre shall not exceed four times the average density indicated in Table 2.
  - b. For nonresidential land uses, the maximum usage intensity on a single acre is as listed in Table 2.
  - c. For the purposes of the above policies, the one-acre areas to be evaluated shall be rectangular (reasonably close to square, not elongated or irregular) in shape.
  - d. In no case shall a proposed development be designed to accommodate more than the total number of dwelling units per acre (for residential

uses) or people per acre (for nonresidential uses) indicated in Table 2 times the gross acreage of the project site.

11. **Avigation Easement Dedication Requirements:** Dedication of an avigation easement is required as a condition for approval of any proposed development situated within the Safety Zones 1 through 5. See Easement Dedication Policy.

### ***Airspace Protection***

The following sample policies are provided. These policies should be adapted to the ALUCs unique circumstances.

1. **Policy Objective:** Tall structures, trees, and other objects, particularly when located near airports or on high terrain, may constitute hazards to aircraft in flight. Other land use features also can create hazards to flight by attracting wildlife, causing visual impairment, or generating electronic interference. Federal regulations establish the criteria for evaluating these hazards, but the federal government does not have the authority to prevent their creation. The purpose of these airspace protection policies, together with regulations established by the state government, is to ensure that hazards to the navigable airspace do not occur.
2. **Evaluating Airspace Protection Compatibility for New Development:** The airspace protection compatibility of proposed land uses within the influence area of [airport name] shall be evaluated in accordance with the policies in this section, including the airspace protection surfaces depicted on Map 3, Compatibility Policy Map: Airspace Protection.
3. **Measures of Airspace Protection Compatibility:** In establishing airspace protection policies, the ALUC shall rely upon regulations enacted by the Federal Aviation Administration (FAA) and the state of California as outlined in this section.
4. **Airspace Obstruction Criteria:** The criteria for determining the acceptability of a project with respect to height shall be based upon: the standards set forth in Federal Aviation Regulations (FAR) Part 77, Subpart C, Objects Affecting Navigable Airspace; the United States Standard for Terminal Instrument Procedures (TERPS); and applicable airport design standards published by the FAA.
  - a. Except as provided in Paragraphs (b) and (c) of this policy, no object, including mobile object such as a vehicle or temporary object such as construction crane, shall have a height that would result in penetration of the airspace protection surface depicted for [airport name] in Map 3, Compatibility Policy Map: Airspace Protection. Any object that penetrates one of these surfaces is, by FAA definition, deemed an obstruction.
  - b. Other than within the Primary Surface and beneath the Approach or Transitional Surface, no object shall be limited to a height of less than 35 feet above the ground even if the object would constitute an obstruction.

- c. A proposed object having a height that exceeds the airport's airspace protection surface shall be allowed only if all of the following apply:
  - i. As the result of an aeronautical study, the FAA determines that the object would not be a hazard to air navigation.
  - ii. Marking and lighting of the object will be installed as directed by the FAA aeronautical study or the California Division of Aeronautics and in a manner consistent with FAA standards in effect at the time the construction is proposed (Advisory Circular 70/7460-1J, Obstruction Marking and Lighting, or any later guidance).
  - iii. An aviation easement is dedicated to the [public agency owner of the airport].
  - iv. The use complies with all policies of this Compatibility Plan related to noise and safety compatibility.
- 5. Other Flight Hazards: Land uses that may cause visual, electronic, or wildlife hazards, particularly bird strike hazards, to aircraft in flight or taking off or landing at the airport shall be allowed within the airport influence area only if the uses are consistent with FAA rules and regulations.
  - a. Specific characteristics to be avoided include:
    - i. Sources of glare (such as from mirrored or other highly reflective buildings or building features) or bright lights (including search lights and laser light displays);
    - ii. Distracting lights that could be mistaken for airport lights;
    - iii. Sources of dust, steam, or smoke that may impair pilots' vision;
    - iv. Sources of steam or other emissions that cause thermal plumes or other forms of unstable air;
    - v. Sources of electrical interference with aircraft communications or navigation; and
    - vi. Any proposed use that creates an increased attraction for wildlife and that is inconsistent with FAA rules and regulations including, but not limited to, FAA Order 5200.5A, Waste Disposal Sites on or Near Airports, and Advisory Circular 150/5200-33, Hazardous Wildlife Attractants On or Near Airports. Of particular concern are landfills and certain recreational or agricultural uses that attract large flocks of birds which pose bird strike hazards to aircraft in flight.
  - b. To resolve any uncertainties with regard to the significance of the above types of flight hazards, local jurisdictions should consult with FAA officials.
- 6. Requirements for FAA Notification of Proposed Construction: Proponents of a project containing structures or other objects that may exceed the height standards defined in FAR Part 77, Subpart C, as applied to the [airport name]

must submit notification of the proposal to the FAA where required by the provisions of FAR Part 77, Subpart B, and by the California Public Utilities Code, Sections 21658 and 21659. (Notification to the FAA under FAR Part 77, Subpart B, is required even for certain proposed construction that does not exceed the height limits allowed by Subpart C of the regulations.) The FAA will conduct an “aeronautical study” of the object(s) and determine whether the object(s) would be of a height that would constitute a hazard to air navigation.

- a. The FAA notification requirements apply to all objects including structures, antennas, trees, mobile objects, and temporary objects such as construction cranes.
- b. The boundaries of the FAA notification area for [airport name] are depicted on Map 3.
- c. In addition to the notification requirements pertaining to individual airports, FAR Part 77, Subpart B, requires notification be submitted regarding any proposal for construction or alteration of a structure (including antennas) taller than 200 feet above the ground level at the site.
- d. Local jurisdictions shall inform project proponents of the requirements for notification to the FAA.

### **Overflight**

The following sample policies are provided. These policies should be adapted to the ALUCs unique circumstances.

1. **Policy Objective:** Noise from individual operations, especially by comparatively loud aircraft, can be intrusive and annoying in locations beyond the limits of the mapped noise contours. Sensitivity to aircraft overflights varies from one person to another. The purpose of overflight compatibility policies is to help notify people about the presence of overflights near airports so that they can make more informed decisions regarding acquisition or lease of property in the affected areas. Overflight compatibility is particularly important with regard to residential land uses.
2. **Overflight Compatibility Policies:** The overflight compatibility policies set forth in this section do not restrict the manner in which land can be developed or used. The policies serve only to establish the requirements for notice of airport proximity to be given in conjunction with real estate transactions.
3. **Overflight Notification Area:** The boundaries of the area around [airport name] within which airport proximity notification is required by state law as described in Policy 2.4.4 are depicted on Map 4 of this chapter. Map 4 also depicts the locations where this Compatibility Plan requires aviation easement dedication as a development condition.
4. **State Law Requirements Regarding Real Estate Transfer Disclosure:** Effective January 1, 2004, California state statutes (Business and Professional Code Section 11010 and Civil Code Sections 1102.6, 1103.4, and 1353) require that,

as part of many residential real estate transactions, information be disclosed regarding whether the property is situated within an airport influence area.

- a. These state requirements apply to the sale or lease of newly subdivided lands and condominium conversions and to the sale of certain existing residential property.
- b. The statutes define an airport influence area as “the area in which current or future airport-related noise, overflight, safety, or airspace protection factors may significantly affect land uses or necessitate restrictions on those uses as determined by an airport land use commission.” The airport influence area for the [airport name] is identified on Map 4, Compatibility Policy Map: Overflight.
- c. Where disclosure is required, the state statutes dictate that the following statement shall be provided:

NOTICE OF AIRPORT IN VICINITY: This property is presently located in the vicinity of an airport, within what is known as an airport influence area. For that reason, the property may be subject to some of the annoyances or inconveniences associated with proximity to airport operations (for example: noise, vibration, or odors). Individual sensitivities to those annoyances can vary from person to person. You may wish to consider what airport annoyances, if any, are associated with the property before you complete your purchase and determine whether they are acceptable to you.

- d. For the purposes of this Compatibility Plan:
  - i. The disclosure provisions of state law are deemed mandatory for new development and shall continue in effect as ALUC policy even if the state law is revised or rescinded.
  - ii. Although not required by state law, the policy of the ALUC is that the above airport proximity disclosure should be provided as part of all real estate transactions involving private property within the airport influence area, especially any sale, lease, or rental of residential property.
  - iii. City and county policy is that signs providing the above notice be prominently posted in the real estate sales office and/or other key locations at any new development within the airport influence area.

### **Additional Compatibility Policies**

The following sample policies are provided. These policies should be adapted to the ALUCs unique circumstances.

***Special Conditions***

1. Nonconforming Uses: Existing uses (including a parcel or building) not in conformance with this Compatibility Plan are subject to the following restrictions:
  - a. Nonconforming residential uses:
    - i. A nonconforming single-family residence may be reconstructed or expanded in building size provided that the reconstruction or expansion does not increase the number of dwelling units. For example, a bedroom could be added to an existing residence, but an additional dwelling unit could not be built unless that unit is a secondary dwelling unit as defined by state law. Also, a new single-family residence may be constructed in accordance with the Development by Right Policy, below.
    - ii. A nonconforming multi-family use may be reconstructed in accordance with the Reconstruction Policy, but not expanded in number of dwelling units or floor area of the building.
    - iii. The sound attenuation and avigation easement dedication requirements set by the Interior Noise Level and Easement Dedication Policies shall apply.
  - b. Nonconforming nonresidential uses:
    - i. A nonconforming nonresidential use may be continued, leased, or sold and the facilities may be maintained, altered, or, if required by state law, reconstructed provided that neither the portion of the site devoted to the nonconforming use nor the building's floor area are expanded (unless the expansion is intended to meet accessibility requirements) and that the usage intensity (the number of people per acre) is not increased above the levels existing at the time of adoption of this Compatibility Plan.<sup>2</sup>
    - ii. The sound attenuation and avigation easement dedication requirements set by the Interior Noise Level and Easement Dedication Policies shall apply.
2. Reconstruction: An existing nonconforming development that has been fully or partially destroyed as the result of a calamity (not planned reconstruction or redevelopment) may be rebuilt only under the following conditions:
  - a. Nonconforming residential uses may be rebuilt provided that the reconstruction does not result in either more dwelling units than existed on the parcel at the time of the damage or, for multi-family residential uses, an increase in the floor area of the building. Addition of a secondary dwelling unit to a single-family residence is permitted if in accordance with state law.

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<sup>2</sup> If only tenant improvements are required, this likely would be a ministerial approval and would not be subject to ALUCP policies as it is an existing land use.



- b. A nonconforming nonresidential development may be rebuilt provided that the reconstruction does not increase the floor area of the previous structure or result in an increased intensity of use (i.e., more people per acre).
  - c. Reconstruction under Paragraphs (a) or (b) above:
    - i. Must have a permit deemed complete by the local jurisdiction within twenty-four (24) months of the date the damage occurred.
    - ii. Shall incorporate sound attenuation features to the extent required by the Interior Noise Level Policy and consistent with the California Noise Standards.
    - iii. Shall be conditioned upon dedication of an avigation easement to the airport proprietor if required under the Easement Dedication Policy.
    - iv. Shall comply with Federal Aviation Regulations Part 77 requirements.
  - d. Reconstruction in accordance with Paragraphs (a), (b), and (c) above shall not be permitted in Safety Zone 1 or where it would be in conflict (not in conformance) with the general plan or zoning ordinance of the local jurisdiction. (e) Nothing in the above policies is intended to preclude work required for normal maintenance and repair.
3. Development by Right:
- a. Nothing in these policies prohibits:
    - i. Other than in Safety Zone 1, construction of a single-family home, including a second unit as defined by state law, on a legal lot of record as of the date of adoption of this Compatibility Plan if such use is permitted by local land use regulations.
    - ii. Construction of other types of uses if local government approvals qualify the development as an existing land use.
    - iii. Lot line adjustments provided that new developable parcels would not be created and the resulting density or intensity of the affected property would not exceed the applicable criteria indicated in the Table 2.
  - b. The sound attenuation and avigation easement dedication requirements shall apply to development permitted under this policy.
4. Avigation Easement Dedication: As a condition for approval of projects meeting the conditions in Paragraphs (a) and (b) below, the property owner shall be required to dedicate an avigation easement to the [public agency airport owner].
- a. Avigation easement dedication is required for projects situated within the following portions of the [airport name] influence area:
    - i. All locations within the CNEL 55 dB contour depicted in Map 1.

- ii. All locations within Safety Zones 1 through 5 as depicted in Map 2.
  - iii. All locations beneath the approach or transitional surfaces or in areas of terrain penetration of airspace protection surfaces as depicted in Map 3.
- b. Aviation easement dedication shall be required for any proposed development except ministerial actions associated with modification of existing single-family residences.
- c. The aviation easement shall:
  - i. Provide the right of flight in the airspace above the property;
  - ii. Allow the generation of noise and other impacts associated with aircraft overflight;
  - iii. Restrict the height of structures, trees and other objects in accordance with the airspace protection policies and the [airport name] Airspace Plan (Map 3) herein;
  - iv. Permit access to the property for the removal or aeronautical marking of objects exceeding the established height limit; and
  - v. Prohibit electrical interference, glare, and other potential hazards to flight from being created on the property.

### ***Airport Development Plans***

- 1. Airport Improvement Plans: When reviewing a future master plan or other plan for improvement of [airport name], land use compatibility issues should be evaluated with respect to potential changes in noise, overflight, and safety impacts or height restrictions which would result from the plans' implementation. Inconsistencies between such plans and the compatibility policies herein may occur if the airport improvement plans include:
  - a. New activity forecasts that are: (1) significantly higher than those used in developing the [airport name] Compatibility Map; or (2) assume a higher proportion of larger or noisier aircraft.
  - b. Proposals for facilities or procedures not assumed herein; specifically:
    - i. Construction of a new runway or helicopter takeoff and landing area.
    - ii. Change in the length, width, or landing threshold location of an existing runway.
    - iii. Establishment of an instrument approach procedure.
    - iv. Modification of the flight tracks associated with existing visual or instrument operations procedures.
- 2. New Heliports: If a heliport should be proposed for construction within the [AIA or county], it should be reviewed for compatibility with surrounding land uses.

The review should examine the impacts that the facility would have upon both existing and planned land uses. Questions to be considered include:

- a. Would the existing or planned land uses be considered incompatible with the heliport if the latter were already in existence?
- b. What measures are included in the proposal to mitigate the noise, safety, and height restriction impacts on surrounding land uses? Such measures might include:
  - i. Locating flight tracks so as to minimize the impacts.
  - ii. Other operational procedures to minimize impacts.
  - iii. Acquisition of property interests (fee title or easements) on the impacted land.

## **Maps and Tables**

Table 1 : Noise Compatibility Table (see Chapter 4)

Table 2 : Safety Compatibility Table (see Chapter 4)

Map 1 : Noise Compatibility Map (noise contours)

Map 2 : Safety Compatibility Map (safety zones)

Map 3 : Airspace Protection Map (imaginary surfaces)

Map 4 : Overflight Compatibility Map (aviation easement and deed notice requirement zones)

## **Background Data**

Can be summarized from current Master Plan and operational data.



## Appendix I

# Sample CEQA Initial Study Checklist

The following template is provided for the preparation of an initial study for adoption or amendment of an (Airport Land Use Compatibility Plan) ALUCP. As discussed in Chapter 3, an ALUCP is considered a “project” as defined by CEQA. Consequently, an initial study should be prepared prior to the adoption of an ALUCP (unless an exemption is found to apply). The purposes of an initial study are to:

- 1) Provide the Lead Agency with information to use as the basis for deciding whether to prepare an EIR or a Negative Declaration.
- 2) Enable an applicant or Lead Agency to modify a project, mitigating adverse impacts before an EIR is prepared, thereby enabling the project to qualify for a Negative Declaration.
- 3) Assist in the preparation of an EIR, if one is required, by:
  - (A) Focusing the EIR on the effects determined to be significant,
  - (B) Identifying the effects determined not to be significant,
  - (C) Explaining the reasons for determining that potentially significant effects would not be significant, and
  - (D) Identifying whether a program EIR, tiering, or another appropriate process can be used for analysis of the project’s environmental effects.
- 4) Facilitate environmental assessment early in the design of a project;
- 5) Provide documentation of the factual basis for the finding in a Negative Declaration that a project will not have a significant effect on the environment;
- 6) Eliminate unnecessary EIRs;
- 7) Determine whether a previously prepared EIR could be used with the project (CEQA Guidelines §15063[c]).

The initial study template is based on Appendix G of the CEQA Guidelines. Appendix G is only a suggested form, and lead agencies are free to use different formats; however, lead agencies

should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected. The guidance for ALUC staff is imprinted in *blue italic* to differentiate from the standard Appendix G checklist. This guidance is not legal advice and is not meant to be exhaustive; and is merely intended to aid staff and commissioners in identifying environmental issues that should be considered in the context of an ALUCP.

### ***Instructions to Preparers***

- 1) Adoption or amendment does not directly affect the environment, as the ALUCP does not authorize particular development projects. Policies set forth in the ALUCP are developed to guide the location, distribution, and density of both residential and non-residential land uses in a way that is intended to reduce potential noise impacts and safety concerns. ALUCPs, however, do have the potential to induce indirect population growth in areas beyond the airport influence area (AIA) when planned land uses within an airport's environ are considered incompatible and must be relocated elsewhere. The potential impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns.
- 2) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
- 2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
- 3) Once the lead agency has determined that a particular physical impact may occur then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
- 4) "Negative Declaration: Less Than Significant with Mitigation Incorporation" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less-than-significant level.
- 5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. (See CEQA Guidelines Section 15063(c)(3)(D)). In this case, a brief discussion should identify the following:

- a) Earlier Analyses Used. Identify and state where they are available for review.
  - b) Impacts Adequately Addressed. Identify which effects from the checklist were within the scope of, and adequately analyzed in, an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analyses.
  - c) Mitigation Measures. For effects that are “Less than Significant with Mitigation Measures Incorporated,” describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
- 6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated. This includes relevant information included in the ALUCP or an airport master plan.
- 7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion. A general note on references: Include appropriate references for each impact discussion, such as an EIR prepared for the applicable general plan(s), specific plans, or zoning ordinance. If prior environmental review, including review under the National Environmental Policy Act, has been done for either the airport or a previous compatibility plan, that reference may be used to the extent the analysis is still valid. Technical documents, such as FAR Part 150 studies, may also be referenced in the initial study.
- 8) The explanation of each issue should identify:
- a) the significance criteria or threshold, if any, used to evaluate each question; and
  - b) the mitigation measure identified, if any, to reduce the impact to less than significant.
- 9) Substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in this form are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance

## ENVIRONMENTAL CHECKLIST

### Initial Study

1. **Project Title:** [enter text here]
2. **Lead Agency Name and Address:** [enter text here]
3. **Contact Person and Phone Number:** [enter text here]
4. **Project Location:** [enter text here]
5. **Project Sponsor's Name and Address:** [enter text here]
6. **General Plan Designation(s):** [enter text here]
7. **Zoning Designation(s):** [enter text here]
8. **Description of Project:** (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)

*The geographic scope (typically the airport influence area), purpose and objectives of the ALUCP should be described. Where the action is an amendment, the changes from the previous ALUCP should be described. If revised compatibility maps are included in the proposed action, it is useful to include or attach those with the initial study.*
9. **Surrounding Land Uses and Setting.** (Briefly describe the project's surroundings.)

*This section should focus on the existing land uses and the physical environment. The existing general plan and zoning designations are briefly identified above. Land use goals, policies, standards, and classifications are discussed in Item 10 of the checklist, Land Use and Land Use Planning.*
10. **Other public agencies whose approval is required** (e.g., permits, financing approval, or participation agreement. Indicate whether another agency is a responsible or trustee agency.)

*When changes to a local general plan, zoning ordinance, or other development regulations are required to maintain consistency with the ALUCP, these actions should be identified here. While the approval of other local agencies (cities and/or county) is not required for the Commission to adopt or amend an ALUCP, achieving the objectives of compatible land use planning will require implementation by local agencies.*



## Environmental Factors Potentially Affected

The proposed project could potentially affect the environmental factor(s) checked below. The following pages present a more detailed checklist and discussion of each environmental factor.

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Aesthetics                       | <input type="checkbox"/> Agriculture and Forestry Resources | <input type="checkbox"/> Air Quality                        |
| <input type="checkbox"/> Biological Resources             | <input type="checkbox"/> Cultural Resources                 | <input type="checkbox"/> Geology, Soils and Seismicity      |
| <input type="checkbox"/> Greenhouse Gas Emissions Quality | <input type="checkbox"/> Hazards and Hazardous Materials    | <input type="checkbox"/> Hydrology and Water                |
| <input type="checkbox"/> Land Use and Land Use Planning   | <input type="checkbox"/> Mineral Resources                  | <input type="checkbox"/> Noise                              |
| <input type="checkbox"/> Population and Housing           | <input type="checkbox"/> Public Services                    | <input type="checkbox"/> Recreation                         |
| <input type="checkbox"/> Transportation and Traffic       | <input type="checkbox"/> Utilities and Service Systems      | <input type="checkbox"/> Mandatory Findings of Significance |

## DETERMINATION: (To be completed by Lead Agency)

On the basis of this initial study:

- ☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- ☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
- ☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
- ☐ I find that the proposed project MAY have a “potentially significant impact” or “potentially significant unless mitigated” impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
- ☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, no further environmental documentation is required.

Signature \_\_\_\_\_

Date \_\_\_\_\_

Printed Name \_\_\_\_\_

For \_\_\_\_\_

## Environmental Checklist

### Aesthetics

<u>Issues (and Supporting Information Sources):</u>	<u>Potentially Significant Impact</u>	<u>Less Than Significant with Mitigation Incorporation</u>	<u>Less Than Significant Impact</u>	<u>No Impact</u>
<b>1. AESTHETICS — Would the project:</b>				
a) Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Create a new source of substantial light or glare which would adversely affect daytime or nighttime views in the area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Discussion

- a - c) *Any state scenic highways or identified scenic vistas within the project area should be identified. Given the potentially large geographic area of an AIA, it is appropriate to summarize the scenic resources and visual quality of the area, or refer to another document, such as a General Plan or General Plan EIR which contains this information. The potential visual impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*
- d) *ALUCPs generally restrict or limit the types of land uses that can generate light or glare. The potential light and glare impacts are generally indirect, related to changes in future development patterns.*

### References

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## Agricultural and Forest Resources

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>2. AGRICULTURAL AND FOREST RESOURCES —</b>				
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.				
<b>Would the project:</b>				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Result in the loss of forest land or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-e) *The potential farmland impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

## Air Quality

<u>Issues (and Supporting Information Sources):</u>	<u>Potentially Significant Impact</u>	<u>Less Than Significant with Mitigation Incorporation</u>	<u>Less Than Significant Impact</u>	<u>No Impact</u>
<b>3. AIR QUALITY —</b> Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. <b>Would the project:</b>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-e) *The potential impacts to air quality from an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below). Air emissions related to aircraft operations are federally regulated and are not within the scope of an ALUCP.*

## References

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## Biological Resources

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>4. BIOLOGICAL RESOURCES — Would the project:</b>				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-f) *The potential biological impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below). The potential effects of wildlife hazard management plans, and protection of airspace from trees, for example, would typically be addressed in the context of operations (such as an airport master plan) rather than the ALUCP.*

## References

**Cultural Resources**

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>5. CULTURAL RESOURCES — Would the project:</b>				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Discussion**

- a-d) *The potential cultural impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

**References**


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## Geology, Soils, and Seismicity

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>6. GEOLOGY, SOILS, AND SEISMICITY — Would the project:</b>				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ii) Strong seismic ground shaking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iii) Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iv) Landslides?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-d) *The potential geological impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

## Greenhouse Gas Emissions

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>7. GREENHOUSE GAS EMISSIONS — Would the project:</b>				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-b) *The potential greenhouse gas (climate change) impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below). As with air quality, emissions related to aircraft operations are not within the jurisdiction of local agencies, although they may be described in local greenhouse gas inventories.*

## References

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## Hazards and Hazardous Materials

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>8. HAZARDS AND HAZARDOUS MATERIALS — Would the project:</b>				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-d) *The potential hazards/hazardous materials impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*
- e) *Changes to safety zones or policies that increase the risk to residential or commercial development should be discussed and the significance of such changes analyzed. As the objective of the ALUCP is to increase safety in the vicinity of the airport, the effect would typically be characterized as beneficial—which would be “No Impact” in the above checklist.*
- f) *While an ALUCP is not prepared for a private airstrip, the presence of a private airstrip within the plan area should be noted, and any safety issues related to such airstrips discussed.*

- g) *An ALUCP will not typically interfere with an emergency response plan.*
- h) *See items a-d, above.*

## References

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## Hydrology and Water Quality

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>9. HYDROLOGY AND WATER QUALITY — Would the project:</b>				
a) Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, in a manner that would result in substantial erosion or siltation on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Substantially alter the existing drainage pattern of a site or area through the alteration of the course of a stream or river, or by other means, substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-j) *The potential hydrological impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

**Land Use and Land Use Planning**

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>10. LAND USE AND LAND USE PLANNING — Would the project:</b>				
a) Physically divide an established community?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Discussion**

- a) *An ALUCP does not regulate existing development, and typically does not specifically authorize linear infrastructure projects (such as roads) that could divide an established community. The potential for the physical division of a community resulting from the adoption or amendment of an ALUCP would be an indirect effect, related to changes in future development patterns (discussed in Population and Housing, below).*
- b) *Inconsistencies between the proposed ALUCP or amendment, and an applicable land use plan, including general plan, specific plan, or zoning ordinance, must be identified and analyzed. Where the adoption of the ALUCP will require changes to the general plan, the effect of these changes on the environment should be discussed. This includes the potential for development displacement, discussed further under Item 13. The ability of the local agency to overrule actions of the ALUC should not be used to avoid analysis of any potential conflicts with adopted local plans and or regulations.*
- c) *This item will mirror the analysis of Item 4f, Biological Resources, and can reference that discussion.*

**References**


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## Mineral Resources

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>11. MINERAL RESOURCES — Would the project:</b>				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-b) *This impact is most often related to the loss of future access to known mineral resources due to presence of residential or other urban development. The potential impacts of an ALUCP adoption or amendment on mineral resources are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

## Noise

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>12. NOISE — Would the project:</b>				
a) Result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Result in exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, would the project expose people residing or working in the area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) For a project located in the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-e) *The analysis should focus on the noise compatibility criteria of the proposed ALUCP. As with safety (item 8e, above), the desired outcome of the ALUCP process is to reduce impacts to sensitive receptors.*
- f) *While an ALUCP does not address private airstrips, this issue should be addressed if the ALUCP would allow new development in the vicinity of a private airstrip resulting in increased noise exposure.*

## References

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## Population and Housing

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>13. POPULATION AND HOUSING — Would the project:</b>				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a) *The potential for displaced development is an example of indirect growth effects that should be considered in the checklist. If not described here, it should be analyzed under Item 10, Land Use Planning. Displaced development may result when the ALUCP includes restrictions on development (use, density, or intensity) in areas previously identified for development in local plans, and future economic and/or population growth results in additional development occurring elsewhere in the surrounding environment. The CEQA Guidelines state that growth is not assumed to be necessarily beneficial, detrimental, or of little significance to the environment (CEQA Guidelines § 15126.2[d]). Factors to be considered in a displacement analysis should include the amount of development that would be restricted, the likely need for additional housing or commercial construction indicated in local general plans, the existence of other available land that is planned for such development. Relevant information sources include the Housing Element of the General Plan, which will include the approved housing need projections and vacant land inventory. It is also noteworthy to consider that a reasonable CEQA analysis will require some level of forecasting (both airport activity and population and housing), but that speculation is not sufficient to determine a potentially significant impact (CEQA Guidelines § 15144 and 15145).*
- b-c) *As ALUCP restrictions do not apply to existing development, the potential to remove and replace existing housing or relocate existing residents is typically low or nonexistent.*

## References

## Public Services

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>14. PUBLIC SERVICES — Would the project:</b>				
a) Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:				
i) Fire protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ii) Police protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iii) Schools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iv) Parks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
v) Other public facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a) *The potential public service impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

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## Recreation

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>15. RECREATION — Would the project:</b>				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a-b) *The potential geological impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below). If appropriate, the lead agency should also consider, either here or elsewhere in the checklist, the potential impacts of the proposed action upon the continued use of recreational facilities. For example, changes in allowable noise levels within open space uses, could be considered as a recreational impact, a noise impact, or a land use consistency impact.*

## References

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**Transportation and Traffic**

<i>Issues (and Supporting Information Sources):</i>	<i>Potentially Significant Impact</i>	<i>Less Than Significant with Mitigation Incorporation</i>	<i>Less Than Significant Impact</i>	<i>No Impact</i>
<b>16. TRANSPORTATION AND TRAFFIC — Would the project:</b>				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Result in inadequate emergency access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Discussion**

- a-b) *The potential surface transportation impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*
- c) *Note that the ALUCP does not cause changes in air traffic patterns, but addresses land use compatibility issues related to current and future patterns. Nevertheless, it may be appropriate to reference the hazard discussion in Item 8 as it relates to air traffic patterns.*
- d-f) *See items a-b.*

**References**

## Utilities and Service Systems

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>17. UTILITIES AND SERVICE SYSTEMS — Would the project:</b>				
a) Conflict with wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Require or result in the construction of new storm water drainage facilities, or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Result in a determination by the wastewater treatment provider that would serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a) *The potential public utilities impacts of an ALUCP adoption or amendment are generally indirect, related to changes in future development patterns (discussed in Population and Housing, below).*

## References

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## Mandatory Findings of Significance

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
<b>18. MANDATORY FINDINGS OF SIGNIFICANCE — Would the project:</b>				
a) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Discussion

- a) *Mandatory findings of significance are discussed in CEQA Guidelines §15065. If there is substantial evidence, in light of the whole of the record, that any of the conditions identified in Item 18 would occur, the lead agency must prepare an EIR. The information necessary to address (a) should be found in the previous initial study checklist answers.*
- b) *This item is a reminder to the lead agency, that while the project by itself may not have significant impacts on the environment, as discussed in the previous seventeen checklist items, the cumulative effects of the project in connection with other current, past, and probable future projects must be considered before the lead agency may make a determination that an EIR is not necessary.*
- c) *While this impact is not further defined in the CEQA Guidelines, for purposes of an ALUCP, adverse effects on human beings may include significant hazard or noise impacts.*

## References

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## Appendix J

# Checklist for Commissioners

### Familiarize Yourself With The Law

- Study Public Utilities Code sections 21670 through 21679.5.

### Execute Your Primary Public Utilities Code Section 21674 Responsibilities

- Prepare and adopt airport land use compatibility plans for public use and military airports, including necessary environmental documentation.
  - Identify the extent of public outreach that is appropriate given local concerns and issues.
    - Consider whether to establish a stakeholders working group and/or technical advisory committee. Potential members include:
      - Local agencies;
      - Regional planning agencies;
      - FAA;
      - Caltrans;
      - Pilots' association;
      - Commercial air carriers;
      - Airport owners and operators;
      - Development community.
  - Consult with local agencies when establishing airport influence area boundaries.
  - Components:
    - Discussion of plan's application, including review procedures and pertinent definitions (e.g., existing land use; infill; redevelopment);
    - Compatibility criteria and policies for noise, safety, airspace protection and overflight;
    - Maps illustrating the geographic area impacted by the compatibility plan;
    - Background information on the airport and its environs.

- *May* consider political, economic, other non-compatibility-related ramifications of criteria and policies. However, ALUCs need not independently undertake cost-benefit analyses.
  - *May* adopt compatibility plans for heliports and certain special use airports.
  - Partial List of Resources:
    - General:
      - This *Handbook*;
      - Airport Master Plans;
      - Airport Layout Plans;
      - FAA's National Plan of Integrated Airport Systems;
      - *ACRP Report 27: Enhancing Airport Land Use Compatibility*, Transportation Research Board (2010)<sup>1</sup>
    - Noise:
      - FAA Advisory Circular 150/5020-1 (Noise Control and Compatibility Planning for Airports);
      - Federal Aviation Regulations, Part 150 (Airport Noise Compatibility Planning)
    - Safety:
      - FAA Advisory Circular 150/5200-33B (Hazardous Wildlife Attractants On or Near Airports);
      - FAA Advisory Circular 150/5200-34 (Construction or Establishment of Landfills Near Public Airports);
      - FAA Advisory Circular 150/5300-13 (Airport Design)
      - FAA Airports Division, Policy and Procedure Memorandum 5300.1B (Runway Protection Zone and Airport Object Clearing Policy);
      - Federal Aviation Regulations, Part 77 (Objects Affecting Navigable Airspace)
- Review the plans, regulations and other actions of local agencies and airport operators.
- Identify local agencies within the ALUC's jurisdiction that are subject to the provisions of the Public Utilities Code.
    - Such agencies include:

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<sup>1</sup> Volume 3 of this publication contains an extensive annotated bibliography for the following topics: airport land use compatibility planning; military compatibility planning; community response to aircraft noise; hazards and third-party risk; land use regulations and takings; economic considerations; state and local compatibility guidance; environmental considerations. Reference should be made to this annotated bibliography, as appropriate.

- Counties;
- Cities;
- Special Districts;
- School Districts;
- Community College Districts;
- Airport Proprietors.
- Other federal, state or regional agencies may request advisory opinions from the ALUC, which should be provided as ALUC's are required to coordinate planning at the state, regional, and local levels.
- Identify local agency actions within the airport influence area that require ALUC review.
  - Such actions may include, but are not limited to, the adoption or amendment of:
    - General Plan;
    - Community Plan;
    - Specific Plan;
    - Zoning Ordinance;
    - Other Land Use Development Regulation;
    - Airport Master Plan;
    - Airport Layout Plan;
    - Plans for the Construction of a New Airport;
    - Plans for Expansion of Airport that Requires a New or Modified Permit.
  - ALUC and local agency also may agree that certain other actions, as a matter of course, will always come to the ALUC for an advisory determination.
- Consider whether the proposed action is consistent with adopted compatibility criteria and policies.
  - *Do not* consider non-compatibility-related ramifications (e.g., economic interests) during the implementation phase. ALUCs must strive to uniformly apply criteria and policies.
- Advise the local agency of the consistency determination.
- If the proposed action is found not to be consistent with adopted compatibility criteria and policies, but the local agency intends to revise the action to ensure that

it is consistent, coordinate with the local agency to ensure that all potential inconsistencies are eliminated in a timely manner.

- If the proposed action is found not to be consistent with adopted compatibility criteria and policies, and the local agency intends to overrule the determination, review and comment on the local agency's proposed findings.
- Adopt rules and regulations that are consistent with the State Aeronautics Act that enable the ALUC to carry out its responsibilities.

Other Considerations

- Comply with the Ralph M. Brown Act, which governs open meetings for local government bodies.
  - Resources: California Government Code, §54590 et seq.; see also *The Brown Act: Open Meetings for Local Legislative Bodies*, California Attorney General's Office (2003), available at [http://www.ag.ca.gov/publications/2003\\_Intro\\_BrownAct.pdf](http://www.ag.ca.gov/publications/2003_Intro_BrownAct.pdf).
- Be wary of potential conflicts of interest or duty.
  - Depending upon the Commissioner's relationship to a particular project or land use action, it may be appropriate for the Commissioner to recuse him/herself from any related decision making.
  - Depending upon the Commissioner's other roles on certain commissions, boards, or advisory committees, it may be appropriate for the Commissioner to recuse him/herself from any related decision making.
- Establish consistent protocol and clear policy regarding the responsibilities of ALUC staff.
  - Answer the following:
    - Are resources available to retain aviation planning and environmental consultants to assist in the preparation of the ALUCP(s)?
    - Will staff be authorized to unilaterally render consistency determinations?
      - As a matter of course, any potentially compatible or incompatible projects/actions should be presented to the ALUC for review.



## Appendix K

# Reference Documents

Note: In the *Handbook* text, document references are cited using the short form indicated in the left column below.

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# Glossary of Terms

**Accident Potential Zone (APZ):** Areas based on historical accident and operations data throughout the military and the application of margins of safety within those areas if an accident were to occur. The three types of Accident Potential Zones are:

- ◆ **Runway Protection Zone-** The trapezoidal area lying immediately beyond the end of the runway and outward along the extended runway centerline for a distance of 3,000 feet.
- ◆ **APZ I-** The rectangular area beyond the Clear Zone, APZ One is typically 3,000 feet wide by 5,000 feet long and may be rectangular or curved to conform to the predominant flight track.
- ◆ **APZ II-** The rectangular area beyond APZ I, typically 3,000 feet wide by 7,000 feet long, and like APZ I, may be curved to correspond to the predominant flight track.

**Air Carriers:** The commercial system of air transportation, consisting of the certificated air carriers, air taxis (including commuters), supplemental air carriers, commercial operators of large aircraft, and air travel clubs.

**Air Installation Compatible Use Zone (AICUZ):** A land use compatibility plan prepared by the U.S. Department of Defense for military airfields. AICUZ plans serve as recommendations to local government bodies having jurisdiction over land uses surrounding these facilities.

**Aircraft Accident:** An occurrence incident to flight in which, as a result of the operation of an aircraft, a person (occupant or non-occupant) receives fatal or serious injury or an aircraft receives substantial damage.

- ◆ Except as provided below, *substantial damage* means damage or structural failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.
- ◆ Engine failure, damage limited to an engine, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered substantial damage.

**Aircraft Incident:** A mishap associated with the operation of an aircraft in which neither fatal nor serious injuries nor substantial damage to the aircraft occurs.

**Aircraft Mishap:** The collective term for an aircraft accident or an incident.

**Aircraft Operation:** The airborne movement of aircraft at an airport or about an en route fix or at other point where counts can be made. There are two types of operations: local and itinerant. An operation is counted for each landing and each departure, such that a touch-and-go flight is counted as two operations. (FAA Stats)

**Airport:** An area of land or water that is used or intended to be used for the landing and taking off of aircraft, and includes its buildings and facilities, if any. (FAR 1)

**Airport Compatibility Zones:** Areas on and near an airport in which land use and development restrictions are established to protect the safety of the public and include the Runway Protection Zone, Inner Approach/Departure Zone, Inner Turning Zone, Outer Approach/Departure Zone, Sideline Zone, and the Traffic Pattern Zone.

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

**Airport Influence Area:** An Airport Influence Area (AIA) is the area or areas in which current or future airport-related noise, over flight, safety, and/or airspace protection factors may significantly affect land uses or necessitate restrictions on those uses. The ALUC establishes its jurisdictional authority by designating one or more AIA(s). If the ALUC has not designated an AIA, PUC Section 21675.1(b) states that land within two miles of a public airport must be used instead.

**Airport Land Use Commission (ALUC):** A commission authorized under the provisions of California Public Utilities Code, Sections 21670 et seq. and established (in any county within which a public-use airport is located) for the purpose of promoting compatibility between airports and the land uses surrounding them.

**Airport Land Use Compatibility Plan (ALUCP):** A planning document that contains policies for promoting safety and compatibility between public use airports and the communities that surround them. The ALUCP is the foundation of the airport land use compatibility planning process. The ALUCP is adopted by the ALUC (or the body acting in that capacity per PUC Section 21670.1), and is based on a current Airport Master Plan (AMP) or Airport Layout Plan (ALP).

**Airport Layout Plan (ALP):** A scaled drawing of existing and proposed airport facilities including airport property lines and the information required to demonstrate conformance with applicable FAA regulations. A current FAA-approved ALP is required for NPIAS airports that receive Federal assistance. ALPs remain current for a five-year period or until major changes are made or are planned to be made at the airport. The ALP is one of the components of an Airport Master Plan (AMP).

**Airport Master Plan (AMP):** An airport master plan is an airport-sponsored, comprehensive planning study that usually describes existing conditions as well as interim and long-term development plans for the airport that will enable it to meet future aviation demand. An AMP contains an FAA-approved activity forecast and an Airport Layout Plan (ALP).

**Airport Reference Code (ARC):** A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at an airport. (Airport Design AC)

**Airports, Classes of:** For the purposes of issuing a Site Approval Permit, the California Department of Transportation, Division of Aeronautics classifies airports into the following categories. (CCR)

- ◆ *Agricultural Airport or Heliport:* An airport restricted to use only by agricultural aerial applicator aircraft (FAR Part 137 operators).
  - ◆ *Emergency Medical Services (EMS) Landing Site:* A site used for the landing and taking off of EMS helicopters that is located at or as near as practical to a medical emergency or at or near a medical facility and
    - (1) has been designated an EMS landing site by an officer authorized by a public safety agency, as defined in PUC Section 21662.1, using criteria that the public safety agency has determined is reasonable and prudent for the safe operation of EMS helicopters and
    - (2) is used, over any twelve month period, for no more than an average of six landings per month with a patient or patients on the helicopter, except to allow for adequate medical response to a mass casualty event even if that response causes the site to be used beyond these limits, and
    - (3) is not marked as a permitted heliport as described in Section 3554 of these regulations and
    - (4) is used only for emergency medical purposes.
  - ◆ *Heliport on Offshore Oil Platform:* A heliport located on a structure in the ocean, not connected to the shore by pier, bridge, wharf, dock, or breakwater, used in the support of petroleum exploration or production.
  - ◆ *Personal-Use Airport:* An airport limited to the non-commercial use of an individual owner or family and occasional invited guests.
  - ◆ *Public-Use Airport:* An airport that is open for aircraft operations to the general public and is listed in the current edition of the *Airport/Facility Directory* that is published by the National Ocean Service of the U.S. Department of Commerce.
- Seaplane Landing Site:* An area of water used, or intended for use, for landing and takeoff of seaplanes.
- ◆ *Special-Use Airport or Heliport:* An airport not open to the general public, access to which is controlled by the owner in support of commercial activities, public service operations, and/or personal use.
  - ◆ *Temporary Helicopter Landing Site:* A site, other than an emergency medical service landing site at or near a medical facility, which is used for landing and taking off of helicopters and

- (1) is used or intended to be used for less than one year, except for recurrent annual events, and
- (2) is not marked or lighted to be distinguishable as a heliport and
- (3) is not used exclusively for helicopter operations.

**Ambient Noise Level:** The level of noise that is all-encompassing within a given environment for which a single source cannot be determined. It is usually a composite of sounds from many and varied sources near to and far from the receiver.

**Approach Protection Easement:** A form of easement which both conveys all of the rights of an aviation easement and sets specified limitations on the type of land uses allowed to be developed on the property.

**Approach Speed:** The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration. (AIM)

**Aviation-Related Use:** Any facility or activity directly associated with the air transportation of persons or cargo or the operation, storage, or maintenance of aircraft at an airport or heliport. Such uses specifically include runways, taxiways, and their associated protected areas defined by the Federal Aviation Administration, together with aircraft aprons, hangars, fixed base operations facilities, terminal buildings, etc.

**Avigation Easement:** A type of easement which typically conveys the following rights:

- ◆ A right-of-way for free and unobstructed passage of aircraft through the airspace over the property at any altitude above a surface specified in the easement (usually set in accordance with FAR Part 77 criteria).
- ◆ A right to subject the property to noise, vibrations, fumes, dust, and fuel particle emissions associated with normal airport activity.
- ◆ A right to prohibit the erection or growth of any structure, tree, or other object that would enter the acquired airspace.
- ◆ A right-of-entry onto the property, with proper advance notice, for the purpose of removing, marking, or lighting any structure or other object that enters the acquired airspace.
- ◆ A right to prohibit electrical interference, glare, misleading lights, visual impairments, and other hazards to aircraft flight from being created on the property.

**Based Aircraft:** Aircraft stationed at an airport on a long-term basis.

**California Environmental Quality Act (CEQA):** Statutes adopted by the state legislature for the purpose of maintaining a quality environment for the people of the state now and in the future. The Act establishes a process for state and local agency review of projects, as defined in the implementing guidelines, which may adversely affect the environment.



**Ceiling:** Height above the earth's surface to the lowest layer of clouds or obscuring phenomena. (AIM)

**Circling Approach/Circle-to-Land Maneuver:** A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or not desirable. (AIM)

**Combining District:** A zoning district which establishes development standards in areas of special concern over and above the standards applicable to basic underlying zoning districts.

**Commercial Activities:** Airport-related activities which may offer a facility, service or commodity for sale, hire or profit. Examples of commodities for sale are: food, lodging, entertainment, real estate, petroleum products, parts and equipment. Examples of services are: flight training, charter flights, maintenance, aircraft storage, and tie-down. (CCR)

**Commercial Operator:** A person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier. (FAR 1)

**Commercial Service Airports:** Public airports receiving scheduled passenger service and having 2,500 or more enplaned passengers per year. Commercial service airports are further broken down into Primary and Non-Primary Airports.

**Community Noise Equivalent Level (CNEL):** The noise metric adopted by the State of California for evaluating airport noise. It represents the average daytime noise level during a 24-hour day, adjusted to an equivalent level to account for the lower tolerance of people to noise during evening and nighttime periods relative to the daytime period. (State Airport Noise Standards)

**Compatibility Plan:** As used herein, a plan, usually adopted by an Airport Land Use Commission, which sets forth policies for promoting compatibility between airports and the land uses which surround them. **Controlled Airspace:** Any of several types of airspace within which some or all aircraft may be subject to air traffic control. (FAR 1)

**Day-Night Average Sound Level (DNL):** The noise metric adopted by the U.S. Environmental Protection Agency for measurement of environmental noise. It represents the average daytime noise level during a 24-hour day, measured in decibels and adjusted to account for the lower tolerance of people to noise during nighttime periods. The mathematical symbol is Ldn.

**Decibel (dB):** A unit measuring the magnitude of a sound, equal to the logarithm of the ratio of the intensity of the sound to the intensity of an arbitrarily chosen standard sound, specifically a sound just barely audible to an unimpaired human ear. For environmental noise from aircraft and other transportation sources, an *A-weighted sound level* (abbreviated dBA) is normally used. The A-weighting scale adjusts the values of different sound frequencies to approximate the auditory sensitivity of the human ear.

**Deed Notice:** A formal statement added to the legal description of a deed to a property and on any subdivision map. As used in airport land use planning, a deed notice would state that the property is subject to aircraft overflights. Deed notices are used as a form of buyer notification as a means of ensuring that those who are particularly sensitive to aircraft overflights can avoid moving to the affected areas.

**Departure Surface for Instrument Runways:** Applied to runways with an instrument approach, this surface has a slope of 40:1 starting from the departure end of the runway with dimensions of 1,000 foot inner width, 6,466 foot outer width, and 10,200 foot length.

**Designated Body:** A local government entity, such as a regional planning agency or a county planning commission, chosen by the county board of supervisors and the selection committee of city mayors to act in the capacity of an airport land use commission.

**Displaced Threshold:** A landing threshold that is located at a point on the runway other than the designated beginning of the runway (see *Threshold*). (AIM)

**Easement:** A less-than-fee-title transfer of real property rights from the property owner to the holder of the easement.

**Equivalent Sound Level (Leq):** The level of constant sound which, in the given situation and time period, has the same average sound energy as does a time-varying sound.

**FAR Part 77:** The part of the Federal Aviation Regulations which deals with objects affecting navigable airspace.

**FAR Part 121 Operations:** Operating requirements for Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft.

**FAR Part 135 Operations:** Operating requirements for Commuter, and On Demand Operations and rules governing persons on board such aircraft.

**FAR Part 150 Study:** A study that determines the amount of noise impact an airport generates from its operations with the purpose of reducing noise impacts on existing incompatible land use and to prevent the introduction of new incompatible land uses in the areas impacted by aircraft noise.

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

**Federal Aviation Administration (FAA):** The U.S. government agency which is responsible for ensuring the safe and efficient use of the nation's airports and airspace.

**Federal Aviation Regulations (FAR):** Regulations formally issued by the FAA to regulate air commerce.

**Findings:** Legally relevant sub conclusions which expose a government agency's mode of analysis of facts, regulations, and policies, and which bridge the analytical gap between raw data and ultimate decision.

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

**Fleet Mix:** The composition of aircraft that operate at a particular airport.

**Flight Tracks:** Routes aircraft routinely use when arriving and departing from an airport.

**Forecasts:** A projection of the amount and type of aircraft operations at an airport.

**General Aviation:** That portion of civil aviation which encompasses all facets of aviation except air carriers. (FAA Stats)

**General Aviation Airport:** Airports that do not receive scheduled commercial service, or do not meet the criteria for classification as a commercial service airport. General aviation airports have at least 10 locally based aircraft, are at least twenty miles from the nearest NPIAS airports

**General Plan:** A statement of policies, including text and diagrams, setting forth objectives, principles, standards, and plan proposals, for the future physical development of a city or county.

**Glide Slope:** An electronic signal radiated by a component of an ILS to provide vertical guidance for aircraft during approach and landing.

**Global Positioning System (GPS):** A navigational system which utilizes a network of satellites to determine a positional fix almost anywhere on or above the earth. Developed and operated by the U.S. Department of Defense, GPS has been made available to the civilian sector for surface, marine, and aerial navigational use. For aviation purposes, the current form of GPS guidance provides en route aerial navigation and selected types of non-precision instrument approaches. Eventual application of GPS as the principal system of navigational guidance throughout the world is anticipated.

**Helipad:** A small, designated area, usually with a prepared surface, on a heliport, airport, landing/ takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters. (AIM)

**Heliport:** A facility used for operating, basing, housing, and maintaining helicopters. (HAI)

**Infill:** Development which takes place on vacant property largely surrounded by existing development, especially development which is similar in character.

**Inner Approach/Departure Zone:** A rectangular area extending beyond the RPZ. If the RPZ widths approximately equal the runway widths, the Inner Approach/Departure Zone extends along the sides of the RPZ from the end of the runway.

**Inner Turning Zone:** A triangular area over which aircraft are turning from the base to final approach legs of the standard traffic pattern. It also includes the area where

departing aircraft normally complete the transition from takeoff to climb mode and begin to turn on their en route headings.

**Instrument Approach Procedure:** A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority (refer to *Nonprecision Approach Procedure* and *Precision Approach Procedure*). (AIM)

**Instrument Flight Rules (IFR):** Rules governing the procedures for conducting instrument flight. Generally, IFR applies when meteorological conditions with a ceiling below 1,000 feet and visibility less than 3 miles prevail. (AIM)

**Instrument Landing System (ILS):** A precision instrument approach system which normally consists of the following electronic components and visual aids: (1) Localizer; (2) Glide Slope; (3) Outer Marker; (4) Middle Marker; (5) Approach Lights. (AIM)

**Instrument Operation:** An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility. (FAA ATA)

**Instrument Runway:** A runway equipped with electronic and visual navigation aids for which a precision or non-precision approach procedure having straight-in landing minimums has been approved. (AIM)

**Intercounty Airport:** An airport where a county line bisects a runway or any various safety compatibility zones.

**Inverse Condemnation:** An action brought by a property owner seeking just compensation for land taken for a public use against a government or private entity having the power of eminent domain. It is a remedy peculiar to the property owner and is exercisable by that party where it appears that the taker of the property does not intend to bring eminent domain proceedings.

**Land Use Density:** Land use density is a measure of the concentration of residential development in a given area. It is typically expressed as the number of dwelling units per acre using a net acreage calculation.

**Land Use Intensity:** Land Use Intensity is a measure of the concentration of nonresidential development in a given area. Intensity can be expressed as number of people per acre using a net acreage calculation.

**Land Use Map:** A map showing land-use classifications as well as other important surface features such as roads, rail lines, waterways, and jurisdictional boundaries. Land Use Maps may show either existing or proposed land uses.

**Large Airplane:** An airplane of more than 12,500 pounds maximum certificated takeoff weight. (Airport Design AC)

**Localizer (LOC):** The component of an ILS which provides course guidance to the runway. (AIM)

**Minimum Descent Altitude (MDA):** The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glide slope is provided. (FAR 1)

**Missed Approach:** A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing. (AIM)

**National Transportation Safety Board (NTSB):** The U.S. government agency responsible for investigating transportation accidents and incidents.

**Navigational Aid (Navaid):** Any visual or electronic device airborne or on the surface which provides point-to point guidance information or position data to aircraft in flight. (AIM)

**Noise Contours:** Continuous lines of equal noise level usually drawn around a noise source, such as an airport or highway. The lines are generally drawn in 5-decibel increments so that they resemble elevation contours in topographic maps.

**Noise Level Reduction (NLR):** A measure used to describe the reduction in sound level from environmental noise sources occurring between the outside and the inside of a structure.

**Nonconforming Use:** An existing land use which does not conform to subsequently adopted or amended zoning or other land use development standards.

**Non-precision Approach Procedure:** A standard instrument approach procedure in which no electronic glide slope is provided. (FAR 1)

**Non-precision Instrument Runway:** A runway with an approved or planned straight-in instrument approach procedure which has no existing or planned precision instrument approach procedure. (Airport Design AC)

**Obstruction:** Any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment or materials used therein, the height of which exceeds the standards established in

Subpart C of Federal Aviation Regulations Part 77, *Objects Affecting Navigable Airspace*.

**One-Engine Inoperative (OEI) Obstacle Identification Surface:** For airports with runways that support air carrier operations, this surface begins at the same elevation of the end of the departure runway and slopes upward at 1 foot vertically to 62.5 feet horizontally. The inner width of the OEI surface is 600 feet while the outer width is 12,000 feet. The surface extends for a distance of 50,000 feet along the runway centerline.

**Outer Approach/Departure Zone:** A rectangular area located along the extended centerline beyond the Inner Approach/Departure Zone.

**Overflight:** Any distinctly visible and audible passage of an aircraft in flight, not necessarily directly overhead.

**Overflight Easement:** An easement which describes the right to overfly the property above a specified surface and includes the right to subject the property to noise, vibrations, fumes, and emissions. An overflight easement is used primarily as a form of buyer notification.

**Overflight Zone:** The area(s) where aircraft maneuver to enter or leave the traffic pattern, typically defined by the FAR Part 77 horizontal surface.

**Overlay Zone:** See *Combining District*.

**Precision Approach Procedure:** A standard instrument approach procedure where an electronic glide slope is provided. (FAR 1)

**Precision Instrument Runway:** A runway with an existing or planned precision instrument approach procedure. (Airport Design AC)

**Referral Area:** The area around an airport defined by the planning area boundary adopted by an airport land use commission within which certain land use proposals are to be referred to the commission for review.

**Runway Capacity:** The number of landings and take-offs, or a combination of both, that can be accommodated without undue delays to aircraft with the minimal approach spacing published for IFR (instrument flight rules) and VFR (visual flight rules).

**Runway Protection Zone (RPZ):** An area (formerly called a *clear zone*) off the end of a runway used to enhance the protection of people and property on the ground. (Airport Design AC)

**Safety Zone:** For the purpose of airport land use planning, an area near an airport in which land use restrictions are established to protect the safety of the public from potential aircraft accidents.

**Sideline Zone:** A rectangular area in close proximity and parallel to the runway.

**Single-Event Noise:** As used in herein, the noise from an individual aircraft operation or overflight.

**Single Event Noise Exposure Level (SENEL):** A measure, in decibels, of the noise exposure level of a single event, such as an aircraft flyby, measured over the time interval between the initial and final times for which the noise level of the event exceeds a threshold noise level and normalized to a reference duration of one second. SENEL is a noise metric established for use in California by the state Airport Noise Standards and is essentially identical to *Sound Exposure Level (SEL)*.

**Site Approval Permit:** A written approval issued by the California Department of Transportation authorizing construction of an airport in accordance with approved plans, specifications, and conditions. Both public use and special-use airports require a site approval permit. (CCR)

**Small Airplane:** An airplane of 12,500 pounds or less maximum certificated takeoff weight. (Airport Design AC)

**Sound Exposure Level (SEL):** A time-integrated metric (i.e., continuously summed over a time period) which quantifies the total energy in the A-weighted sound level measured during a transient noise event. The time period for this measurement is generally taken to be that between the moments when the A-weighted sound level is 10 dB below the maximum.

**Straight-In Instrument Approach:** An instrument approach wherein a final approach is begun without first having executed a procedure turn; it is not necessarily completed with a straight-in landing or made to straight-in landing weather minimums. (AIM)

**Taking:** Government appropriation of private land for which compensation must be paid as required by the Fifth Amendment of the U.S. Constitution. It is not essential that there be physical seizure or appropriation for a *taking* to occur, only that the government action directly interferes with or substantially disturbs the owner's right to use and enjoyment of the property.

**Terminal Instrument Procedures (TERPS):** Procedures for instrument approach and departure of aircraft to and from civil and military airports. There are four types of terminal instrument procedures: precision approach, non-precision approach, circling, and departure.

**Threshold:** The beginning of that portion of the runway usable for landing (also see *Displaced Threshold*). (AIM)

**Touch-and-Go:** An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. (AIM)

**Traffic Pattern:** The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach. (AIM)

**Traffic Pattern Zone:** An elliptical area that includes the majority of other portions of regular air traffic patterns and pattern entry routes, and generally extends to the farthest point of 6,000 foot radius arcs from the centers of each of the primary surfaces and connecting lines tangent to those arcs.

**Visual Approach:** An approach where the pilot must use visual reference to the runway for landing under VFR conditions.

**Visual Flight Rules (VFR):** Rules that govern the procedures for conducting flight under visual conditions. VFR applies when meteorological conditions are equal to or greater than the specified minimum—generally, a 1,000-foot ceiling and 3-mile visibility.

**Visual Runway:** A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan. (Airport Design AC)

**Zoning:** A police power measure, enacted primarily by units of local government, in which the community is divided into districts or zones within which permitted and special uses are established, as are regulations governing lot size, building bulk, placement, and other development standards. Requirements vary from district to

district, but they must be uniform within districts. A zoning ordinance consists of two parts: the text and a map.

**Glossary Sources**

**FAR 1:** *Federal Aviation Regulations Part 1, Definitions and Abbreviations*

**AIM:** *Aeronautical Information Manual*

**Airport Design AC:** Federal Aviation Administration, *Airport Design Advisory Circular 150/5300-13*

**CCR:** California Code of Regulations, Title 21, Section 3525 et seq. *Division of Aeronautics*

**FAA ATA:** Federal Aviation Administration, *Air Traffic Activity*

**FAA Stats:** Federal Aviation Administration, *Statistical Handbook of Aviation*

**HAI:** Helicopter Association International

**NTSB:** National Transportation and Safety Board



## Appendix M

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