Airport Land Use Compatibility

HANDBOOK

Kern Council of Governments

Airport Land Use Commission
Comprehensive Land Use Plan

Prepared
by
Hodges & Shutt
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1 - INTRODUCTION

This handbook is designed to provide a broad background on the topic of airport land use compatibility. Although the handbook is intended for use by Airport Land Use Commissions (ALUC's), it presents the entire range of compatibility measures, not just those which ALUC's can implement. It is believed that it is appropriate to place the ALUC's authority over land use in the context of the full range of compatibility measures.

This handbook is organized into seven sections:

- Airport Land Use Commission enabling legislation
- Flight procedures
- Noise
- Safety
- Annoyance
- Compatibility measures

(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 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 for reviewing and processing proposals and for providing copies of land use plans, as required by subdivision (d) of Section 21675. 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 Chapter 13 (commencing with Section 54990) of Part 1 of Division 2 of Title 5 of the Government Code. After June 30, 1991, a commission which has not adopted the comprehensive land use plan required by Section 21675 shall not charge fees pursuant to this subdivision until the commission adopts the plan.

Rules and Regulations

21672. 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.

Initiation of Proceedings for Creation by Owner of Airport

21673. In any county when a commission has not been created by Section 21670, 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 therefor to their satisfaction.

Powers and Duties

21674. The commission shall have the following powers and duties, subject to the limitations upon its jurisdiction herein set forth:

(a) To study conditions and make recommendations concerning the need for height restrictions on buildings near airports;

(b) To make recommendations for the use of the land surrounding airports to assure safety of air navigation and the promotion of air commerce;

(c) To hold pubic hearings regarding the subject matter in subdivisions (a) and (b) and make findings of fact thereon which would be advisory only to the involved jurisdiction.

(d) To make and enforce rules and regulations for the orderly and fair conduct of such hearings which shall conform as nearly as possible to the provisions applicable to hearings conducted by

local agency formation commissions.

(e) To achieve by zoning 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 such airports is not already devoted to incompatible uses, and to this end the commissions shall require that all new construction in such areas shall conform to such standards as the department may from time to time adopt.

The powers of the commission shall in no way be construed to give the commission jurisdiction over the operation of any airport.

This section shall become operative January 1, 1989.

Land Use Plan

21675 (a) Each commission shall formulate a comprehensive land use 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 plan shall include a long-range master plan that reflects the anticipated growth of the airport during at least the next 20 years. In formulating a land use plan, the commission may develop height restrictions on buildings, may specify use of land, and may determine building standards, including soundproofing adjacent to airports, within the planning area. The comprehensive land use 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 may include, within its plan formulated pursuant to subdivision (a), the area within the jurisdiction of the commission surrounding any federal military airport for all the purposes specified in subdivision (a). This subdivision does not give the commission any jurisdiction or authority over the territory or operations or any military airport.

(c) The planning boundaries 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 plan and each amendment to the plan.

21675.1 (a) By June 30, 1991, each commission shall adopt the comprehensive land use plan required pursuant to Section 21675.

(b) Until a commission adopts a comprehensive land use 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 which will be included or reasonably could be included within the plan. If the commission has not designated a study area for the 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 plan.

(2) There is a reasonable probability that the action, regulation, or permit will be consistent with the plan being prepared by the commission.

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PREFACE

This is the first in a series of documents to be prepared during the process of updating the Airport Land Use Commission's (ALUC) Comprehensive Airports Land Use Plan. The Compatibility Criteria and Policies will be used as the basis for updating the ALUC Airports Plan for the area around each public-use airport in Kern County. This process will be accomplished over the next two years, contingent upon the availability of funding, and will ensure that the ALUC plan conforms to the most recent requirements of the state Aeronautics Act.

Work on the Comprehensive Airports Land Use Plan will be accomplished in the following basic phases:

I. Establish ALUC Policies and Criteria.

II. Update Airport Planning Area boundaries for each public-use airport in the system.

III. Update the Comprehensive Airports Land Use Plan for the Planning Area for each airport.

When adopted, the Comprehensive Airports Land Use Plan will be used by the ALUC in determining the compatibility of land use plans and proposed development in the vicinity of public-use and military airports in Kern County. This process will help to ensure that decisions involving land uses around the airports consider the need for compatibility with airport activities. This approach is intended to simplify implementation by both the ALUC and the various jurisdictions affected by it.

1 - INTRODUCTION

FUNCTION OF THE PLAN

This document sets forth the criteria which the Kern Airport Land Use Commission will use as interim guidance for preparing the ALUC update and, upon adoption of the revised plan, in evaluating land use plans and proposed development in the vicinity of the public-use and military airports located in Kern County. It is the purpose of the Commission's review to assure that future actions involving land uses in the environs of these airports take into account the need for compatibility with airport activities. The Commission has no authority over existing land uses, even if such uses are considered incompatible with airport activity. Also, the Commission has no authority over the operation of any airport.

AUTHORITY AND REQUIREMENTS

The statutory authority for the establishment of airport land use commissions is provided in the California Public Utilities Code, Sections 21670 et seq. (Chapter 4, Article 3.5 of the State Aeronautics Act). Every county in which there is located an airport "operated for the general benefit of the public" is required (with limited exceptions) to have an airport land use commission.

The purpose of the article and the reason for the creation of the commissions is expressly stated as being:

> "... 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."

Among the required duties of each commission is to formulate a comprehensive land use plan (CLUP) intended to achieve the above purpose. The plan must address each public airport within the commission's jurisdiction and its time frame must be long-range. It may include height restrictions, specify land uses, and determine building standards.

Under provisions of the law added in 1982, either local general plans and specific plans must be made consistent with the airport land use commission plan or the governing body of the local jurisdiction must take specific steps to override the commission. The steps to override include making specific findings that the proposed action is consistent with the purposes of the article and passage by a two-thirds vote. Once consistency has been achieved or an override has been approved, individual land use development projects need no longer be reviewed by the commission unless the commission and the local jurisdiction agree that such review be continued.

The complete text of Article 3.5 is included in Appendix A.

KERN AIRPORT LAND USE COMMISSION

The Kern Council of Governments (Kern COG) was designated as the agency responsible for carrying out the functions of the Airport Land Use Commission (ALUC) for Kern County in October, 1971. This action was based upon the July 27, 1971 Board of Supervisors approval of such designation and the August 26, 1971 concurrence by the mayors of the cities of Kern County. These two approvals were required by the Public Utilities Code as conditions for designation of Kern COG as the ALUC. Kern COG accepted the assumption of the duties of the ALUC at its meeting of November 11, 1971.

Airport Land Use Study Areas for each of the airports in Kern County were established by Kern COG, in its capacity as the ALUC, on June 5, 1973. These boundaries were prepared in cooperation with the Kern County Planning Department and reflected changes requested by the Kern County Planning Commission. In December 1974, Kern COG adopted an Airports Plan as an element of the Areawide Transportation Plan. This was followed by the Airport Land Use and Height Recommendations on March 3, 1976.

In 1984, a Regional Airport System Plan was prepared. This project was funded by a grant from the Federal Aviation Administration. The Regional Airport System Plan addressed the short-to-medium term (10 to 15 years) and long-term (20 years and beyond) development of the various airports in the Kern Airport System. Also addressed were the roles of the military facilities in Kern County, and the need for expansion of existing or development of new airports in the county.

To date, ALUC review of projects in Kern County has been limited to that required by state law. No agreements have been entered into with local jurisdictions which would allow ALUC review beyond the scope required by the State.

SCOPE OF THE PLAN

The scope of the land use actions which are subject to Airport Land Use Commission review can be defined in terms of:

- The extent of the geographic area around each airport which is of concern to the commission;
- The types of airport impacts which are critical to airport/land use compatibility; and
- The types of actions to be reviewed.

2 - STATE AERONAUTICS ACT

ARTICLE 3.5 AIRPORT LAND USE COMMISSION

A portion of the Public Utilities Code

Creation, Membership, Selection

21670. (a) 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 these 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 subdivisions (b) and (c) shall each be increased by one.

(2) Two representing the county, appointed by the board of supervisors.

(3) Two representing the airports within that county, appointed by a selection committee comprised of the managers of all of the public airports within that county, except that one representative shall be appointed from an airport operated for the benefit of the general public.

(4) One representing the general public, appointed by the other six members of the commission.

(b) Public officers, whether elected or appointed, may be appointed and serve as members of the commission during their terms of public office.

(c) Each member shall promptly appoint a single proxy to represent the member 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.

(d) This section shall become operative January 1, 1989.

Action by Designated Body Instead of Commission

21670.1 Notwithstanding any provisions of this article, if the board of supervisors and the city selection committee of mayors in any county each makes a determination by a majority vote that proper land use planning can be accomplished through the actions of an appropriate designated body, then such body 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.

Applicability to Counties Having Over 4 Million Population

21670.2. Sections 21670 and 21670.1 do not apply to counties of more than 4 million population. In such counties, the county regional planning commission has the responsibility of 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 such an appeal may be overruled by a four-fifths vote of the governing body of a public agency whose planning led to the appeal.

Airports Owned by a City, District, or County; Appointment of Certain Members by Cities and Counties

21671. 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 (a) of Section 21670 shall be appointed by the 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) subdivision (a) of Section 21670 shall be appointed by the board of supervisors of the county in which the owner of that airport is located.

This section shall become operative January 1, 1989.

Term of Office; Removal of Members; Vacancies; Compensation; Staff Assistance; Meetings

21671.5 (a) Except for the terms of office of the members of the first commission, the term of office for 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 if four years. The body which 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 him or her. The expiration date of the term of office of each member shall be the first Monday in May in the year in which his or her 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.

2 - COMPATIBILITY CRITERIA AND POLICIES

GENERAL APPROACH

The approach to airport/land use compatibility planning taken by this plan is intended to simplify its implementation. A composite set of Compatibility Criteria has been assembled which includes three of the four traditional airport/land use compatibility concerns – noise, safety and overflight annoyance. Airspace protection remains as a separate set of criteria. The intent is to simplify the review process by eliminating the need to consider several different compatibility tables and associated maps. For those cases in which further understanding of the Compatibility Criteria may be necessary, supporting policies are provided.

The criteria in this plan are performance oriented, rather than list oriented. That is, the criteria contain standards which are to be achieved (e.g., occupancy limits), rather than a list of specific uses which are permitted in each zone. This format directly relates the concern (e.g., safety) to a criteria (e.g., occupancy limits). The local governments which have the implementing authority for land use must then interpret these criteria in terms of their land use and zoning ordinances. Because most local land use and zoning ordinances are list-oriented, a **suggested** list of uses for each of the compatibility zones is included in this plan. However, the list of uses is not intended to be a formal part of the ALUC policies. They are intended as an aid in matching ALUC policies to each jurisdiction's specific circumstances. A discussion of implementation strategies for local governments is presented in Chapter 3.

The compatibility policies presented in this plan are directly derived from well-established criteria. Among the specific sources utilized are:

- Federal Aviation Regulations Part 77, "Objects Affecting Navigable Airspace".
- Federal Aviation Administration Advisory Circular 150/5020-1, "Noise Control and Compatibility Planning for Airports".
- California State Aeronautics Law.
- California Division of Aeronautics Noise Regulations.
- California Division of Aeronautics *Airport Land Use Planning Handbook*.
- Oregon Division of Aeronautics *Airport Compatibility Guidelines*.
- Previously adopted local plans and policies.

POLICIES REGARDING SCOPE OF REVIEW

Geographic Area of Concern

- The Airport Land Use Commission's geographic area of concern encompasses all lands on which the uses could be negatively affected by current or future aircraft operations associated

with one of the public-use airports or military airfields in Kern County, as well as those lands on which the uses could adversely affect the safety of aircraft flight around these airports.

- The specific limits of the area of concern for each airport is termed the "planning area" under California law (Public Utilities Code Section 21675). The planning area for each airport is depicted on the respective **Compatibility Map** for that airport.

- When a revised comprehensive land use plan is developed for each of the airports in Kern County, the airport's horizontal surface shall be used as the planning area. The horizontal surface shall be based upon the **forecast** runway length and approach type for the airport's runways. Figure 1 presents three examples of horizontal surfaces. Appendix A provides additional detail. The planning area for an individual airport shall be expanded beyond the airport's horizontal surface under two circumstances. In those cases where the airport's **forecast** noise contour (as defined in the Supporting Policies) extend beyond the horizontal surface, the planning area shall be expanded to encompass the noise contour. The planning area shall also be expanded to include areas where land uses might be affected by aircraft operations, because of terrain or unusual flight patterns.

- For the following two types of projects, the Commission's geographic area of concern encompasses all of Kern County:

  - Any proposal for a new airport.

  - Any proposal for construction or alteration of an object having a height which would require that notice be given to the Federal Aviation Administration in accordance with Part 77, Subpart B, of the Federal Aviation Regulations.

Types of Airport Impacts

The Commission is concerned only with the noise, safety, and overflight annoyance impacts; and airspace protection requirements of each airport. Other impacts sometimes created by airports (e.g., air pollutants, automobile traffic, etc.) are beyond the scope of this plan. They are within the authority of other local, state, and federal agencies. The principal compatibility considerations for these categories are:

- **Noise Impacts** – Usually perceived as the most significant adverse impact of airport activity. Noise impacts are most commonly defined in terms of average noise exposure levels. The descriptor used in California to measure cumulative noise impact is the Community Noise Equivalent Level (CNEL).

- **Safety on the Ground** – The objective in providing an acceptable level of safety on the ground is to reduce the risks of damage to property or injury to persons or property in the event of an aircraft accident. The issue of safety is most critical within the approaches to an airport where aircraft are below standard traffic pattern altitude. Reducing occupancy levels, limiting residential densities, clustering development, and providing open spaces for emergency landing sites are the principal means of providing acceptable levels of safety on the ground.

(3) 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.

(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) with respect to a publicly owned airport that the city or county does not operate, the operator of the airport shall be immune from liability for damages to property or personal injury from the city's or county's decision to proceed with the action, regulation, or permit.

(g) A commission may adopt rules and regulations which 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 (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 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 63943 to 63946, 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. Each public agency having representation on the commission shall assist in the development of an area plan. All such plans shall be filed with the commission for its approval. If in the determination of the commission, an action or regulation of any public agency within the boundaries of the area plan is inconsistent with the commission plan, then the commission shall hold a hearing to determine whether or not the proposed action is in the best interest of the airport and the adjacent area. If it is determined that the action would be harmful, then the public agency shall be notified and the public agency shall have another hearing to reconsider its action. The public agency proposing the action or regulation, however, may overrule the commission after such hearing by a four-fifths vote of its governing body.

Each public agency owning any airport within the boundaries of the area plan shall file an substantive change in the development plans with the commission for its approval. If such plans are inconsistent with the commission plan, then the public agency shall be notified and shall have another hearing to reconsider its action. Such public agency, however, may overrule the commission by a four-fifths vote of its governing body.

This section shall become operative January 1, 1989.

Review of Local Plans

21676.5 (a) If the commission finds that a local agency has not revised its general plan or specific plan or overrule 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 its 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 wit the commission plan, the local agency shall be notified and that local agency shall hold a hearing to reconsider its plan. The local agency may 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 inconsistent with the purposes of this article as stated in Section 21670.

(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.

Marin County Override Provision

21677. Notwithstanding 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.

Airport Owner's Immunity

21678. With respect to a publicly owned airport that a public agency does not operate, if the public agency pursuant to Section 21676 or 21676.5 overrides a commission's action or recommen-

dation, the operator of the airport shall be immune from liability for damages to property or personal injury caused by or resulting directly from the public agency's decision to override the commission's action or regulation.

(b) The section shall remain in effect only until January 1, 1989, and as of that date is repealed, unless a later enacted statute, which is chaptered before January 1 1989, deletes or extends that date.

21679.5. (a) Until June 30,1 991, 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 plan, but is making substantial progress toward the completion of the plan.

(b) If a commission has been prevented from adopting the comprehensive land use plan by June 30, 1991, or if the adopted plan could not become effective, because of a lawsuit involving the adoption of the 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 plan, but is making substantial progress toward the completion of the plan, which has not proceeded to final judgement, shall be held in abeyance until June 30, 991. If the commission or other designated body does not adopt an airport land use 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 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.

3 - FLIGHT PROCEDURES

OVERVIEW

Essential to any discussion of airports and their interaction with surrounding land uses is a basic understanding of aircraft operations. Aircraft fly to and from airports under two different sets of federally-defined operating procedures: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). VFR operating procedures are used when the weather (i.e., visibility and cloud height) permits pilots sufficient time to see and avoid other aircraft visually. IFR operating procedures are required when visibility limitations preclude use of the "see and be seen" concept. Under IFR procedures, pilots must rely on their cockpit instrumentation, ground-based navigational aids, and (where available) air traffic control services. VFR and IFR procedures are applicable to both en route aircraft operations and operations in the vicinity of an airport.

VISUAL FLIGHT RULES

As noted above, when using VFR procedures pilots operate under a "see and be seen" concept. It is the pilots' responsibility to maintain appropriate separation between aircraft. To facilitate the orderly and efficient operation of aircraft, the FAA and airport operators have jointly established flight routes and procedures. An airport traffic pattern is a prime example of such a procedure.

An airport traffic pattern is typically defined in terms of an altitude (or height above the airport) and a generalized routing. This generalized routing is typically the racetrack-shaped path leading to and from the runway in use (Figure 1) It is important to realize that, although most pilots will typically fly a standard pattern at a non-towered airport, use of the standard pattern is not mandatory. Depending upon the direction of flight, a pilot may make a "base entry" or "straight in" approach to landing. At towered airports, pilots will request the type of entry which will be most convenient for them. Air traffic controllers will typically grant the request unless congestion dictates the need for an alternate approach.

The existence of standard patterns tends to give those who are not pilots the idea that aircraft will be following well defined "corridors in the sky". The reality is that there is considerable variation in how pilots fly a standard pattern. Standard-performance, single-engine aircraft will fly downwind and base legs (Figure 1) anywhere from one-quarter mile to one mile from the runway when there are no other aircraft in the pattern. The base leg may be extended out to two miles or more when there are other aircraft in the pattern for landing. When larger and faster aircraft fly a standard pattern, their pattern is typically well outside the pattern being flown by slower aircraft. Often the pattern for larger and faster aircraft is so much further out that operationally it is as if these aircraft are making a straight in approach.

Nonstandard patterns are sometimes adopted – formally or informally – for an airport. Nonstandard patterns may be designed to avoid terrain or noise-sensitive uses, or to utilize distinct

landmarks. The existence of nonstandard patterns is often not well documented. When one evaluates the potential impacts of a specific airport – when preparing an ALUC plan, for example – it is essential to interview the airport manager, air traffic controllers, and the pilots who regularly use an airport (especially flight instructors). Only through this interview process is one likely to determine the flight paths that are actually being used at an airport.

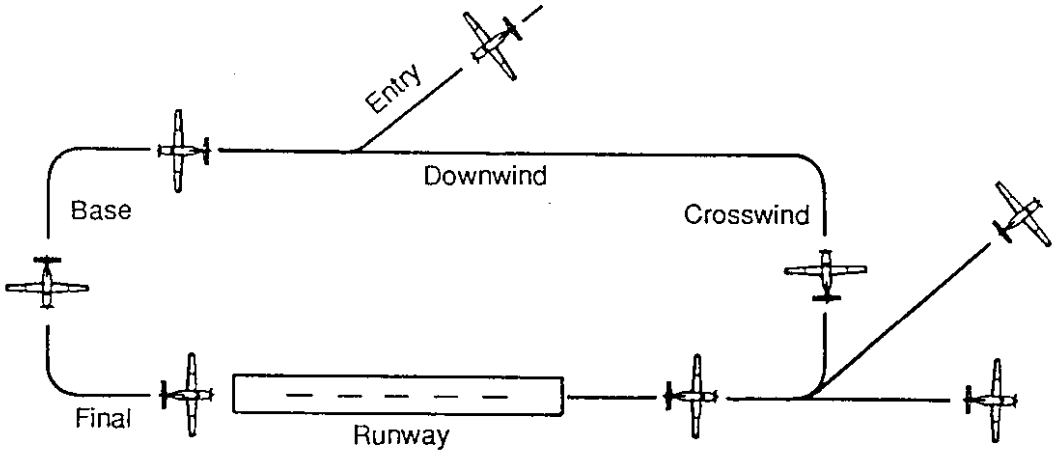
INSTRUMENT FLIGHT RULES

Aircraft operations under Instrument Flight Rules are typically more complex than under Visual Flight Rules. On an IFR flight, the pilot receives verbal and electronic assistance from ground-based personnel and navigational aids. This assistance is necessary for both en route operations and for approaching the destination airport. Not all airports offer instrument approach capability. Typically, larger, more active airports offer one or more types of instrument approach procedures.

Instrument approach procedures are categorized as either "precision" (i.e., offering electronic course and elevation guidance) or "nonprecision" (i.e., offering only electronic course guidance). Typically a precision approach procedure guides the aircraft on a straight-in course at a three-degree slope to a point approximately one-half mile from the runway threshold and 200 feet above the airport's elevation. A nonprecision instrument approach procedure offers less precise navigation guidance and, as a result, the aircraft can approach the airport to a point approximately three-quarters of a mile from the runway threshold and 400 feet above the airport's elevation. These approaches are usually from a straight-in course.

Nonprecision approaches can also be configured to permit "circle-to-land" operations when the final approach course does not permit a straight-in approach to the runway. Circle-to-land approach minimums are generally higher than for straight-in approaches. A circle-to-land approach results in aircraft maneuvering in close proximity to the airport at less than the normal VFR traffic pattern altitudes and frequently at high power settings.

Having made an instrument approach, if the pilot is unable to see the runway at the desired point, a "missed approach" maneuver is initiated. In this maneuver, the pilot abandons the instrument approach and climbs to a higher altitude. The sudden increase in engine power required for the aircraft to climb is very noticeable to persons on the ground. Following the missed approach, the pilot can try another approach or proceed to an alternate airport.



Note:
Recommended standard left-hand pattern is depicted. Recommended standard right-hand pattern would be opposite.

Source: Airman's Information Manual, Federal Aviation Administration, January 11, 1990; Figure 4-5.

Figure 1

Standard Traffic Patterns

4 - NOISE CONSIDERATIONS

INTRODUCTION

Noise is often perceived to be the most significant of the adverse impacts associated with airport activity. To a great extent, establishing standards for noise compatibility between airports and their environs is a matter of determining what is "acceptable" to the community affected. There is, however, a substantial amount of scientific data regarding human reactions to noise which also is relevant to the development of noise standards.

The following two sections of this chapter describe some of the basic characteristics of sound and discuss ways in which noise, particularly aircraft noise, affects people. Established regulations and policies regarding noise are outlined in the subsequent section. The chapter concludes with a discussion of the principal issues and choices involved in developing airport/land use noise compatibility policies.

CHARACTERISTICS OF SOUND

Sound is transmitted in the form of pressure waves. These waves are created by particles of air 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.

There are two principal dimensions to sound waves: amplitude (intensity of loudness) and frequency (pitch). The intensity of sounds which are audible to the ear is commonly measured in "decibels" (abbreviated dB). The decibel scale ranges from 0 to 140, with 0 corresponding to the lowest sound level that the healthy, unimpaired human ear can detect. The scale is logarithmic rather than linear such as miles or pounds. Each increase of 10 dB thus means that the acoustical energy is multiplied by 10 – a sound of 70 dB is 10 times as intensive as one of 60 dB. The relative "loudness" of sound, as perceived by the human ear, however, does not closely match the actual relative amounts of sound energy. For example, while 70 dB is physically 10 times as intensive as 60 dB, listeners will tend to judge it as only twice as "loud". A tabulation of approximate decibel levels generated by common indoor and outdoor sound sources is presented in Table 1.

The frequency of a sound – its "highness" or "lowness" – depends upon the relative rapidity of the vibrations by which it is produced. In a low-pitched tone, the sound waves are relatively far apart, while in a high-pitched one they are squeezed much closer together. Pitch 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.

	INDOORS	DECIBELS	OUTDOORS
THRESHOLD OF PAIN		140	
		130	Pneumatic Riveter
UNCOMFORTABLY LOUD		120	
	Rock and Roll Band	110	Jet Takeoff at 1,000 feet
			Jet Flyover at 1,000 feet
VERY LOUD	Inside Subway Train (New York)	100	
	Newspaper Press		Farm Tractor at 50 feet Power Mower at 3 feet
	Food Blender at 3 feet	90	Motorcycle at 50 feet
			Diesel Truck at 50 feet
	Garbage Disposal at 3 feet Shouting at 3 feet	80	Noisy Urban Daytime
MODERATELY LOUD			Auto 65 mph at 50 feet Light Airplane at 1,000 feet
	Vacuum Cleaner at 10 feet	70	Power Mower at 100 feet
	Normal Speech at 3 feet Electric Typewriter at 10 feet		Commercial Area Auto 30 mph at 50 feet
	Conversation Background Music Large Business Office	60	Air Conditioner at 50 feet
QUIET	Dishwasher, Next Room	50	Light Traffic at 100 feet Quiet Urban Daytime
	Very Quiet Radio at Home	40	Quiet Urban Nighttime
	Library		Quiet Suburban Nighttime
VERY QUIET		30	Quiet Rural Nighttime
	Concert Hall (background)		
	Broadcasting Studio	20	
		10	Leaves Rustling

Table 1

Approximate Decibel Level of Common Sound Sources

Although the human ear can hear frequencies as low as 20 hz and as high as 20,000 hz, it does not hear them all equally well. This means that people may assign different "loudnesses" to two sounds having identical intensities but widely differing frequencies. Higher frequency sounds tend to seem louder to people than lower frequency sounds. Most environmental sound measurements consequently are weighted to simulate the varying frequency sensitivity of the human ear. The most commonly used weighting is the A-weighted decibel (abbreviated dBA).

Among the basic characteristics of sound which are of particular interest in the discussion of aircraft-generated sounds is its attenuation or reduction over distance. Part of the reduction occurs because the sound energy is spread over a geometrically increasing area as the distance from the source increases. At sufficient distances from the source, the geometric spreading results in a 6 dB loss per doubling of distance. Additional attenuation results from absorption of the sound by the air and by the ground, structures, and other objects. Sound propagation through the air is affected by meteorological conditions including air temperature, temperature inversions, humidity, wind speed, and air turbulence. Sounds travelling along a hard ground surface are attenuated by 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 sounds as well. Ground cover and objects on the ground, however, have little effect on air-to-ground sounds, such as those from aircraft.

The attenuation of sound from the exterior to the interior of a building is fairly consistent among structures of similar construction type. Table 2 indicates the amount of attenuation afforded by common types of building construction.

EFFECTS OF NOISE ON PEOPLE

Noise is often defined as unwanted sound. A substantial amount of research has been done regarding the effects of noise on people; much of this research has specifically examined aircraft noise impacts. (Although most of the latter deals with high-activity, airline airports, the basic concepts can be applied to small, general aviation facilities as well.)

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 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 generally not severe enough to produce permanent or even sustained (after the noise ceases) physiological 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 mentioned effects. Interference with concentration of mental activities and disruption of sleep are two others.

Construction Type	Typical Occupancy	General Description	Noise Level Reduction (NLR) in dBA
1	Residential, Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Windows partially open.	15-20
2	Same as 1 above	Same as 1 above, but windows closed.	25-30
3	Commercial, schools	Same as 1 above, but windows are fixed 1/4-inch plate glass.	30-35
4	Commercial	Steel or concrete framing. Curtain-wall or masonry exterior wall. Fixed 1/4-inch plate glass windows.	30-40

Notes:
- Construction methods assume no special noise control provisions.
- The NLR range depends upon the openness of the windows, the degree of seal and the window area involved.

Source: Paul S. Veneklasen & Associates (1973), "Noise Insulation Problems in Buildings".

Table 2

Noise Reduction Afforded by Common Building Construction

Most of the readily identifiable aircraft noise effects fall into this category. Some of the parameters of these effects are described later in this chapter.

Subjective effects are by their nature unique to individuals and, therefore, difficult to quantify. Anecdotal information from airports which document the location of noise complaints suggests that an individual's perception of noise are shaped by their personal sensitivity, perception of the importance/appropriateness of the event causing the noise and general expectations about noise. The implications of this are discussed both in subsequent paragraphs and in Chapter 6.

Measures of Environmental Noise

Some assessment of the effects of noise on people can be made relative to a specific decibel value. Noise in the everyday environment, however, fluctuates considerably from loud one moment to quiet the next. Historically, state and federal agencies have sought an acceptable means of expressing average noise levels. The averaging can be with respect to a single event or a number of events over a specified time period.

The average for an individual event, such as aircraft overflight, is often computed in terms of the Sound Exposure Level (SEL) or the Single Event Noise Exposure Level (SENEL). (The latter term is used in California, the former is adopted by the U.S. Environmental Protection Agency and the Federal Aviation Administration). SEL and SENEL values are identical. SEL and SENEL measure the A-weighted sound level integrated over the entire noise event above a threshold level and normalized to a referenced duration of one second. Hence, they give the level of a continuous one-second signal which contains the same amount of energy as the noise event. Note that, while the SEL and SENEL are measured in terms of the A-weighted sound level scale, they are generally not equal to the maximum A-level occurring during the noise event. Aircraft noise events last more than one second, so SEL/SENEL values will be higher than the maximum A-level for the same events.

A standard measure of sound level averaged over a longer time is the Equivalent Sound Level (abbreviated L_{eq}). L_{eq} is an objective measure of sound in that it is a function solely of a mathematical relationship between decibels and time.

Human sensitivity to noise varies considerably depending upon the circumstances in which the noise occurs. Probably most important among these variations is that people tend to be more sensitive to nighttime noises than they are to ones occurring in the day. Some explanation for this is that, in most communities, exterior background noises generally drop at night form daytime levels. Also, the activity in most households decreases at night, lowering from internally generated noise levels. Noise events consequently become more intrusive at night because a noise of a given intensity will normally extend farther above the nighttime background noise level than above the daytime background level.

To account for this change in sensitivity, a weighting or penalty is often assigned to nighttime noise levels. The amount of weight and the time period over which it is applied differs depending upon the noise assessment method used (appropriate values can be approximately determined by research, but selection of a specific value is inherently somewhat subjective). Mostly, a 10 dBA

weight is used – i.e., nighttime noise events are assumed to be 10 dBA louder than they actually are. This figure corresponds to the drop in background noise level which studies have found takes place between daytime and nighttime in a typical community.

The time-weighted noise descriptor, adopted by the EPA and the FAA, is the Day-Night Average Sound Level (Ldn). It applies a nighttime penalty of 10 dBA to noise events occurring between 10 p.m. and 7 a.m. A similar descriptor, the one used in California, is the Community Noise Equivalent Level (CNEL). In addition to the nighttime penalty, the CNEL methodology applies an evening weighting of 5 dBA to noise events occurring between 7 p.m. and 10 p.m. Because the Ldn and CNEL equations are logarithmic, a 10 dBA penalty on a single event is identical to counting the same event 10 times and a 5 dBA penalty is equivalent to counting the event 3 times. To facilitate the calculations, the equivalent operations method is used.

In the last several years there has been mounting political pressure and increased interest among acoustics specialists to replace or supplement Ldn/CNEL with some measure of single-event noise. The intensity of interest was increased by three events:

- Creation of new air traffic routes by the FAA as part of the Expanded East Coast Plan in February 1987.

- A Notice Of Proposed Rulemaking issued by the FAA in March 1987 to set en route noise rules for propfan engines.

- Announcement by the U.S. Forest Service that it is considering using a measure of noise detectibility to determine public response to en route aircraft noise in wilderness areas.

No single-event noise measure has been formally proposed by the FAA. The EPA is using SEL to evaluate speech interference and sleep disturbance.

Parameters of the Behavioral Effects of Noise

As a step toward defining criteria for airport/land use noise compatibility, it is valuable to consider some of the identified parameters of how noise effects human activity. The following points have been culled from a variety of published documents. Some of the past studies deal with aircraft noise in particular; others concern environmental noise in general. Not all studies, it should be noted, have findings which are fully consistent with other studies.

- The primary effect of noise on human activity is interference with speech communication.

    - The maximum continuous sound level that will permit relaxed conversation with 100 percent intelligibility throughout a typical residential living room (talker-listener separation greater than approximately 3.5 feet) is 45 dBA (L_{eq} = 45 dBA). A 95 percent intelligibility – considered to be "satisfactory conversation" – can be obtained with a steady sound level of up to 64 dBA.

- Outdoors, the sound level of speech generally continues to decrease with increasing distance between the talker and listener because of the absence of reflecting walls which provide the reverberance found indoors. In a steady background noise there comes a point, as the talker and listener increase their separation, where the decreasing speech signal is masked by the noise. This relationship is shown in Figure 2.

- 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}) value. 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).

- The noise levels that interfere with human activities not involving active listening cannot be quantified relative to absolute sound levels. The extent of interference depends upon the nature of the noise source, the background noise level, and the state or attitude of the human listener. Some measure of noise interference with these activities can be identified in terms of the percentage of people "disturbed" by certain noise levels. Figure 3 illustrates these relationships for aircraft noise near a busy airline airport.

- The effect which noise disturbances have on the average individual can be examined in terms of community reactions. Two measures of such reactions are actions taken (complaints, law suits, etc.) and responses to social surveys. Results indicate that reactions vary from community to community, depending largely upon the normal background noise level in the community and previous experience with and attitudes towards intruding noise. The time of the year is also a factor – windows are open and more outdoor activity occurs in summer.

  The majority of available data on community reactions involves typical urban residential communities. Table 3 has been developed to provide corrections for the circumstances of a specific community; the corrections result in a "normalized" Ldn for intruding noise. Taking these corrections into account, it has typically been found that:

  Not surprisingly, no community reaction to an intruding noise can be expected when the normalized Ldn of identifiable intruding noise is approximately 5 dBA less than the Ldn which exists in the absence of that noise;

  Widespread complaints may be expected when the noise exceeds the background by 5 dBA; and

  Vigorous community reaction can be expected when the excess approaches 20 dBA.

- In a typical community, about 10 percent of the population is so sensitive to noise that they object to any noise not of their own making. On the other hand, about 25 percent of the population seems to be practically imperturbable: they do not complain even in very severe

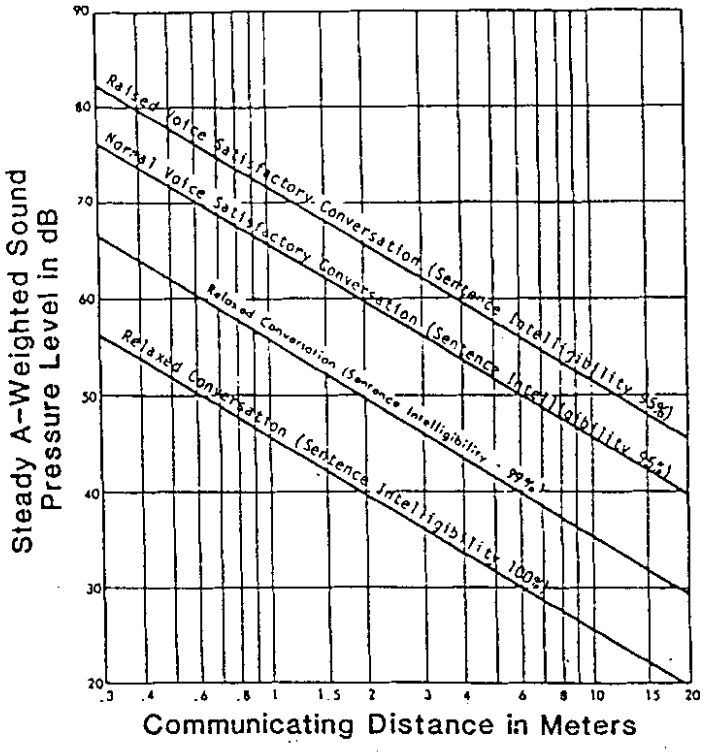


Figure 2

Maximum Distances Outdoors Over Which Conversation is Considered to Be Satisfactorily Intelligible In Steady Noise

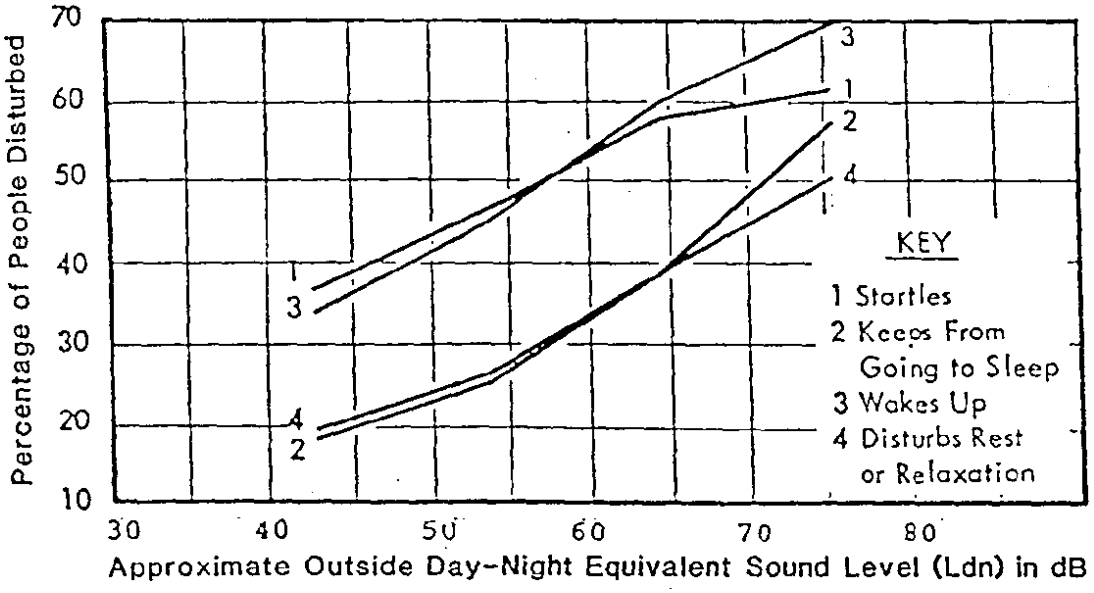


Figure 3

Percentage of People Disturbed by Aircraft Noise for Reasons Concerned With Rest and Sleep

Type of Correction	Description	Amount of Correction to be Added to Measured L_{dn} in dB
Seasonal Correction	Summer (or year-round operation)	0
	Winter only (or windows always closed)	−5
Correction for Outdoor Noise Level Measured in Absence of Intruding Noise	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
Correction for Previous Exposure & Community Attitudes	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
Pure Tone or Impulse	No pure tone or impulsive character	0
	Pure tone or impulsive character present	+5

Table 3

Corrections Factors for Obtaining Normalized Ldn

noise exposures. Noise abatement efforts which focus on the middle two-thirds of the population will therefore be most effective.

- Two of the inputs to calculation of the Day-Night Average Sound Level (or the Community Noise Equivalent Level) for aircraft noise are the maximum noise level and the number of aircraft overflights. Focusing on these variables individually, one study found that the number of noise exposure events is a critical determinant of annoyance only within a limited range. The major noise factor responsible for annoyance is the noise level and particularly the noise from the noisiest aircraft type. (This study, it should be noted, dealt with airline airports.)

  - The relationship between the percentage of people surveyed who reported being "very annoyed" by aircraft overflights and the number of overflights is depicted in Figure 4. As can be seen, once the overflight frequency exceeded about 50 to 60 per day, no further increase in annoyance occurred.

  - The low extent of annoyance when the noise levels do not exceed 70 dBA, even when overflight frequency is high, indicates that this level may represent an outdoor noise level which the majority of the population in a built-up area accepts their normal environment.

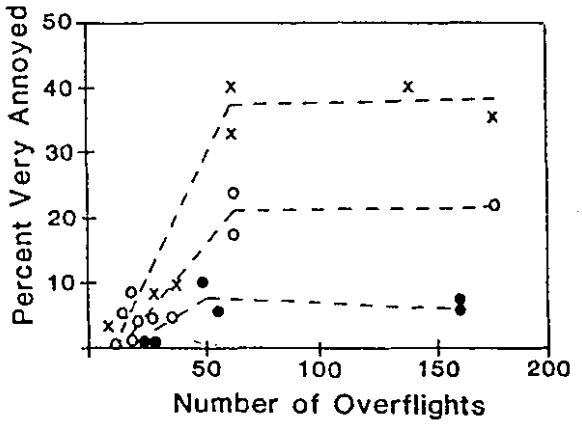
  - At 50 or more overflights per day, the percentage of people annoyed depends upon the activity in which they are involved and the maximum level of the noise. Figure 5 illustrates this relationship.

Documenting the Subjective Effects

To our knowledge, there has been no systematic study of subjective effects. Experience at general aviation airports has shown that annoyance can occur anywhere within the traffic pattern or where aircraft are less than 1,000 feet above ground level when approaching or departing the airport. At some air carrier airports complaints are regularly being received from individuals as far as 40 miles away.

ESTABLISHED REGULATIONS AND POLICIES

The preceding discussion provides a theoretical basis for the development of airport/land use noise policies. Other factors to consider are the established regulations and policies adopted by various Federal and State agencies. Laws and statutes enacted by Congress and the California State Legislature typically provide general requirements and the authority for administrative adoption of more detailed regulations and policies. With respect to airports, most of the administrative actions are taken by the Federal Aviation Administration and the California Division of Aeronautics. These laws and regulations provide the basis for local development of airport plans, analyses of airport impacts, and enaction of compatibility policies. Brief descriptions of selected laws, regulations, and policies having particular significance to noise issues are provided in the paragraphs which follow. Additional regulations pertaining primarily to safety are discussed in the next chapter.

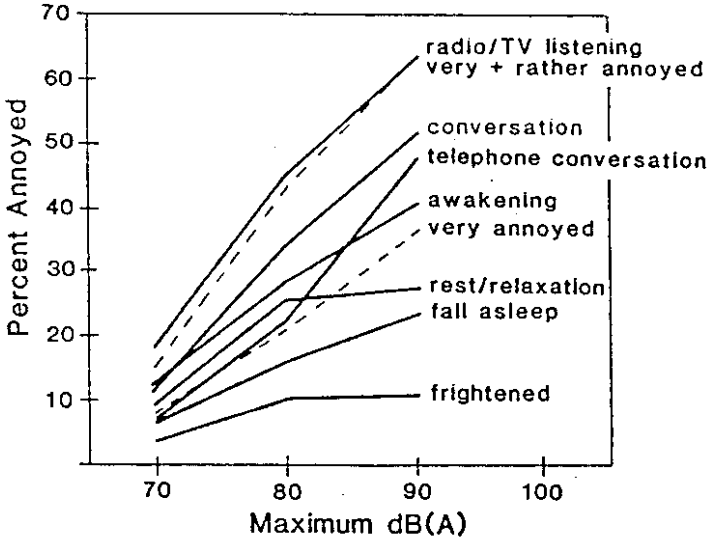


SHOWS RELATIONSHIP BETWEEN PERCENTAGE OF PEOPLE "VERY ANNOYED" AND NUMBER OF OVERFLIGHTS FOR DIFFERENT AREAS.

dB(A) LEVELS FROM NOISIEST AIRCRAFT TYPE INDICATED AS: ● = 70 ± 2, o = 80 ± 2, x = 90 ± 2

Figure 4

Relationship Between Annoyance Level and Overflight Frequency



DEPICTS THE EXTENT OF SPECIFIC EFFECTS AND PROPORATION OF POPULATION REPORTING THAT THEY WERE "VERY ANNOYED" AND "RATHER OR VERY ANNOYED" IN AREAS EXPOSED TO 50 OVERFLIGHTS OR MORE AT DIFFERENT dB(A) LEVELS.

Figure 5

Relationship Between Annoyance Level and Noise Level

Federal Laws and Regulations

- Airport Improvement Program Act of 1982, as amended

  This act establishes the federal requirements for funding of airport planning and airport development. An Airport and Airway Trust Fund is created to pay for these programs and operation of the federal aviation system. The general types of projects eligible for federal funding are indicated. Additionally, the Act directs the preparation of a National Plan of Integrated Airport Systems (NPIAS) which lists the location of airports in the national system of airport and the recommended development of each.

  Among the conditions for federal funding are two requirements involving airport/land use compatibility. As a condition to the receipt of AIP funds, the airport sponsor (owner) must, among other things, give assurances regarding land uses in the airport environs that:

  > "It will adequately clear and protect the aerial approaches to the airport by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards";

  and that:

  > "It will take appropriate action, including the adoption of zoning laws, to the extent reasonable, 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."

- U.S. Department of Transportation Noise Abatement Policy.

  This policy, adopted in 1976, sets forth the noise abatement authorities and responsibilities of the Federal Government, airport proprietors, state and local governments, the air carriers, air travelers and shippers, and airport area residents and prospective residents. The basic thrust of the policy is that the FAA's role is primarily one of regulating noise at its source (the aircraft) plus supporting local efforts to develop airport noise abatement plans. The FAA will give high priority in the allocation of ADAP funds to projects designed to ensure compatible use of land near airports; but it is the role of state and local governments and airport proprietors to undertake the land use and operational actions necessary to promote capability.

  A new noise abatement policy is expected to be released in the immediate future.

- Aviation Safety and Noise Abatement Act of 1979.

  Further weight was given to the FAA's supporting role in noise compatibility planning by congressional enaction of this legislation. 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 funding for noise compatibility planning and sets the requirements by which

airport operators can apply for funding. The law does not require any airport to develop a noise compatibility program.

- Federal Aviation Regulations, Part 150, "Airport Noise Compatibility Planning".

  As a means of implementing the Aviation Safety and Noise Abatement Act, the FAA adopted Regulations on Airport Noise Compatibility Planning Programs. These regulations are spelled out in FAR Part 150. "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." It also prescribes a system for measuring airport noise impacts and presents guidelines for identifying noncompatible land uses.

  The noise exposure maps are to be depicted in terms of Yearly Day-Night Average Sound Level (Ldn) contours around the airport. All land uses are considered compatible with noise levels of less than 65 Ldn unless the local jurisdictions can document the appropriateness of a lower standard. 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. 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 remains 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 compatible land uses".

- Federal Aviation Regulations, Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification".

  Originally adopted in 1960, FAR Part 36 prescribes noise standards for issuance of new aircraft type certificates. Subsequent amendments extended the standards to certain newly produced aircraft of older type designs. Other amendments have at various times extended the required compliance dates. Although aircraft meeting Part 36 standards are noticeably quieter than many of the aircraft then and now flying, the regulations make no determination that such aircraft are acceptably quiet for operation at any given airport. Part 36 prescribes limiting noise levels for certification of new types of propeller-driven, small airplanes, as well as for transport category, large airplanes.

- Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety".

  The "Levels Document", published in 1974 and extensively referred to in the preceding section, does not constitute EPA regulations or standards. Rather, it is intended to "provide state and local governments as well as the Federal Government and the private sector with an informational point of departure for the purposes of decision-making". Using the Yearly Day-Night

Average Sound Level (Ldn) as a measure of noise acceptability, the document states that "undue interference with activity and annoyance" will not occur if outdoor noise levels in residential areas are below 55 Ldn and indoor levels are below 45 Ldn.

California State Law and Regulations

- State Aeronautics Act, Chapter 4, Article 3, Section 21669 – Adoption of Noise Standards (Public Utilities Code).

  This section requires the Division of Aeronautics to adopt noise standards governing the operation of aircraft at state permitted airports.

- California Airport Noise Standards (California Code of Regulations, Title 21, Sections 5000 et seq.).

  These standards are promulgated in accordance with Section 21669 of the Public Utilities Code. "The regulations are designed to cause the airport proprietor, aircraft operator, local governments, pilots, and the [Division of Aeronautics] to work cooperatively to diminish noise. The regulations accomplish these ends by controlling and reducing the noise in communities in the vicinity of airports".

  Limitations on airport noise in residential communities are established. The new regulations become effective March 22, 1990. As with the previous version, no noncompatible land uses are to be located within areas subject to a Community Noise Equivalent Level (CNEL) of 65 dBA or greater. (The 65 CNEL is essentially identical to a Yearly Day-Night Average Sound Level, Ldn, of 65 dBA.) The land uses which are deemed compatible include agriculture, airport property, industrial property, commercial property, property subject to an avigation easement for noise, zoned open space, and acoustically insulated high-rise apartments.

  When originally adopted, the State Noise Standards also included single-event noise limits. The single-event standards, however, were challenged in federal court and subsequently struck down in Air Transportation Association v. Crotti as being a preemption of federal authority.

- California Noise Insulation Standards (California Code of Regulations, Title 24, Part II, Appendix Chapter 35).

  These standards, applicable to new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings, state that "interior community noise equivalent levels (CNEL) with windows closed, attributable to exterior sources shall not exceed an annual CNEL of 45 dBA in any habitable room". Furthermore, "Residential structures to be located within an annual CNEL contour of 60 require an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels. CNEL's shall be as determined by local jurisdiction in accordance with its local general plan".

- California Noise Planning in Land Use Act (California Government Code, Division 1, Section 65302).

  The requirement that a noise element be included in local general plans was established by this act. Airports are among the noise sources specifically to be analyzed. Noise contours, expressed in terms of either CNEL or Ldn, are to be shown down to 60 dB.

POLICY ISSUES AND CHOICES

The development of noise compatibility standards and policies can be considered in terms of several individual issues. Some of these issues involve choices which will affect the eventual policies.

Ease of Use

An overriding consideration in the development of noise compatibility policies is how easily they can be put to use. Determining whether a particular land use is acceptable within a given noise environment required being able to categorize the land use and to measure or predict the extent of the noise exposure. Policies/criteria which are cumbersome to apply will either be applied inconsistently or not at all.

"Acceptability"

As suggested by the background discussion earlier in this chapter, there are no absolute measures for establishing what land uses and noise exposures are or are not compatible with each other. The best that can be hoped for is that compatibility criteria will reflect what is "acceptable " to the average person in the communities involved. Moreover, it must be remembered that what may be considered an acceptable degree of compatibility probably is not the most desirable degree of compatibility.

Acceptable Residential Area Noise Exposure

The earlier discussion focused on residential land uses as these are among the most sensitive to noise exposure. Several factors contribute to this sensitivity: 1) normal residential construction usually provides less sound attenuation than typical commercial construction and windows are more likely to be open; 2) outdoor activity is a significant aspect of residential land use; and 3) people are particularly sensitive to noise at night when they are trying to sleep.

There are several reasonable choices as to where to set the limit for acceptable residential noise exposure. The choices and the rationale for each are listed below:

- CNEL = 65 dBA

  - Established by state law as the maximum acceptable for residential and other noncompatible land uses, effective beginning 1986.

- CNEL = 60 dBA

  - The contour within which California Noise Insulation Standards require an acoustical analysis of proposed residential structures, other than detached single-family dwellings.

  - Suggested by the California Department of Health as the maximum "normally acceptable" noise exposure for residential areas.

  - Individual noise events will occasionally cause significant interference with residential land use activities, particularly outdoor activities, in quiet suburban/rural communities.

- CNEL = 55 dBA

  - Identified by the U.S. Environmental Protection Agency as the level below which "undue interference with activity and annoyance" will not occur.

  - Individual noise events will seldom significantly interfere with residential land use activities; commonly occurring noise events will not cause disruption under most circumstances.

Other Noise-Sensitive Uses

Data on acceptable noise exposure for other noise-sensitive land uses is not as extensive as for residential uses. Some guidelines exist in various U.S. Department of Housing and Urban Development, California Department of Health, and other agency documents. In general, once a criterion has been set for residential uses, the criteria for other land uses can be established by considering their degree of structural sound attenuation, outdoor activity, etc. relative to residential uses.

The extent to which land uses types are grouped or separated into categories for the purpose of compatibility evaluation is a question of ease of use. Three possible means of categorizing are by: 1) Standard Land Use Codes; 2) local zoning districts or land use plan classifications; or 3) uses having similar degrees of noise sensitivity.

Single-Event Limits

The California Airport Noise Standards originally contained single-event as well as annual average noise level standards, but the former were eliminated as a result of a court decision. Several airport proprietors, however, have successfully implemented single-event standards for aircraft operating at their airports. Single-event standards have been based upon either noise levels published by the FAA in accordance with FAR Part 36 or actual measured noise levels recorded at the individual airport.

Airport land use commissions cannot set limits for the noise generated by individual aircraft overflights as it would be a direct regulation of airport operations. ALUC's nonetheless can consider single-event noise levels as a factor in evaluating land use compatibility. The FAA's Integrated Noise Model contains the only readily available data base for single-event noise levels. This data base expresses single-event noise in terms of SEL dBA.

Interior Noise Level Criteria

The California Noise Insulation Standards, cited previously, set a 45-dBA CNEL 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, state, or local interior noise level regulations.

Problems arise with developing interior standards for other uses because some are used only occasionally and others (such as concert halls) are especially sensitive to peak noises. The issue then is whether an average noise exposure measure (e.g., CNEL or Ldn) is the most appropriate basis for compatibility standards. Some airport land use commissions have adopted peak noise level criteria for intermittent noises. However, application of these criteria poses questions in defining intermittent noise and in translating projected CNEL values into peak noise levels.

Change in CNEL Contours Over Time

As activity levels and/or the noise levels generated by individual aircraft types change over the years, the resulting CNEL contours also will change. At airline airports, the foreseeable noise reduction technology of the future aircraft fleet is such that, even with increased activity, the future contours often are smaller than the present ones. General aviation aircraft, however, are not expected to become enough quieter to compensate for forecast activity increases. Noise impact areas for general aviation airports consequently will expand over time. For compatibility planning purposes, the worst-case noise impact is normally used.

Engine Run-up Noise

Many people perceive the noise from engine run-ups while aircraft are on the ground 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 less necessary and more under the control of the aircraft operator.

Engine run-up noise is not included in the calculation of CNEL or Ldn contours. Nonetheless, 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.

In terms of potential ALUC policies, run-up noise is similar to single-event noise. ALUC's do not have the authority to regulate the noise at its source, but can consider it in land use compatibility evaluation.

5 - SAFETY CONSIDERATIONS

INTRODUCTION

The issue of safety as it involves the compatibility between airports and surrounding land uses must be examined from two perspectives – the hazards which airport activity creates for neighboring areas and the hazards which certain land use characteristics can pose for aircraft flying near an airport. The concern is for safety both of people on the ground and of aircraft occupants.

A basic problem in developing safety compatibility policies is that the events being considered – i.e., aircraft accidents – occur very randomly in time and space, especially with respect to an individual airport. Noise events, by way of comparison, are generally predictable on an average annual basis for a individual airport, despite the variations of aircraft types and flight tracks. The safety issue must be examined in terms of statistical information compiled on aircraft accidents nationwide. This data can then be applied to individual airports on the basis of statistical probability.

The remainder of this chapter presents some of the available data about aircraft accident locations, summarizes existing federal and state regulations, and discusses some of the specific issues and choices involved in the development of safety policies.

AIRCRAFT ACCIDENT CHARACTERISTICS

Only a few aspects of aircraft accidents have much bearing on airport/land use compatibility planning. The characteristics which generally are of most interest are: 1) the location of the accident; 2) the nature of the impact; and 3) the occurrence of injuries to people on the ground. Certain other conditions such as phase of operation, time of day, weather conditions, etc., also provide some insight into accident probabilities.

Accident Location

Although a substantial amount of data is available regarding various aspects of aircraft accidents, comparatively little of it is tabulated in terms of airport proximity. Many of the sources of locational data are old – some quite old. However, it is worth consideration if for no other reason than it was the basis for many of the FAA regulations which currently exist.

Location is an important factor because only the accidents which are significant in terms of compatibility planning are those occurring "near" an airport. Accidents on airport property, especially those on or adjacent to the runway, have little effect on off-airport safety. Also, accidents occurring beyond where an aircraft in engaged in departure from or arrival at an airport – roughly three to five miles under most Visual Flight Rules circumstances – have no statistical significance for land use planning. Those "en route" accidents can happen anywhere with almost equal probability and are normally not attributable to the presence of an airport.

Some data on accident locations was compiled in 1973 in a study conducted for the California State Assembly Committee on Natural Resources and Conservation. This report notes that of 4,954 civil aircraft accidents investigated by the National Transportation on Safety Board in 1970, 48.5 percent occurred within the airport boundary and 37.9 percent happened more than one mile from an airport. This leaves 13.6 percent, or 672 accidents nationwide, which occurred off airport property but within one mile.

The one-mile distance, the report states:

"Is a reasonable measure of the region of influence between an airport and its surrounding community. It encloses the entire traffic pattern and most departing aircraft have made their initial power reduction and assumed normal climb attitude within that distance. On instrument approaches, the minimum descent altitude is usually reached within that area. In this region, the aircraft is at a critical transition between ground and flight with both the aircraft and pilot under significant stress. On takeoff, the aircraft is at maximum gross weight and fuel load with the engine(s) producing maximum power. This increases the likelihood of a power failure while at the same time decreasing the chances of a successful emergency landing. On the landing approach, the pilot is under great stress, particularly under instrument conditions, thus increasing the probability of pilot error."

As part of an airport safety study, Hodges & Shutt collected accident data from 14 busy, general aviation airports (Table 4). The location of crash sites for accidents which occurred during departures was plotted relative to the departure end of the runway (Figure 6). Crash sites associated with approaches were plotted relative to the arrival end of the runway (Figure 7). Figure 8 combines the data presented in Figures 6 and 7. Although this data is limited in scope, it is the best data on general aviation accidents known to the authors.

"Safety zones" – areas where development is severely restricted – are a common feature to many ALUC and approach protection plans. A variety of shapes and sizes have been adopted for safety zones. One means of evaluating the efficiency of rectangular safety zones is to compare the relationship between the aspect ratio of the rectangle (i.e., the ratio of width to length), the percentage of accidents within the rectangle, and the number of acres within the rectangle. Figure 9 presents this comparison. As can be seen, the smallest aspect ratio was consistently the most efficient. That is, fewer acres were required to encompass the same percentage of accident sites as the higher ratios. This suggests that accidents do tend to cluster along the extended runway centerline and that narrower safety zones will generally be more efficient. This conclusion is supported by the shape of the curves presented in Figure 10.

Nature of Impact

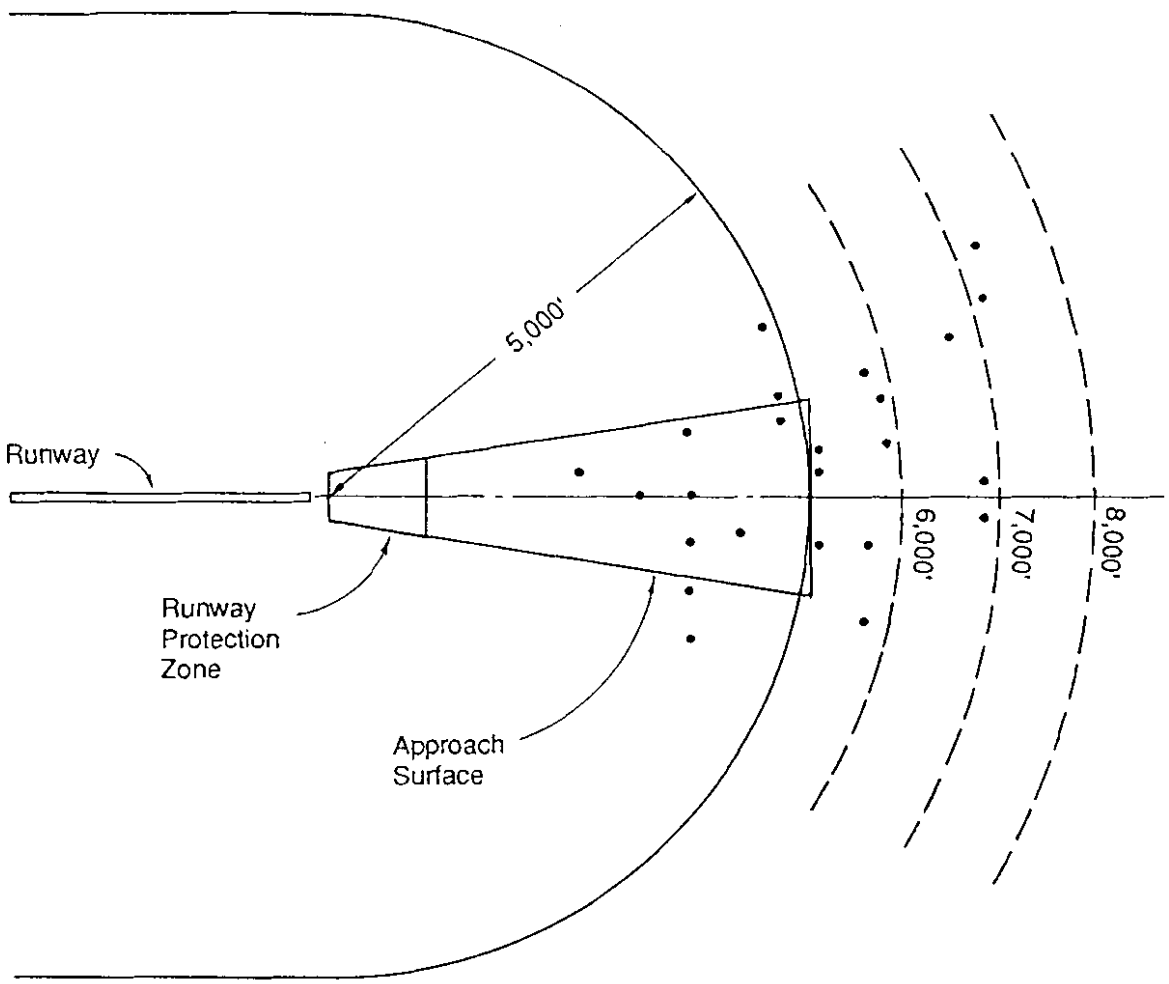
The nature of impact has significance in the context of airport/land use compatibility because it sheds light on the controllability of the aircraft at the time of accident. In most aircraft accidents, the pilot can exercise at least partial control over the direction of flight and the place of impact. (A light, general aviation aircraft having engine failure in flight, for example, is still controllable and can glide as much as 1,000 feet horizontally for each 100 feet of altitude.) Given this choice, the pilot

AIRPORT	ASSOCIATED CITY
California	
John Wayne Airport	Santa Ana
Torrance Municipal Airport	Torrance
Buchanan Field	Concord
Fullerton Municipal Airport	Fullerton
Reid Hillview Airport	San Jose
Palo Alto Airport	Palo Alto
South County Airport	Martinez
Chino Airport	Chino
Hayward Air Terminal	Hayward
Florida	
Opa Locka Airport	Opa Locka
North Perry Airport	Ft. Lauderdale
Kentucky	
Bowman Field	Louisville
Louisiana	
Lakefront Airport	New Orleans
Missouri	
Spirit of St. Louis Airport	St. Louis

Table 4

Airport Accident Data

Sources of Information



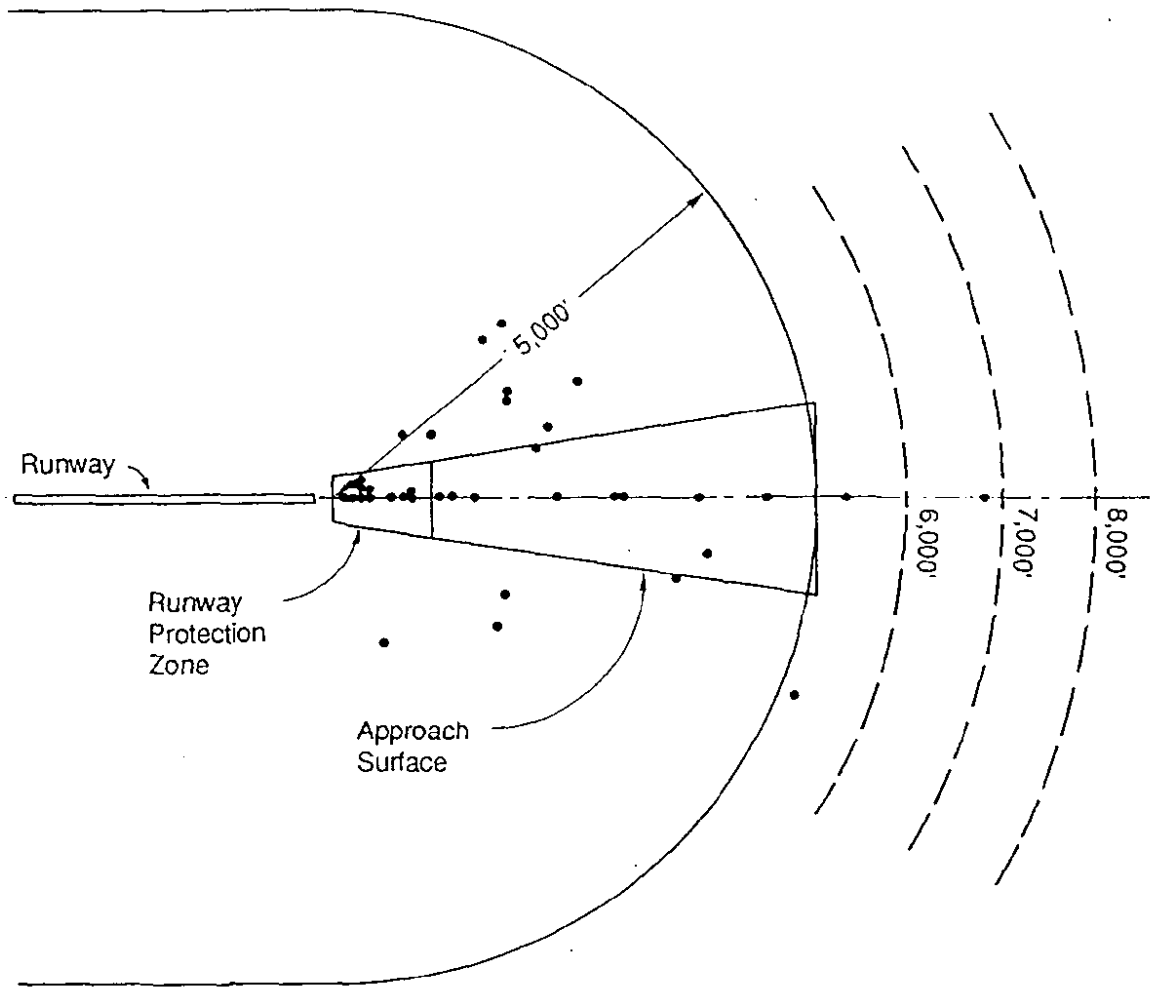
• Accident site

0 2,000
Feet

Note: Data compiled from 14 general aviation airports.
Runway protection zone and approach surface assumes a nonprecision approach to a utility runway.

Figure 6

Accident Sites - Departures Only



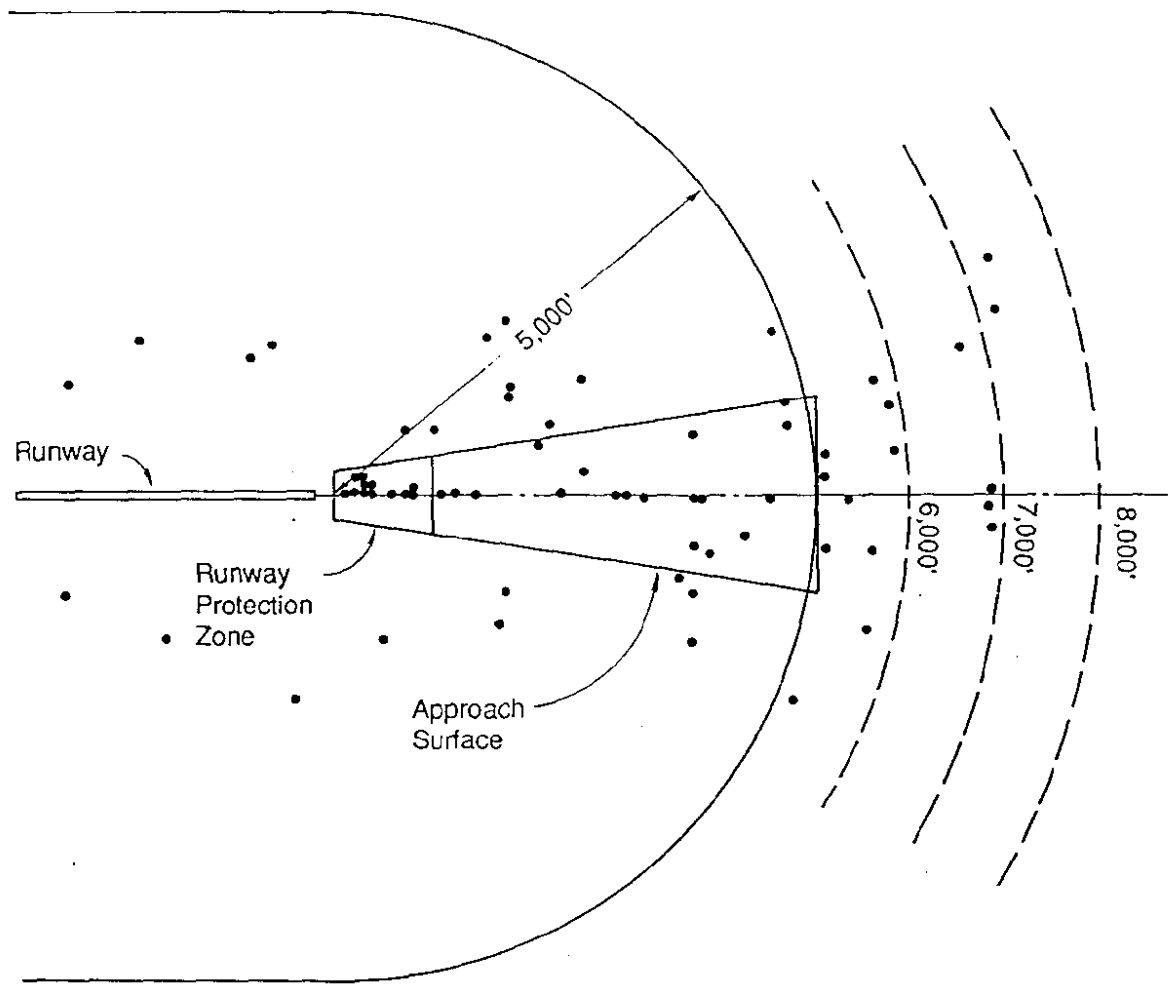
• Accident site

0 2,000
Feet

Note: Data compiled from 14 general aviation airports.
Runway protection zone and approach surface assumes a nonprecision approach to a utility runway.

Figure 7

Accident Sites - Arrivals Only



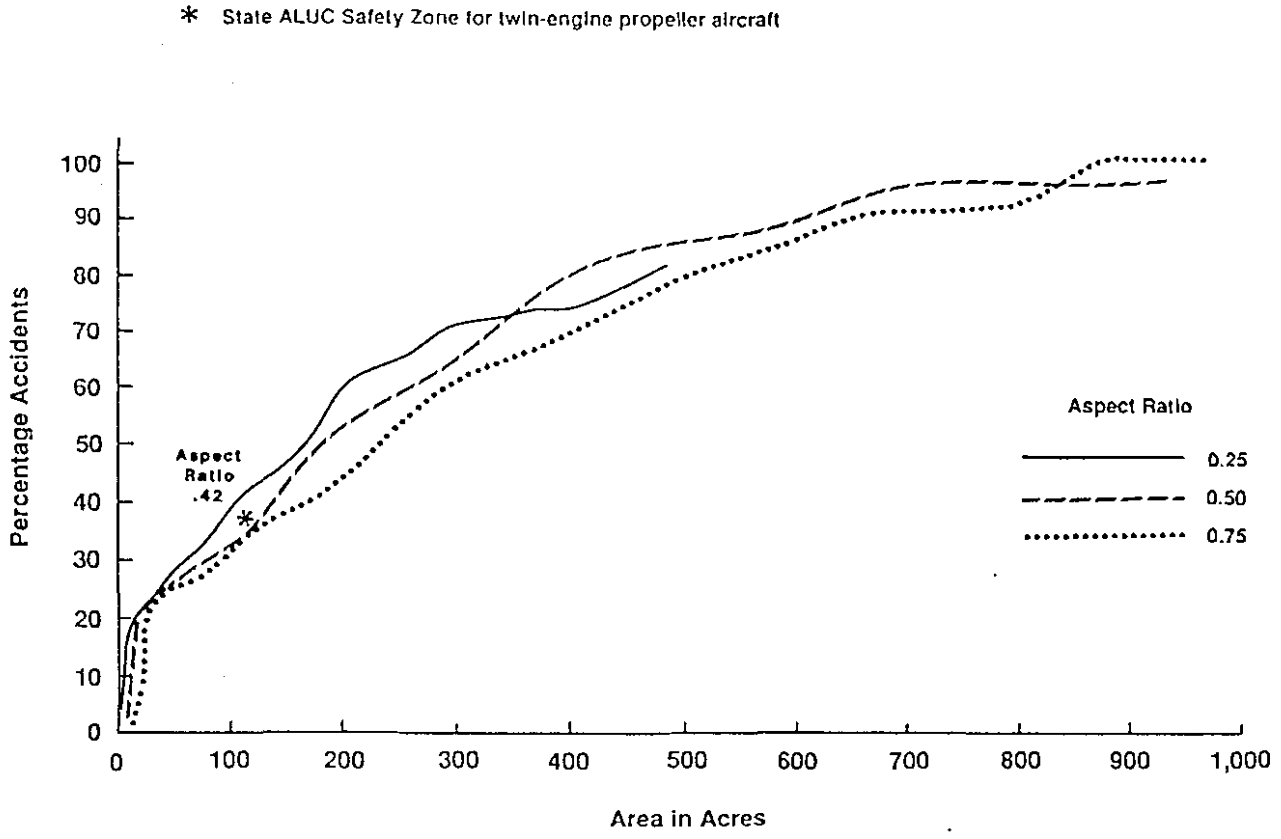
• Accident site

0 2,000
Feet

Note: Data compiled from 14 general aviation airports.
Runway protection zone and approach surface assumes a nonprecision approach to a utility runway.

Figure 8

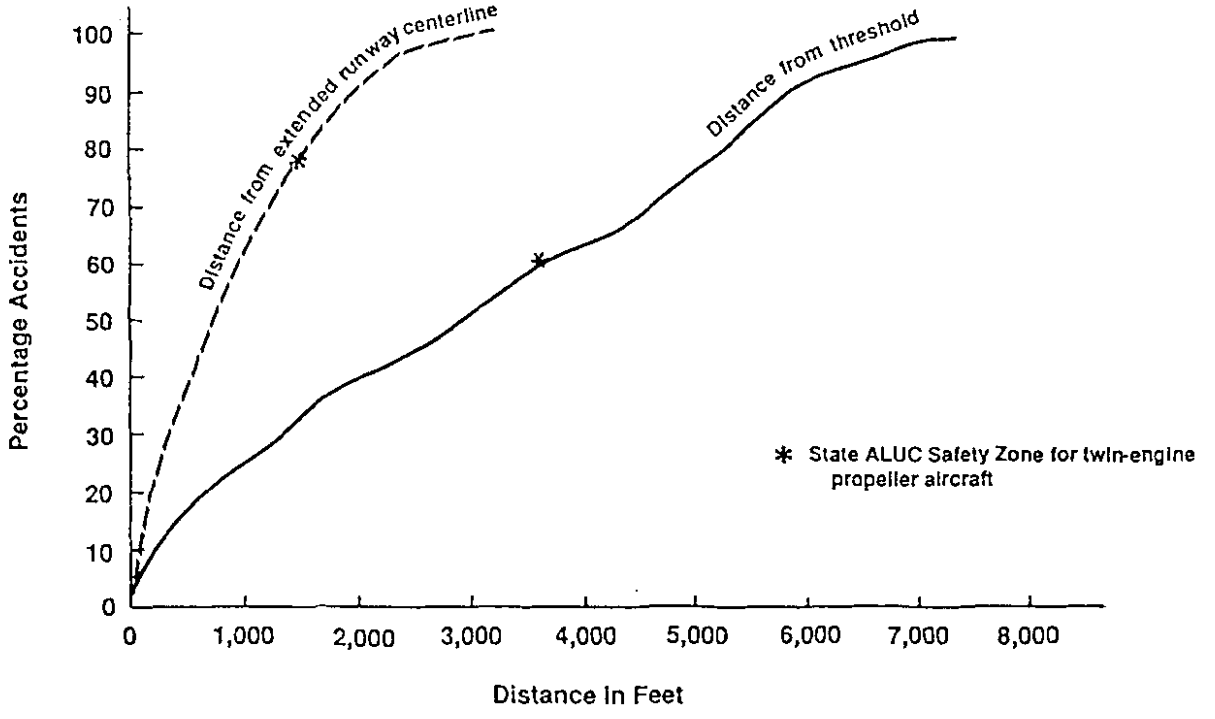
Accident Sites - Arrivals and Departures



Source: Hodges & Shutt survey of 14 U.S. airports.
Annual operations at airports ranged from 150,000 to 300,000.
All airports had air traffic control towers.

Figure 9

Comparison of Aspect Ratios



Source: Hodges & Shutt survey of 14 U.S. airports.
Annual operations at airports ranged from 150,000 to 300,000.
All airports had air traffic control towers.

Figure 10

Accident Locations

can be expected to select an emergency landing spot which is as free of obstacles as possible. With skill and luck, damage may be nonexistent or so minor that the incident does not even appear in NTSB records (the NTSB prepares briefs only on accidents involving serious injury or substantial aircraft damage). The potentially 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: 1) loses control of the aircraft and, because of damage, low altitude, or improper procedures, is unable to regain control; or 2) is unable to select a reasonable forced landing spot because of darkness, fog, or the nonexistence of such a spot.

No complete data specifically indicating nature of impact is available. Data on one general category of impact – collisions – are summarized in Table 5 for the 1974-1978 period. About half of all aircraft accidents involved collisions, either as the first occurrence of the accident sequence or as a result of something else (e.g., mechanical failure or ground loop) happening first. Collision with the ground, embankments, etc., was cited in 20 percent of the accidents over that period. A collision with a house or other building occurred in less than one percent of all accidents. It should be noted that this data does not necessarily reflect either the severity or the location of the impact: for example, it includes on-airport taxiing accidents as well as collisions, such as with power lines, after which the aircraft still safely lands on the runway.

Non-Occupant Injuries

One of the first analyses of non-occupant injuries in aircraft accidents is contained in the 1952 "Report of the President's Airport Commission" (the "Doolittle Commission"). The study examined the records of all commercial and military, not general aviation, aircraft accidents which had taken place over the preceding six years and in which people on the ground had been killed. A total of 85 fatalities had occurred (19 of them in one accident at an air show). By way of perspective, the study notes that scheduled air transport planes caused far fewer non-occupant deaths per 100 million passenger miles in 1950 than autos, buses, or railroad passenger trains (0.2 versus approximately 1.3, 0.9, and 4.1 respectively); the total number of bystander deaths caused by scheduled air transport planes was about the same as those caused by bicycles.

Also included in the Doolittle Commission report was an analysis of the runway proximity of the non-occupant-fatality accidents which occurred "near" an airport. Figure 11, reproduced from the report, reveals that half of such accidents occurred along the extended runway centerline and within about a half mile of the runway end.

More recent data on aircraft accidents involving non-occupant fatalities was obtained from a compilation of NTSB Briefs of Accidents for 1974-1978. During this period, there were 32 civil aviation accidents occurring on or within five miles of an airport in which persons on the ground were fatally injured. General aviation (or air taxi) aircraft were involved in 29 of these accidents and scheduled air carrier aircraft were involved in four (one – in San Diego – was a mid-air collision involving both categories of aircraft). About half (14) of the accidents related to general aviation took place on airport property; most were propeller accidents associated with taxiing or stationary aircraft. The non-occupant fatalities in the remaining (15) accidents resulted from aircraft crashes or forced landings beyond airport boundaries.

Object Struck	Annual Average	Percentage of All Accidents
Ground (uncontrolled), Ground (controlled), Ditches, Dirt Banks, Water, Etc.	884	20.4%
Trees, Crops	495	11.4%
Wires, Poles, Fences	411	9.5%
Houses, Other Buildings	26	0.6%
Automobiles	28	0.6%
Persons, Animals	9	0.2%
Airport Hazards (e.g., runway approach lights)	37	0.9%
Aircraft (one or both on ground)	33	0.8%
Aircraft (both in air)	68	1.6%
Other	173	4.0%

Notes:

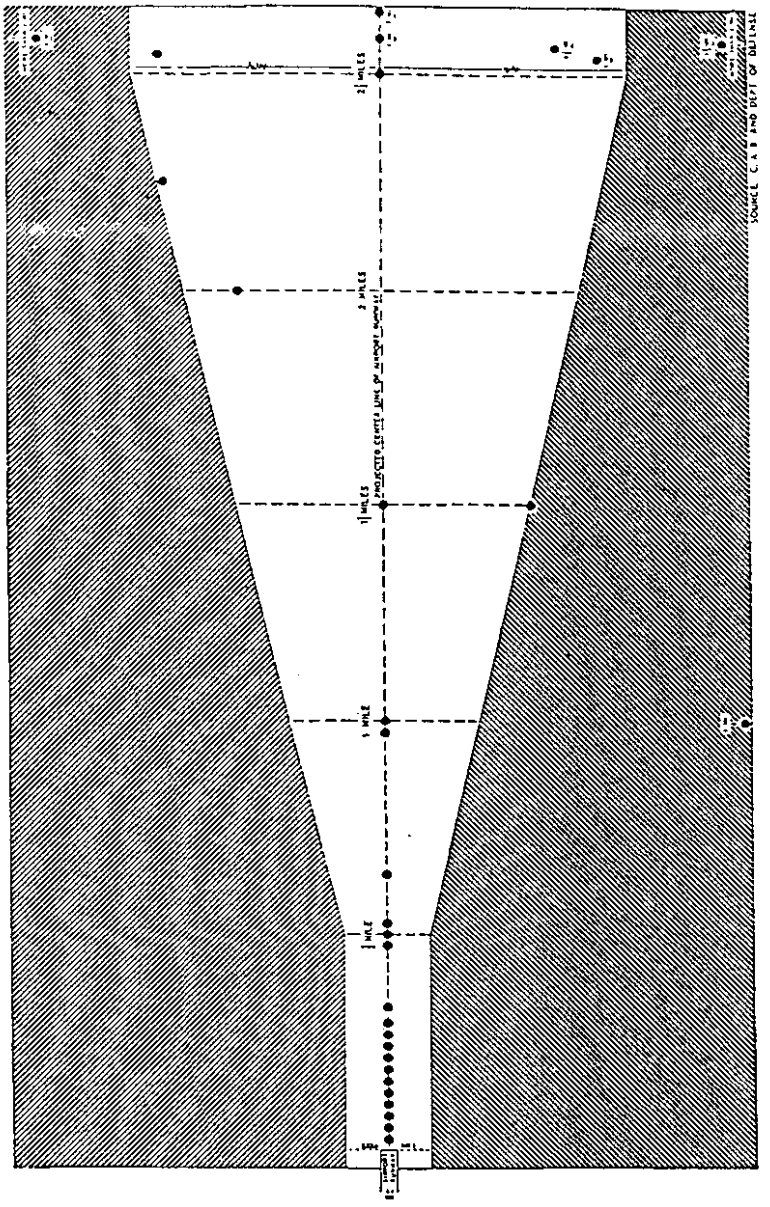
- Data includes both primary accident types (i.e., accident began with the collision) and secondary accident types (i.e., something else happened which then resulted in a collision). A collision can be both a primary and a secondary accident type in the same accident – a few of these instances are included in the data, but others (especially ones in which a mid-air collision was the primary accident type) appear not to be.
- The total number of general aviation accidents of all types averaged 4,327 annually in the U.S. during the 1974 to 1978 period.

Source: National Transportation Safety Board, *Annual Review of Aircraft Accident Data – U.S. General Aviation*, Calendar Years 1974 to 1978.

Table 5

Accidents Involving Collisions

U.S. General Aviation 1974-1978



THIS CHART SHOWS THE RELATIVE LOCATION OF ALL COMMERCIAL AND MILITARY CRASHES WHICH CAUSED DEATH OR INJURY TO PERSONS ON THE GROUND NEAR AIRPORTS DURING THE PERIOD 1946-52.

SOURCE: PRESIDENT'S AIRPORT COMMISSION - 1952

Figure 11

Airport Proximity of Aircraft Accidents Involving Non-Occupant Fatalities

The data does not note the runway proximity of these accidents. Some indication of location can, however, be inferred from the phase of operation at the point when the accident occurred. These were evenly divided: five occurred when the aircraft was in the landing pattern or final approach; five during initial climb following a takeoff or go-around; and five while in flight.

Other Characteristics

Data on other selected characteristics of accidents were examined in search of any trends which might have a bearing on off-airport safety.

Phase of Operation

The data in Table 6 indicates the relative frequency with which accidents occur during different phases of aircraft operation. Landing accidents are the most common. Two-thirds of these, however, take place during the level off/touchdown/rollout process (i.e., on or near the runway) rather than in the traffic pattern or during final approach. The phases of operation most likely to produce near-airport accidents (as opposed to on-airport or en route) are initial climb, in traffic pattern, final approach, and go-around/missed approach (data on phase of operation by accident location is not available). Among these operational phases, the initial climb and the similar go-around/missed approach phases account for 60 percent of the accidents. As might be expected, near-airport accidents tend to be more severe than on-airport accidents. Some 33 percent of the accidents occurring during the initial climb, in traffic pattern, final approach and go-around/missed approach phases resulted in serious or fatal injuries, compared to only seven percent for the operational phases which normally would result only in on-airport accidents.

Time of Day

Table 7 reveals that nearly 89 percent of all general aviation accidents take place during dawn, daylight, or dusk, with about 11 percent occurring in hours of darkness (officially, one hour after sunset to one hour before sunrise). No definitive data is available on the percentage of all aircraft takeoffs and landings made at night, but a reasonable estimate is 7 to 10 percent. Considered together, these figures indicate that the nighttime accident rate is greater than the daytime rate, but not substantially so. The greater difference between daytime and nighttime accidents is their severity. About 24 percent of dawn/daylight/dusk accidents involve serious or fatal injuries, compared to nearly 47 percent of the night accidents. Once again, there is no available data as to the relationship between time of occurrence and airport proximity of accidents. It might be concluded that the need for open, emergency landing areas is more critical around airports which have night activity than around ones used solely in daylight; this conclusion is somewhat tempered, however, by the fact that pilots might not be able to spot such areas in the dark unless they are highly familiar with the airport.

Phase of Operation	Percent of Total Accidents		Proporation Involving Serious/Fatal Injury
Static	0.8%		51%
Taxi	3.7%		4%
Takeoff	19.5%		23%
run		4.8%	7%
initial climb		12.3%	31%
other		2.4%	12%
In Flight	33.7%		45%
Landing		41.5%	14%
in traffic pattern		2.1%	46%
final approach – VFR		6.6%	28%
final approach – IFR		0.9%	68%
roll		12.6%	2%
go-around/missed approach		2.7%	30%
other		3.4%	31%
Unknown	0.8%		77%
TOTAL	100.0%[1]		27%

[1] Total accidents records for the six-year period was 25,963.

Source: National Transportation Safety Board, *Annual Review of Aircraft Accident Data – U.S. General Aviation*, Calendar Years 1974-1979.

Table 6

Accident Distribution by Phase of Operation

U.S. General Aviation 1974-1979

Conditions of Light	Percent of Total Accidents	Proportion Involving Serious/Fatal Injury
Dawn	1.4%	27%
Daylight	83.3%	24%
Dusk	3.8%	26%
Night (dark)	9.1%	50%
Night (moonlight/bright)	1.7%	28%
Unknown	0.7%	46%
TOTAL	100.0%[1]	27%

[1] Total accident records for the six-year period was 25,963

Source: National Transportation Safety Board, *Annual Review of Aircrfaft Accident Data – U.S. General Aviation*, Calendar Years 1974-1979.

Table 7

Accident Distribution by Conditions of Light

U.S. General Aviation 1974-1979

Weather

Weather conditions affect safety in much the same way that conditions of light affect it. Poor visibility, whether because of clouds or darkness, eliminates some of the margin of safety which better flying conditions allow. The available data categorizes weather conditions according to the flying rules which prevail: Visual Flight Rules (VFR), Instrument Flight Rules (IFR), or below minimums (Table 8). Generally, Visual Flight Rules (VFR), - "see and be seen" - are in effect at an airport when the visibility is at least three miles and the ceiling at least 1,000 feet above ground level. Poorer conditions require the use of Instrument Flight Rules - the pilot guides the aircraft by reference to electronic signals rather than visually, and coordination between aircraft is provided by FAA air traffic control. "Below minimums" refers to when conditions are so poor that landings cannot be made even with IFR. These minimums vary from airport to airport. The vast majority of accidents occur during VFR weather since most flying is limited to these conditions (less than half of non-student pilots nationwide are certified for Instrument flying and only about 30 percent of California public-use airports have instrument approaches). As might be expected, however, the severity of IFR accidents is substantially greater than those under VFR (67 percent involve severe or fatal injuries versus 23 percent for VFR).

ESTABLISHED REGULATIONS AND POLICIES

Most regulations and policies pertaining to airport and airport environs safety have been established at the Federal or State levels. These are outlined here. Other regulations which principally address noise issues are described in the preceding chapter.

Federal Laws and Regulations

- Federal Aviation Regulations, Part 77, "Objects Affecting Navigable Airspace".

  The Federal Aviation Administration adopted FAR Part 77 as a means of monitoring and protecting the airspace required for safe operation of aircraft at an airport. These regulations require that the FAA be notified of certain proposed construction or alternation of objects, whether permanent or temporary or of natural growth, within a specified vicinity of an airport. Standards for determining what constitutes an obstruction to air navigation also are established, defined in terms of imaginary surfaces in the airspace. Part 77 does not give the FAA authority to enforce the standards and nothing in the regulations prohibit a State or local government from taking actions which are contrary to the Federal standards. However, if a city or county which operates an airport permits the development of an obstruction, it may be found in noncompliance with the conditions for receipt of grant funds and become ineligible for future grants.

- Federal Aviation Regulations (FAR), Part 152, "Airport Aid Program".

  FAR Part 152 spells out the requirements for Federal funding of airport projects. The kinds of airport development eligible for funding are listed in some detail. Requirements for airport

Type of Weather Conditions	Percent of Total Accidents	Proportion Involving Serious/Fatal Injury
Visual Flight Rules	90.6%	23%
Instrument Flight Rules	7.4%	67%
Below minimums	0.6%	70%
Unknown	1.4%	52%
TOTAL	100.0%[1]	27%

[1] Total accident records for the six-year period was 25,963

Source: National Transportation Safety Board, *Annual Review of Aircrfaft Accident Data – U.S. General Aviation*, Calendar Years 1974-1979.

Table 8

Accident Distribution by Type of Weather Conditions

U.S. General Aviation 1974-1979

ownership and/or acquisition of runway clear zone are also set forth. Additionally, Part 152 establishes the FAA's authority to set airport design standards.

State Laws and Regulations

- State Aeronautics Act, Chapter 4, Article 2.7 - Regulation of Obstructions (Public Utilities Code, Sections 21655 through 21660).

  Among other provisions, these sections of the statute prohibit any person from constructing any structure of permitting any natural growth at a height which would constitute a hazard to air navigation as defined in FAR Part 77 unless a State permit or Federal exemption is obtained. This regulation applies to objects located within one mile of an airport boundary.

- State Aeronautics Act, Chapter 4, Article 3 - Regulation of Airports (Public Utilities Code, Sections, 21661 through 21669.6).

  The elements of this article provide for the issuance of airport permits by the California State Division of Aeronautics. It is unlawful for any political subdivision or person to operate an airport unless it has a current airport permit. Safety is the principal factor in issuance of a permit, although noise can also be a consideration. To be issued a permit, an airport must conform to the minimum standards of safety set forth in Division of Aeronautics rules and regulations, have safe air traffic patterns established, and have a zone of approach which conforms to the standards of Federal Aviation Regulation, Part 77. Failure to continue to maintain an airport in conformance with permit standards and conditions can result in revocation of the permit.

POLICY ISSUES AND CHOICES

As is also the case for noise, there are a variety of issues which need to be examined in the process of developing safety compatibility standards and policies. These issues and the policy choices, where they are available, are discussed below.

"Acceptable Risk"

The concept of "acceptable risk" is central to any safety compatibility standards and policies. The operation of any airport entails some amount of risk both to aircraft occupants and to the use of land use near the airport. To have an absolute minimum level of risk, an airport should ideally be located in the midst of a broad, flat area with nothing but vacant land for miles around. Since these circumstances are highly impractical to provide, the issue becomes one of deciding what kind, how much, and in what location development is acceptable in an airport vicinity. Some indication of the risks (the accident probabilities) associated with such choices with respect to a specific airport (or type of airport) can be obtained by considering accident statistics such as those discussed above, the characteristics of the aircraft activity at that airport, and the airports historical safety

record. Ultimately, though, the determination of what constitutes an "acceptable risk" is a policy decision which invariably must balance safety considerations against a large variety of other factors.

Height Limitations on Structures

Minimum standards for the height of structures and other objects around airports are set forth in Part 77 of the Federal Aviation Regulations. These standards reflect, with margin of safety, the lowest altitudes at which an aircraft might reasonably be flown while approaching or departing an airport. A local jurisdiction can adopt more restrictive criteria if it chooses. Adoption of airport height limit zoning by the local jurisdiction having authority over land uses is normally a prerequisite to the airport's receipt of any Federal or State development grants. A model zoning ordinance is presented in FAA Advisory Circular 150/5190-4.

Other Hazards to Flight

Land use activities which may present visual, electronic, or physical hazards to aircraft in flight should be avoided in the vicinity of an airport. Visual hazards include distracting lights (particularly lights which can be confused with airfield lights), glare, and sources of smoke. Electronic hazards include any uses which interfere with aircraft radio communications. The principal physical hazards, other than the height of structures, are bird strikes. Although the risk of bird strikes is most serious in the takeoff and landing phases, the concern extends to elsewhere in the airport vicinity. Any land uses which can attract birds should be avoided, but those which are artificial attractors are particularly inappropriate because they generally need not be located near airports. Sanitary landfills are a prime example of such land uses.

Development Density Limitations

A primary means of limiting the risks of near-airport aircraft accidents is to limit the density of land use development. There are two aspects to such limitations - a limit on structural coverage and limit on the number of occupants. The former relates primarily to protecting people in an aircraft while with the latter the concern is for people on the ground.

Federal and State regulations provide no guidance as to the level to which densities should be limited. Most of the precedent for density limitations derives form various airport land use commissions in California.

The rationale to limiting structural densities is that, in most off-airport accidents, the pilot has enough control over the aircraft to be able to select an emergency landing site. This being the case, it is desirable to maintain selected sites in the airport vicinity in which an aircraft potentially could be landed without major property damage or serious injury to the aircraft occupants. Such sites would need to be free not only of buildings, but also of large signs, large trees, and other comparable obstacles. A minimum useful size would be 100 feet wide by 300 to 500 feet long.

The appropriate locations and spacing of these open areas is dependent on several factors. Given a typical 10:1 glide ratio, a light aircraft having an engine failure just about anywhere within an airport traffic pattern should be able to glide to the runway. The principal exception is if the engine fails on takeoff before pattern altitude has been reached. Under these circumstances, aircraft generally do not have sufficient speed and altitude to be able to return to the airport. A high proportion of open area - perhaps 20 percent or more - is therefore important along the extended runway centerline up to about a mile from the runway ends. Elsewhere within a mile of an airport, usable open areas spaced a half to one mile apart probably would be enough to provide an adequate margin of safety.

The concept behind placing occupancy level limitations on land uses near an airport is to limit the number of people who might be affected by an aircraft accident. The larger the aircraft which use an airport, the greater the potential for a high number of injuries of occupancy levels are not kept low. For light, general aviation aircraft, the area affected by an uncontrolled crash is usually quite small. Even when a building is hit, the structural damage is seldom extensive - a greater danger is subsequent fire.

The choice of where to set the maximum occupancy level is again a question of acceptable risk. It is generally agreed that high concentrations of people, such as occur in theaters and similar uses, should be avoided in areas most susceptible to aircraft accidents. Uses in which the occupants have low effective mobility -- hospitals, nursing homes, elementary and secondary schools, etc. -- also pose higher risks. Limits ranging from 10 to 50 persons per acre, depending upon proximity to the runway, duration of occupancy, and other factors, have been used by different airport land use commissions. To put these figures in perspective, a single-story office structure having one occupant per 100 square feet of floor area (the maximum occupancy load allowed under the Uniform Building Code) and covering 25 percent of the lot would have 100 people per acre. A figure of about 35 people per acre is common for light industrial uses.

Clustering Versus Spreading of Development

The preceding discussion points up that in certain respects, there are opposing strategies on how to best enhance safety near an airport. Given that the tradeoffs between safety and economic concerns often dictate some amount of development, the issue is whether the development should be clustered or spread out. Clustering enables the amount of useful open space between developed areas to be maximized, but it increases the number of people who could be within the impact area of an uncontrolled crash. A uniform spreading of development, on the other hand, provides fewer potential emergency landing spots and increases the chance of someone on the ground being injured, but limits the maximum number of people who could possibly be in the impact area.

A compromise between these two strategies probably represents the optimum approach. 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.

Differentiation of Safety Zones

The number, shape and size of the zones for which different safety criteria are established should be based upon the accident probabilities for each zone. Clear zones are well defined in FAA regulations and, because they are most susceptible to aircraft accidents, require the greatest degree of protection. Some limitation on development elsewhere along the inner approach/departure flight path is also generally considered desirable. How much, if any, restrictions to place on other portions of the airport environs is again a matter of acceptable risk. The statistics indicated, though, that the probability of an accident in any specific location beyond a mile from an airport is extremely small. In setting the size of the safety zones and the degree of development restrictions, the character of the airport activity – in particular, the size of aircraft regularly using the facility, the extent of nighttime use, and the availability of an instrument approach – should be considered.

Land Use Categories

The categories into which airport vicinity land uses are divided for evaluation purposes can be narrowly defined and large in number or broadly defined and few in number. Some choices include using standard land use code designations, local general plan designations, local zoning districts, or broad performance categories based upon uses posing similar safety risks. The choice is mostly a questions of allowing easy and consistent application of the safety criteria. It is not necessary that the safety criteria use the same land use categories as the noise criteria.

6 - ANNOYANCE

HUMAN REACTIONS

Compared to noise and safety compatibility considerations, the annoyance factor of airport activity is more subtle and subjective. It arises in locations where neither noise nor safety is measurably a significant factor – the noise of aircraft overflights seldom disrupts people's activities and the risk of an aircraft accident is statistically very low. Moreover, the degree of perceived annoyance varies widely from individual to individual even though the definable impacts may be similar.

One explanation of annoyance impacts is that they result from a combination of noise and safety concerns with fear being an element of the equation. Although people generally do not fear aircraft noise itself, they may be fearful of an aircraft crashing on their property, and it is the noise that mostly creates their awareness of aircraft presence. The occurrence of annoyance impacts thus appears to be influenced by several factors related to the individuals affected - their attitudes toward aviation including their feelings regarding the importance of the particular activity, their understanding of how airplanes fly, and their knowledge of when and how often overflights occur -- as well as by the actual noise levels and the altitude of the aircraft.

POLICY IMPLICATIONS

Perhaps the only policy implication of the above discussion is that owners of property near an airport should be made aware of the nature and extent of the Airport's activity and the plans for its future. It is particularly important that a mechanism be established which will assure that prospective buyers of property in the airport area receive this information. ALUC's can disseminate information on airport referral areas to real estate brokers and title insurance companies. This would increase the likelihood that prospective buyers would be made aware of the proximity of an airport. Unfortunately, ALUC's do not have jurisdiction over those buyer awareness measures which are permanent (e.g., avigation easements). ALUC's can, however, urge airport owners to acquire avigation easements and can encourage local governments to establish a comprehensive buyer notification program.

7 - COMPATIBILITY MEASURES

INTRODUCTION

Most land use control measures fall into one of four groups:

- **Acquisition of Fee Simple Title** – Outright purchase of property by the airport owner.
- **Approach Protection Easement Acquisition** – A means of limiting the type of development that can occur on a property.
- **Land Use Designation** – Measures regarding how land should be designated for future use on local land use plans and zoning ordinances.
- **Buyer Awareness** – Means of assuring that prospective purchasers of land in the airport vicinity are aware of the potential airport impacts and the land use restrictions.

There are distinct advantages and disadvantages to each of these forms of land use control.

ACQUISITION OF FEE SIMPLE TITLE

Outright airport-owner purchase of fee simple title to a property is the most direct means of land use control. It provides positive assurance of long-term land use compatibility and is the only type of action that enables existing incompatible uses to be removed.

The FAA has defined three sizes of "acquisition eligible areas". FAA grant funds can be used to acquire land within these areas.

- For runways used or anticipated to be used by turbojet aircraft the acquisition eligible area is 2,500 feet in width by 5,000 feet in length.
- On existing or planned nonprecision instrument runways the acquisition eligible area is 1,500 feet by 3,400 feet.
- For an existing or planned visual runway the acquisition eligible area is 1,000 feet by 2,000 feet.

In each case, the acquisition eligible area begins 200 feet beyond the end of the runway and is centered on the extended runway centerline. Airport owners can obtain grants in advance of actual acquisition or can be reimbursed if the land was acquired with other funds. As with other grant-eligible projects, being eligible does not mean that the grant request will be funded.

Weighing against the benefits of fee simple acquisition are several important drawbacks:

- **Cost** – Fee simple acquisition is usually the most expensive land use compatibility measure. Also, although some 90 percent of acquisition costs are eligible for FAA grants under current legislation, the FAA normally will not participate in acquisition of parcels lying totally outside the previously described acquisition eligible area unless very high noise levels are involved.

- **Disruptiveness** – The need to relocate residents and businesses occupying the property to be acquired is disruptive both to the individuals directly involved and to the neighborhood as a whole. Compliance with State and Federal relocation laws is required (assistance in finding replacement property must be provided and moving costs must be paid).

- **Tax Implications** – Government acquisition of real property removes it from the tax rolls unless it is leased out for compatible development.

- **Owner Opposition** – Landowners may be unwilling to sell their property voluntarily. Although the property can still be acquired by eminent domain, the condemnation process can be time consuming and costly (financially, socially, and politically).

APPROACH PROTECTION EASEMENT

Approach protection easements are parallel in concept to the conservation easements used for protection of farmlands. However, the term "conservation easement" is not used to avoid confusion. Under California statute, "conservation easements" are authorized for a specific set of limited purposes and can only be acquired through by donation.

As a means of airport approach protection, approach protection easements are a relatively untried and an unfamiliar concept. If these easements are to be successfully established as a means of approach protection, then questions posed because of the newness of the concept will need to be addressed.

Concept

Easements have been used as an airport approach protection device for many years. Typically, these easements have taken one of two forms:

- "Airspace" or "height limit" easements designed to assure that excessively tall structures or trees do not penetrate the airspace critical to flight around an airport; or

- "Avigation" easements which, in addition to setting height limits, explicitly provide for the flight of aircraft over a property together with the noise, vibration, and other impacts caused by the overflights.

A major limitation of avigation easements is that they do not restrict the type of use of the underlying land other than with regard to height. The concept of using approach protection easements around airports thus arose as a way of addressing this limitation. An approach protection easement further restricts the underlying land use by removing certain of the development rights from the property. (It is worth noting that the concept of purchase or transfer development rights, not associated with establishment of an easement, has been used in older urban areas a means of saving historically or architecturally significant buildings.) The essence of the approach protection easement is that it requires the land to remain in agricultural, open space, or other airport-compatible use for perpetuity.

Even though approach protection easements greatly restrict how the landowner can use his property, it is important to recognize that the owner retains most of rights associated with property ownership. For example, the owner has the right to keep people from entering the property other than for the limited purposes stated in the easement - the general public is not given access to the property. The owner also retains the rights to sell or lease the property or give it to his heirs.

As with other types of easements, approach protection easements must be accomplished on a parcel-by-parcel basis. Each easement is recorded in county records with the deed for the respective parcel and is binding on subsequent owners of the land.

Application

Historically, conservation easements were first used for preservation of scenic qualities. As noted above, they have more recently become popular as means of preserving agricultural land. The total number of examples nationwide, however, is quite limited and, with few exceptions, their establishment has been voluntary on the part of the landowner. As of this writing, there are no cases known to the author where approach protection easements have been purchased for the purpose of public airport approach protection. The most similar form of control that has been used is the establishment of avigation easements to ground level.

The best use of approach protection easements for airport-related purposes is to preserve existing compatibility within the critical inner portions of runway approaches. Approach protection easements are consequently most suited to agricultural lands and parcels having little of no incompatible development. They are not useful as a way of mitigating already existing incompatibilities. (Where a residence already exists, a "grandfather clause" exemption could be provided or the easement could cover all of the property except the dwelling site.)

The advantage of approach protection easements over fee simple acquisition is that they can be much less costly to obtain, especially when the property has no immediately foreseeable development potential. Compared to zoning, on the other hand, the purchase of development rights gives greater long-term assurance that the land uses will remain compatible. It also provides compensation to the landowner for the use restrictions that would be involved. Accomplishing the same objective by zoning could constitute a taking.

At most airports, funding constraints will prevent a complete program of approach protection easement acquisition from being accomplished at one time. Acquisition priorities should be based upon such factors as the imminence of the development, proximity to the runway, and cost of acquisition. The highest priority for acquisition should be the critical, close-in parcels having high potential for near-term incompatible development. High priority might also be given to approach protection easements that can be obtained for a small fraction of the full market value of the property.

Determination of Cost

Theory

Determining the fair market value of approach protection easements is one of the more difficult issues which must be dealt with. *In theory, the value of development rights to be acquired equals the true market value of the land minus its value solely for agricultural or other open space use.* The market value is based upon the concept of "highest and best use." The property's development potential – taking into account the proximity of urban areas, the existing zoning, the possibility of rezoning, etc. – is a major factor in this evaluation. Agricultural value is determined, again in theory, by the income capability of the property.

In most circumstances, the difference between the two values should reflect the number of homesites which could be developed on a property. If, for example, an 80-acre parcel could be subdivided into four 20-acre parcels, each with a 1-acre home site and 19 acres of agricultural land, then the cost of the approach protection easement should be similar to that of four developable 1-acre parcels in the same area.

Influences

Part of the difficulty in actually determining approach protection easement costs, though, is that determination of the number of home sites which could be developed on a parcel often depends on the individual's point of view. As an urban area expands outward, owners of land in the fringe area frequently believe that they soon will be able to subdivide their property into small parcels even absent any supporting local land use plan or zoning designation.

If it could be concluded that zoning provisions and other restrictions would indefinitely preclude development of a parcel for other than agricultural use, then the value of the development rights should be zero. A landowner cannot be expected to sell those rights for this price, however. Regardless of whether the development rights have real value, the landowner will believe that they do (and, if a contested evaluation is given to a court to decide, a jury might well agree with the landowner). Also, by actively soliciting to purchase an approach protection easement on a specific parcel, the airport owner may convey the impression to the property owner that the development rights must be worth something or the airport would not be seeking them. In general, as development pressure increases, both the absolute cost of development rights and their cost as a percentage of market value can be expected to increase.

In certain circumstances, an opposing influence on acquisition costs could occur. This might happen where the property owner finds owning or living on a large "estate" to have amenities and other nonfinancial values which are greater than the property's agricultural income potential. To such a person, any price obtained by selling an approach protection easement might be considered money ahead if he realizes that this perceived open space value may not increase the actual market value of the land. The point to be made here is that land rarely sells for a price which solely reflects its agricultural income value.

Appraisals

One means of establishing a fair value for an approach protection easement is to conduct an appraisal. Obtaining an appraisal may require some special attention in that not all appraisers are familiar with the concept of development rights acquisition. It is essential that the appraiser be very knowledgeable about local agricultural land values and also have an understanding of the effects, if any, of the airport's presence on the value of nearby property.

A more difficult problem is the lack of comparable transactions for approach protection easements or even for land sold strictly for its agricultural value. Many of the conservation easements which have been established not only have been voluntary on the part of the landowner, but have been donated or sold to a land trust at a reduced or "bargain" price. Appraisals consequently could produce a wide range of "fair" values. (In one locality where conservation easements were being acquired, separate appraisals of the market value and agricultural value were obtained and, on some parcels, the latter was appraised higher than the former.) Ultimately, policy decisions by the airport owner and the attitudes of the landowners may predominate in setting the price paid for purchase of development rights.

Based upon the limited, and largely theoretical, information available, the average cost of conservation easements can be expected to be between 25 percent and 50 percent of the full market value of the properties involved. In addition to the influences mentioned above, the cost of an approach protection easement on an individual parcel will be affected by the parcel size, the extent of agricultural-related investment, the existence of a dwelling, etc.

Other Issues

Although perhaps not as complex as the question of cost, several other issues are also important to the establishment of approach protection easements for airport approach protection. Some thoughts on these topics are presented below.

Defining Land Use Restrictions

It is essential that the rights to be obtained (in other words, the restrictions to be applied) be carefully and explicitly defined. The land use restrictions can be stated either by indicating the remaining uses which are acceptable or by defining the uses prohibited. The restrictions could be slightly varied depending upon the location of each property with respect to the airport. For property within a clear zone, for example, all structures as well as trees should be prohibited if

practical. Farther from the airport, farm structures and perhaps certain industrial uses or even a dwelling (if the parcel is large) may be acceptable. Also, the wording will need to assure the landowner that he is not surrendering any property rights other than the right of development.

An approach protection easement should include standard avigation easement restrictions. The specific rights which an avigation easement conveys to the airport owner are:

- 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.

- 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 to prohibit electrical interference, glare, misleading lights, visual impairments, and other hazards to aircraft from being created on the property.

- A right-of-entry onto the property, with appropriate advance notice, for the purpose of removing, marking, or lighting any nonconforming structure or other object.

Remaining Use

Care should be taken in the drafting of development restrictions to make sure that the remaining allowable use of the land is viable. Periodic reevaluation (about every 10 years) of the circumstances facing each property may be desirable. If warranted, some adjustments to the easement conditions may be appropriate.

Method of Acquisition

The question here is how hard the airport owner should pursue the purchase of development rights. At one extreme would be the use of eminent domain and at the other would be purely voluntary sales. The former end of the spectrum is likely to result in higher costs, both for the easements themselves and for the acquisition procedures. On the other hand, it is uncertain how receptive landowners would be to selling their development rights voluntarily.

Fee Title and Resale Alternative

In instances where the cost of an approach protection easement is determined to approach or exceed 50 percent of the fee simple value of the property, an alternative which the airport owner should seriously consider is to purchase the property outright. Two options would then be available. One would be to retain the property under airport ownership and lease it for compatible uses. The other would be to resell the property on the open market with the approach protection easement in place. The latter result has the added benefit of serving to determine the actual fair

market value of the approach protection easement. This information can then be used in the appraisal of subsequent easements.

Enforcement

Some provision must be made in the easement agreement for the airport owner to inspect the property on which the easements have been acquired to assure that unauthorized development has not taken place. Procedures are also needed to make certain that unwarranted releasing of owners from the restrictions of the easements does not occur as a result of unawareness or misunderstanding of the easement provisions.

Tax Implications

The establishment of approach protection easements will have tax implications for both the landowner and the local jurisdiction. By restricting the land's use to agricultural and open space use, the property can no longer be valued for its development potential and should therefore be taxed accordingly. This is essentially the same as the concept behind taxing of land placed in agricultural preserve contracts under California's Williamson Act. Some loss of local property tax receipts may be incurred, more in the long range (by which time the property might have been developed) than the near term.

Another consideration for landowners may be the effect on their income, capital gains, and inheritance taxes. To some individuals, donating the development rights or selling them at a below-market-value price may have tax advantages.

Acceptability to the FAA

Since most airport owners cannot afford the cost of property acquisition without financial assistance from the Federal Aviation Administration, the grant eligibility of approach protection easements must be considered. Although as of yet there are no examples of FAA participation in approach protection easement acquisition (at least in the western U.S.), the agency has indicated that, as a true legal property interest, the easements are grant eligible.

The uncertainty of approach protection easement costs has important implications with regard to application for an FAA grant. If the ultimate cost of acquisition turns out to be greater than the amount estimated in the grant application, then the airport owner will not be able to obtain 90 percent FAA funding of the excess amount. At most, the FAA would contribute 50 percent, the same as with cost overruns in fee simple property acquisition. The more certain method, if the airport owner can afford to advance money, is to acquire the easements and then obtain a grant for 90 percent reimbursement of the actual cost.

Land Trusts

One last issue concerns the possible role that a land trust might play in the acquisition of development rights around an airport. A land trust is a private, nonprofit, tax-exempt corporation set up to

acquire and manage lands in the public interest. Land trusts generally can act faster than governments in acquiring land, an advantage that could be valuable if a property comes on the market. Moreover, land trusts can negotiate gifts or bargain-price sales of approach protection easements, whereas a government must offer full market value. A trust can serve as a broker, acquiring the easements and then selling them to a public agency, or it can hold and administer them itself. The American Farmland Trust (a nationwide organization with an office in San Francisco) and various county land trusts have had experience in conservation easement acquisition for farmlands preservation and may be interested in participating in a program having dual airport/farmlands objectives.

LAND USE DESIGNATION

As a means of assuring airport/land use compatibility, the designation of land uses offers a lesser degree of control than fee title or conservation easement acquisition. Although it can and should be applied throughout the airport environs, designation of land uses needs to be used in conjunction with the more positive measures in locations where assurance of compatibility is most critical.

Limitations

Among the major limitations of land use designations as a form of land use control are these:

Ease of Change: Nothing permanently locks in a land use designation. If pressured by landowners to allow less restricted development, future local legislative bodies can change the established designations. Such changes especially can occur if the land changes jurisdiction (e.g., as a result of incorporation). Adoption of airport compatibility plans by Airport Land Use Commissions offers the potential to substantially reduce the ability of cities and counties to change land use designations to permit incompatible uses. However, cities and counties retain the ability to override ALUC plans.

Nonaviation Orientation: The basic land use categories employed throughout the community do not address the specific issues of compatibility with airport activities. Additional conditions need to be established to assure that land uses normally compatible with the airport – industrial and agricultural, for example – do not include incompatible characteristics.

Restrictiveness: Land use designations can go only so far in restricting development of private property without being considered an unfair taking. Close to the runway ends, the restrictions may need to be more severe than can be accomplished by this means alone.

Lack of Retroactiveness: Designating an area for a different use than the one already existing may encourage change over the long run but does not directly eliminate any incompatible uses. Other devices, such as fee simple acquisition, may be necessary to bring about the changes.

Airport Combining Zone

Another form of land use designation which is frequently useful as a method of implementing elements of an airport/ land use compatibility program is an airport combining or overlay zone. The basic concept of a combining zone is to add a secondary zoning designation to the principal designation. The principal zoning classification continues to define most of the use and site design parameters. The secondary classification then serves to modify the primary classification in a few very specific ways. The specific modifications might include: density limitations, site design criteria, and noise insulation requirements. The boundary of an airport combining zone should be defined to encompass all areas subjected to overflights at or below traffic pattern altitude.

There are several benefits to using an airport combining zone. It permits the continued utilization of the majority of the design and use guidelines contained in the existing zones. This avoids the need for a large number of discrete zoning districts. It also simplifies implementation of the measures by avoiding the use of separate overlapping development criteria.

Airport Land Use Commissions

Airport Land Use Commissions were established as a means of assuring compatibility between public-use airports and adjacent land uses. Each commission required to prepare a "comprehensive land use plan" for each airport within its jurisdiction. The plan may specify: height restrictions, permitted land uses and building standards within airport plan areas. Although cities and counties retain the authority to override ALUC plans, state law requires that specific findings be made to show that the override is consistent with the purposes of the ALUC statutes. One of the purposes of the recent (1989) revisions to ALUC law was to strengthen the requirement for specific findings.

BUYER AWARENESS

Buyer awareness is an umbrella category for two types of measures whose objective is to ensure that prospective buyers of property in the airport area are informed about the airport's impact on the property.

Avigation Easement Dedication

Establishment of an avigation easement on a property constitutes the most comprehensive and stringent form of buyer awareness measure. Although the rights associated with most avigation easements are established in other forms (e.g. local, airport-vicinity, height-limit zoning ordinances and Federal Aviation Regulations), an avigation easement clearly conveys these rights to the airport owner. It also serves to notify all future owners of affected property that aircraft overflights occur. An avigation easement normally 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 (set in accordance with

Federal Aviation Regulations Part 77 and/or criteria for terminal instrument approaches).

- 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 light visual impairments, and other hazards to aircraft from being created on the property.

Historically, avigation easements have been acquired mostly in portions of the airport environs where height restrictions and noise impacts are substantial. Typically, these areas are within the approach zones. More recently, avigation easements have been obtained on property elsewhere in the airport environs which is not as severely impacted, but which is regularly subjected to aircraft overflights. Most often, avigation easements acquired within this broader area are not purchased by the airport proprietor; rather, they are dedicated to the airport as a condition for the local jurisdiction's approval of a subdivision or other major development action on the property.

Noise Notification

In conjunction with adoption of a combining zone, it may be effective for a notification describing the zone and discussing its significance to be formally sent to all local real estate brokers, and perhaps title companies as well. This notification should be by registered mail to verify its receipt. Having received this information, the brokers would be obligated to pass it along to prospective buyers. Potentially, this buyer awareness measure would enable people who likely would be annoyed by aircraft overflights to avoid moving to the principally affected areas.