

Control of Airport- and Aircraft-Related Noise in the United States

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Regulatory control of aircraft noise in the airport community environment is becoming increasingly common. Such controls are being applied to both civilian and military activities. These controls apply to two aspects of the noise problem: operational control of aircraft, both fixed and rotary wing, and land use controls around airports enacted by communities potentially affected by aircraft. A summary is given of the status of airport noise regulations enacted by municipalities (i.e., cities, counties) within the United States. To date, 2,000 municipalities have been inventoried in terms of existing noise controls that have land use implications. In addition, more than 200 airports have been evaluated regarding applicable operational and land use controls that are now in effect. The results of this analysis will be a discussion of 28 categories of noise control measures, categorized primarily in terms of operational and land use controls. Emphasis will be on describing these noise-control-related techniques and where they are being applied (i.e., case-study method), but not on their legal or political standing.

Aircraft-related noise is recognized as a primary noise source within airport communities. It is estimated that there are approximately 5,000,000 residents in the vicinity of civilian airports affected by aircraft noise where the annual day-night average sound level (DNL) is 65 or greater (1). Although it appears that there may be a possible decline in the total population exposed to aircraft-related noise in the future, the effect on the airport community will not be eliminated. Major advances are being made to reduce this exposed population, including operational and land use controls.

These noise control efforts involve both civilian and military airport environments. The problem of airport noise was documented as a national concern by the Doolittle Commission report, *The Airport and Its Neighbors* (2). Prepared for President Truman in 1952, the report identified conflict between airport noise and community land use as a future national problem. It was the military that first responded to the problem: the U.S. Air Force initiated a noise program in 1962 for ensuring compatible land development for their airfield operations. This subsequently evolved into the Airport Installation Compatible Use Zones (AICUZ) program (3).

The U.S. Air Force, Navy, and Marine Corps began AICUZ planning at each of their installations in 1973. In 1982 the U.S. Army joined this process and has expanded the concept by requiring such planning around each army installation generating any type of noise, including airfields (4). This is referred to as the Installation Compatible Use Zone (ICUZ) program and such studies are being initiated at most army bases.

Although its program was initiated after that of the Department of Defense, the Federal Aviation Administration (FAA) has taken a very active role regarding civilian aircraft and airports. Aircraft noise has been reduced by the enactment of Federal Aviation Regulation (FAR) Part 36, Aircraft Noise Certification (5). This regulation applies to aircraft on the basis of gross weight, with maximum permissible noise limits measured at three distinct locations. The initiation of FAR Part 150, Airport Noise Compatibility Planning, is beginning to have a positive influence on airport community noise impact and planning (6). Today there are more than 75 studies under way funded by the FAA that involve operational and land use compatibility planning for civilian airports.

The focus of all these effects has not been only at the federal level. Historically, significant interest has been expressed by municipal and state governments. Currently there are approximately 1,900 municipal and 26 state noise control laws in existence (7,8). Many of these relate to specific airports or to the control of land surrounding airports, both civilian and military. These laws, with acoustical limits, involve a variety of controls, as summarized in Figures 1 and 2.

There is an increasing interest in the regulation of noise around airports. These measures involve operational control of aircraft, as well as land use controls. A survey of 402 airports has been analyzed to determine the characteristics of these noise control measures (9,10). This information was gathered from a variety of sources and involves civilian-operated airports that include air carrier and general aviation facilities.

OPERATIONAL NOISE CONTROL MEASURES

Several approaches for operationally controlling aircraft have been instituted at civilian airports. These measures are summarized by rank order in Table 1. A wide range and number of operational noise measures are being used at these airports. The following is a brief description of each measure.

Noise-Abatement Flight Tracks

The most common operational noise measure, use of noise-abatement flight tracks, involves arrival and departure patterns over the least-sensitive land use areas where feasible. Approach and departure procedures over bodies of water and agricultural or open-space corridors are usually designated (e.g., Los Angeles International Airport and Washington, D.C., National Airport).

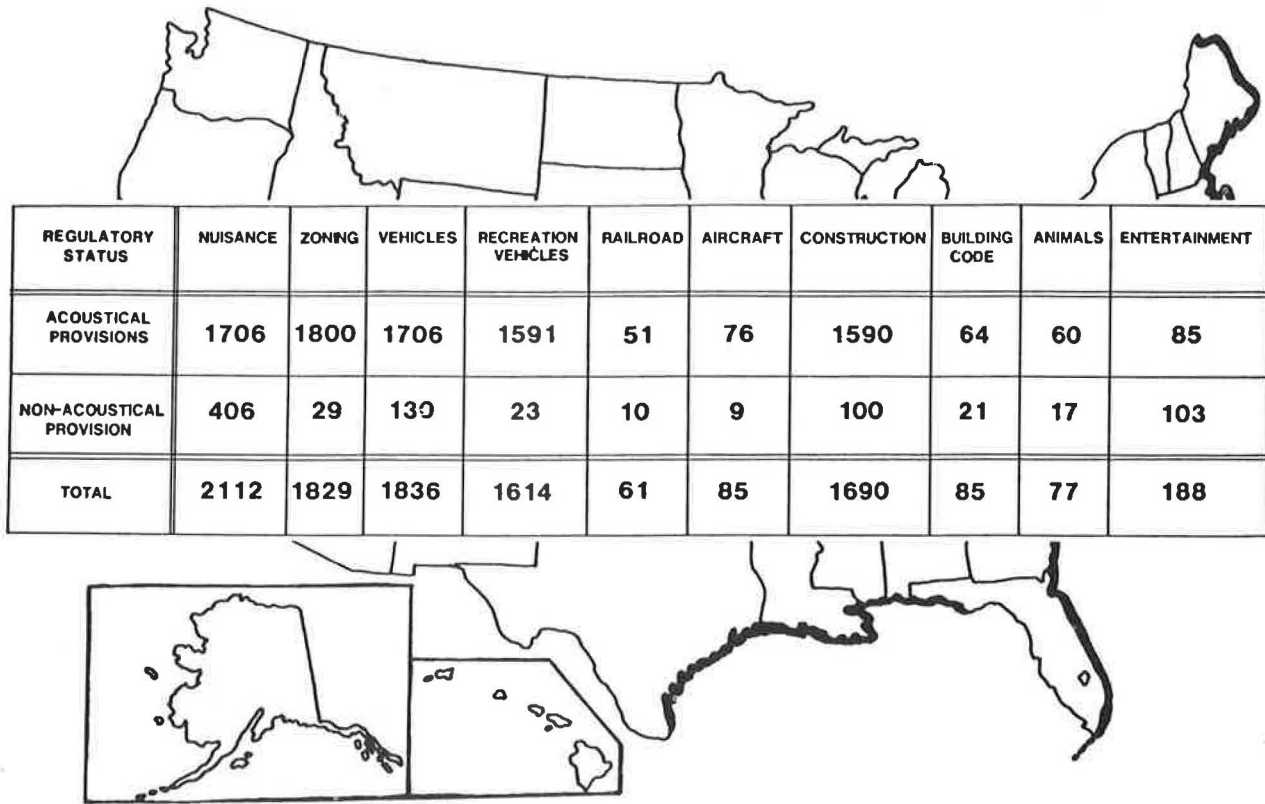


FIGURE 1 Municipal noise legislation: summary.

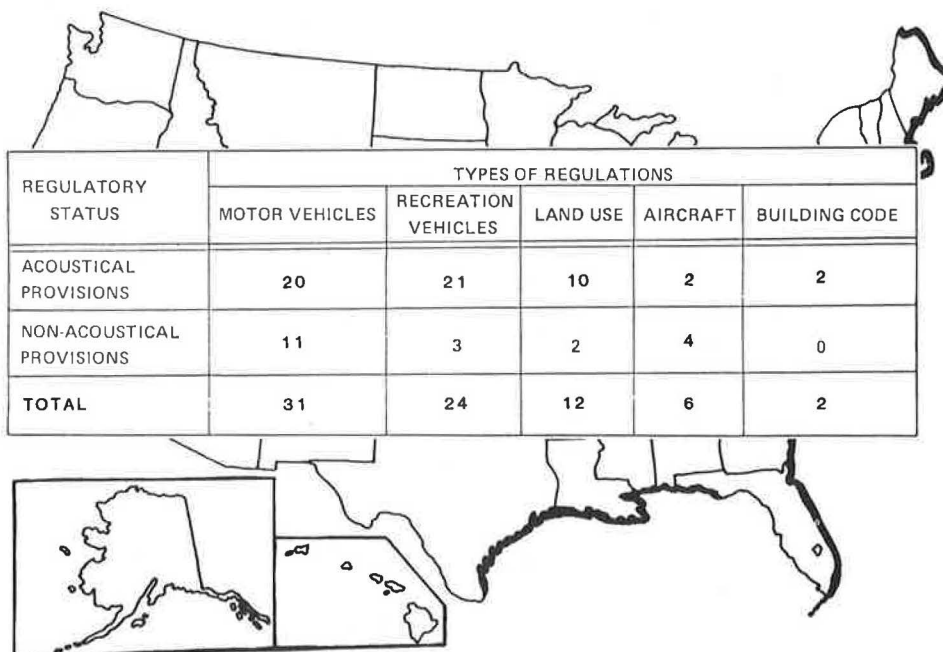


FIGURE 2 State noise legislation: summary.

TABLE 1 AIRPORT NOISE CONTROL STRATEGIES:
OPERATIONAL

RANK ORDER	OPERATIONAL CONTROLS	AIRPORT COMMUNITIES	
		NUMBER	PERCENT*
1	Preferential Runway	139	34.5
2	Ground Runup Restrictions	94	23.3
3	Flight Training Restrictions	81	20.1
4	Noise Abatement Flight Tracks	68	16.9
5	Noise Abatement Profiles	55	13.6
6	Aircraft Bans	42	10.4
7	Partial Curfew/Ban	41	10.1
8	Noise Monitoring	36	8.9
9	Slots	35	8.7
10	Noise Emission Levels	26	6.4
11	Displaced Landing Thresholds & Takeoff Points	24	5.9
12	Capacity Limits	6	1.4
13	Aircraft Towing	5	1.2
14	Curfews	4	0.9
15	Operational Fees	3	0.7

*Percent of Sample (402 Airports)

Ground Runup Restrictions

Restrictions are frequently applied to aircraft power checks when they are performed as part of ground runup maintenance. This noise measure usually involves a time-of-day restriction and noise emission and duration limit. Runup areas are generally designated and are often remote sites or are designed to minimize sound propagation with engineering and architectural control techniques.

Noise-Abatement Profiles

Frequently airports develop aircraft profiles based on the FAA recommended advisory circular or its equivalent. This may involve a three-segment departure procedure or a higher-than-minimum altitude until glide slope intercept occurs on arrival. Such procedures are adopted by an airline using FAA guidance to maximize height (altitude) from ground (land use) exposure.

Preferential Runways

Often an airport will specify a preferred runway to minimize aircraft flights over noise-sensitive areas. This applies particularly during nighttime conditions between 10:00 p.m. and 7:00 a.m. For example, at McCarran International Airport, Las Vegas, Nevada, crosswind Runway 25 is used whenever possible to minimize use of Runway 1R-19L.

Aircraft Bans and Curfews

Bans range from prohibiting all aircraft from operating during certain time periods to restrictions among types or categories of aircraft during certain times or in certain areas of the airport. In most cases, restrictions are involved rather than the absolute banning of aircraft on the basis of type, weight, manufacturer, category, occurrence, and so forth.

Slots and Capacity

A limitation on the number of aircraft operations that can be allowed within a specified time period, a passenger limit, or a limit on other airport services have been used, for example, at Islip Long Island MacArthur Airport using an index of total noise level.

Training Restrictions

Aircraft are frequently restricted from making practice takeoffs and landings. The restrictions may range from partial (e.g., allowed during certain times of the day) to complete. Accident potential has been dramatically increased when training flights are interspersed with air carrier (jet) operations.

Noise Emission Levels

Airport- or community-based single event or integrated noise levels may be applied to an individual aircraft operation or to the total number of operations over a specified time period. Noise caps, using an annual average, are now being applied to many commercial airports.

Displaced Landing

Aircraft are required to land at a point on the runway closer than the actual end, so that the approach trajectory, being steeper, will place aircraft higher above noise-sensitive land uses. The general concept sounds attractive; however, on the basis of the elevation and distance (e.g., runway length), there are only nominal acoustical benefits.

Aircraft Towing

Generally, aircraft engines may be shut off and the aircraft towed to a specified area of the airport for performing any runup-related activity, in compliance with runup provisions. Such procedures are more common at military installations than at civilian airports.

Operational Fee

A monetary fee may be applied to aircraft on the basis of their noise emission performance and time of operation. This is paid to the airport proprietor for noise abatement. Very few programs in the United States [e.g., Palm Beach International Airport (PBI)] apply this technique as compared with those in Europe. Approximately \$1 million a year will be collected

from airlines at PBLA, all of which must be applied to noise abatement.

LAND USE NOISE CONTROL MEASURES

Off-airport control of land use for noise compatibility purposes is essential, especially for airport affected communities. Table 2 presents, in rank order, these land use measures. A brief description of each land use control technique is given in the following sections.

TABLE 2 AIRPORT NOISE CONTROL STRATEGIES: LAND USE

RANK ORDER	LAND USE CONTROLS	AIRPORT COMMUNITIES	
		NUMBER	PERCENT*

1	Zoning	133	33.0
2	Comprehensive Plan	108	26.8
3	Land Acquisition	77	19.1
4	Avigational Easement	49	12.1
5	Noise Disclosure	34	8.4
6	Environmental Impact Review	33	8.2
7	Building Code	32	7.9
8	Capital Improvements	18	4.4
9	Sound Insulation	16	3.9
10	Development Rights	10	2.4
11	Site Design	9	2.2
12	Land Banking	7	1.7
13	Subdivision Regulations	6	1.4
14	Purchase Assurance	4	0.9
15	Tax Incentives	3	0.7

*Percent of Sample (402 Airports)

Zoning

Zoning is a form of power that enables governments to enact ordinances protecting the public health, safety, and welfare. Performance requirements specify noise limits by zoning-district classification.

Comprehensive Plan

The comprehensive plan, often referred to as the general or master plan, is usually an official public document adopted by a government projecting the future uses of land development.

Land Acquisition

A fee-simple purchase of incompatible land in the vicinity of an airport is an effective method for ensuring land compatibility.

Avigational Easement

An easement being the legal right for one property owner to use the land of another, an avigational easement allows the trespass of aircraft and their associated impact for an agreed-on price and time period.

Noise Disclosure

A noise disclosure informs the public or a prospective buyer, or both, of the existing or projected noise level on the subject property. A disclosure can be either advisory or regulatory.

Building Code

Building codes establish noise performance requirements typically associated with the building envelope, including minimum sound transmission requirements.

Capital Improvements

Public improvements for budgeting purposes can be examined in terms of noise generation and noise impact.

Sound Insulation

The application of sound control materials to a structure, including the building envelope, to reduce the transmission of sound around airports is common. Some 10 airports are now insulating nearly 2,500 residences.

Development Rights

Development rights to a property may be purchased and then transferred to another piece of property.

Site Design

In site design a review procedure is established whereby the environmental factors, including noise, are considered and solutions are integrated into a plat or land plan.

Land Banking

Land banking can be defined as a system in which a government acquires a substantial fraction of land in a region that is available for future development for the purpose of implementing a public land use policy.

Tax Incentives

Special or preferential tax assessment of land by a local government allows an owner of a piece of property to pay a lower or no property tax.

Subdivision Regulation

Subdivision regulations are the means by which a local government can ensure that proper lot layout, design, and improvements are made for a proposed residential development.

Environmental Impact Review

In environmental review, public-related projects are assessed that may have some potential impact on land use and the public interest.

CONCLUSION

There is a diversity of land and operational noise control techniques potential available. The application of these techniques depends many factors, including legal authority, financial consequences, degree of land use impact, and social and political conditions. These techniques represent three distinct methods for controlling noise: at the source, the path, and ultimately the receiver (person or property). Considerable progress is occurring in both the civilian and military sectors of airport planning and noise control. It appears that airport proprietors and their respective political jurisdictions must take the initiative to address airport-related community noise problems and solutions. Both military and civilian airports now have sufficient authority to proceed on the basis of current federal legislation.

REFERENCES

1. *Report to Congress: Alternatives Available to Accelerate Commercial Aircraft Fleet Modernization*. FAA, U.S. Department of Transportation, April 1986.
2. *The Airport and Its Neighbors*. U.S. Government Printing Office, 1952.
3. *Air Installation Compatible Use Zones*. Instruction 4165.57. U.S. Department of Defense, July 1973.
4. *Environmental Protection and Enhancement, Installation Compatible Use Zone Program (ICUZ)*. AR200-1. U.S. Department of Army, 1982.
5. *Noise Standards: Aircraft Type and Airworthiness Certification*. Federal Aviation Regulations, Part 36. FAA, U.S. Department of Transportation, June 1974.
6. *Airport Noise Compatibility Planning*. Federal Aviation Regulations, Part 150. FAA, U.S. Department of Transportation, Jan. 1981.
7. C. R. Bragdon. *Municipal Noise Legislation*. Fairmont Press, Inc., Atlanta, Ga., 1980.
8. C. R. Bragdon. *Airport Noise and Land Use Planning*, 2 vols. FAA, U.S. Department of Transportation, Dec. 1983.
9. P. A. Cline. *Airport Noise Control Strategies*. Report FAA-EE-86-02. Office of Energy and Environment, FAA, U.S. Department of Transportation, May 1986.
10. C. R. Bragdon. *Airport/Aircraft Related Noise Control in the United States*. *NATO Proceedings*, Committee on the Challenge of Modern Society, Mittenwald, Germany, Sept. 1986.

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