

# PART 1: Airport Noise

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Airport safety, noise, and land use planning go hand in hand. The problem has been, in the past, that most elected officials and airport sponsors just didn't understand this interaction. Even today, many of these decision-makers still don't understand these important issues or their responsibility to the airport and their communities. Many of the problems existing at airports today are the direct result of poor or nonexistent airport land use planning decisions made by elected officials.

Although many who complain about airports cite aircraft noise as disturbing them, the reality of their complaints is often based on fear - if they can hear an airplane, it must be too close to them. If those responsible for administering land use in areas surrounding their airport facility had implemented a long-term approach to responsible land use zoning of areas surrounding the airport, many of the problems experienced by airports and their users simply wouldn't exist in today's world. Responsible land use planning is simply a fair way to protect both the interests of the airport and the community surrounding the airport. Almost every concern a community expressed about an airport relating to noise and safety could be eliminated with responsible land use planning.

## Noise: A Matter of Perception

The drone of an airplane overhead may be music to your ears, but for the slumbering non-flier next door, it can be as grating as the gleeful band of trash collectors seeking to finish a day's work between 5 and 6 a.m.

As cities and suburbs have spread, airports and residences have become increasingly wedged together. Saying "the airport was here first" presents an unconvincing argument to homeowners and apartment dwellers who have established their homes a mile from the departure end of a runway. Maybe they knew the airport was there and felt it would be no problem. Others acquired housing ignorant of the nearby airfield. Regardless of who was there first, the airport or the housing development, perceived aircraft noise is a problem that, unless addressed and mitigated, could create an intolerable situation for both the airport and the surrounding community.

Most people can live with airplane noise - particularly the sounds generated at a general aviation airport. Those sounds are less obnoxious than the cacophony of trucks, sirens, construction sites, and motorcycles that one confronts walking down a street.

For some people, the intrusion of airplane sounds into their home, particularly late at night, is a source of irritation that becomes magnified because airplanes are conspicuous, unfamiliar, and perceived by some as unnecessary. In some cases, people may also transfer a subconscious fear of an airplane crash in their neighborhood into anxiety over the airplane's noise.

Those people who find aircraft sounds offensive have been mounting surprisingly effective fights to get at the source of their frustration. Their efforts are leading to bans on jet flights, night closings or "curfews," and restrictions on flight training at airports.

The FAA has set standards for machines that fly, and all users of airspace agree noise standards or limitations should be applied uniformly throughout the country. Most pilots would also argue any noise standards set in a community should be applied equally and fairly to all noise sources - not just airplanes.

This section of the packet provides information about aircraft noise levels and compares aircraft noise to other noise sources.

## Description of Noise

Noise is, very simply, unwanted sound or any undesirable sound interfering with normal speech and hearing or sound that is intense and annoying. The best way to describe noise and the problems relating to each individual's response to noise is to view airport noise as a system of integral parts including, but not limited to, the following:

- Nature and intensity.
- Number and fleet mix of aircraft using the airport.
- Distribution of operations among runways.
- Arrival and departure flight patterns.
- Time of day.
- Adjacent land uses, meaning compatible use vs. non-compatible use.
- Background or ambient noise levels in adjacent residential communities.

Each one of these factors plays a major role in the definition of the overall airport noise impact.

There are no less than 25 different methods to define noise; however, the aviation industry uses four basic methodologies to specifically describe aircraft noise:

### 1. dBA

A-weighted sound level (using a decibel base) that discriminates against lower frequencies according to a relationship approximating the auditory sensitivity of the human ear. In short, it is a unit that measures the intensity of a sound in comparison to the lowest volume detectable to the human ear.

### 2. EPNdB

Effective perceived noise levels measured in decibels, which provides a subjective assessment of the human perception of the noisiness of the aircraft.

### 3. SEL

Single event level measures the precise dBA of one activity and considers duration and frequency. The noise produced by an individual aircraft overflight, takeoff, or landing is usually measured in SEL.

### 4. Lmax

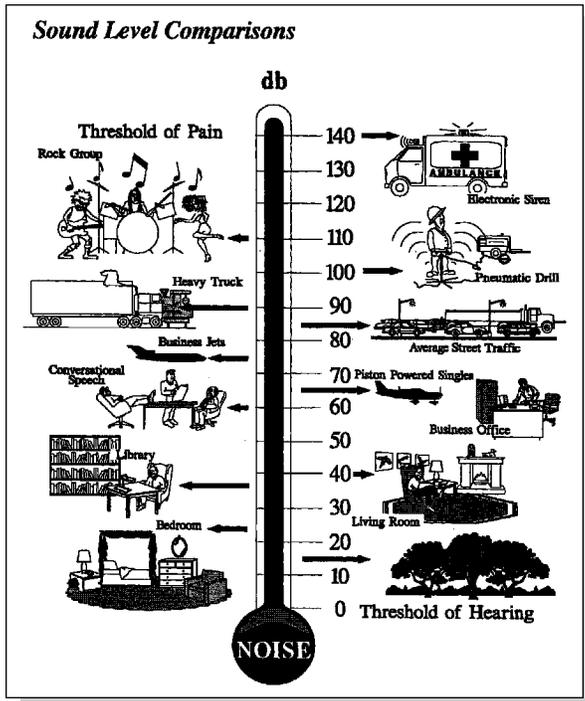
Maximum noise level, or Lmax, is the maximum sound level, expressed in dBA, that occurs during a single noise event.

### 5. Ldn/DNL<sup>1</sup>

Day-night average sound level defines the average A-weighted sound level during a 24-hour period, with a 10-dBA penalty applied to nighttime sound levels (10 p.m. to 7 a.m.), and is applicable to the measurement of all community noise sources.

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<sup>1</sup> The community noise equivalent level (CNEL) is an additional penalty applied to nighttime noise in states such as California, which require use of CNEL for state environmental analysis. CNEL is identical to DNL, except that CNEL applies a 5-dBA penalty for noise occurring between 7 p.m. and 10 p.m.



The preceding illustration depicts sound level comparisons from absolute quiet to the threshold of pain. These noise levels are encountered in the average environment on a daily basis. By comparing the noise levels indicated for general aviation aircraft to the "noise thermometer," one can clearly see where general aviation aircraft fit into the overall noise picture.



U.S. Department of Transportation  
Federal Aviation Administration

# Advisory Circular

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**Subject:**

**ESTIMATED AIRPLANE NOISE LEVELS IN A-WEIGHTED DECIBELS**

**Date:** 4/2/96

**Initiated by:** AEE-110

**AC No:** 36-3G

**Change:**

**1. Purpose.** This circular provides listings of estimated airplane noise levels in units of A-weighted sound level in decibels (dBA), ranked in descending order for the conditions and assumptions described below. This information is provided both for aircraft that have been noise type certificated under 14 CFR part 36, and for aircraft for which no such requirement currently exists.

FAA Advisory Circular (AC) 36-3G is a compilation of aircraft noise generation for takeoff and approach configurations of various makes and models of aircraft. The circular provides listings of estimated airplane noise levels in units of A-weighted sound level in decibels (dBA), ranked in descending order for the conditions and assumptions described in the AC. The information is provided both for aircraft that have been noise type certificated under CFR 14, Part 36, and aircraft for which no such requirement currently exists. All stipulations presented in the text of this AC are applicable to dBA noise levels. The circular also dictates specific placement criteria for noise monitors used during the aircraft noise data collection process. Located in this excellent reference is information such as the noise level of a Concorde taking off, 112.9 dBA; the older 747-100, 100.5 dBA; while the Cessna 152 and the Bellanca 7GCAA only 55.0 dBA and 51.0 dBA, respectively. On the other hand, a heavy truck passing by or the average street traffic can generate 85-90 dBA. Who makes more noise? It is a matter of perception and familiarity.

Manufacturer	Designation	dBA		
		Takeoff	Landing	
<b>Reciprocating Engine Category</b>				
Beechcraft	Baron (BE55)	63.0	72.1	
	Bonanza (BE35/36)	61.0	65.2	
	Duke	63.0	80.0	
	Duchess (BE76)	62.0	71.0	
Bellanca	Citabria (CH10)	51.0	60.0	
	Decathlon (BL30)	58.0	62.0	
	Viking (BL26)	65.0	64.0	
Cessna	Centurion (C210)	63.0	64.0	
	Cessna 150 (C150)	56.0	59.0	
	Cessna 152 (C152)	55.0	59.0	
	Cessna 170	68.0	61.0	
	Cessna 310 (C310)	65.0	73.7	
	Cessna 401 (C401)	67.0	74.0	
	Cessna 414 (C414)	67.0	73.0	
	Skyhawk (C172)	63.0	62.0	
	Skylane (C182)	69.0	56.0	
	Skymaster (C336)	70.0	72.0	
	Mooney	Mark 10 (MO10)	68.0	62.0
		Mark 20 (MO20)	65.0	62.0
	Piper	Aztec (PA27)	68.0	64.0
Cherokee (PA28)		60.0	61.0	
Arrow (PARO)		63.0	62.0	
Cherokee Six (PA32)		61.0	64.0	
Cub (PA2)		51.0	59.7	
Seminole (PA44)		62.0	71.0	
Seneca (PASE)		64.0	73.0	
Tomahawk (PA38)		56.0	60.0	
Tripacer/Colt (PA22)		52.0	61.2	
Navajo (PA31)		62.8	72.8	
Chiefton (PA31-350)		70.0	74.0	

The noise levels presented in the circular are associated with the aircraft certification process and are NOT INTENDED TO BE USED BY AIRPORT OPERATORS to make arbitrary assessments of which aircraft are and are not suitable for access to the airport. Individual site-specific studies of airport noise are performed under the authority of Federal Aviation Regulations (FAR) Part 150 and are most often federally funded. Within these studies, Noise Exposure Maps (NEMs) are developed, illustrating the most noise-impacted areas surrounding the airport. A more detailed description of the Part 150 process is provided in **“Appendix 1: Final Policy on Part 150 Approval of Noise Mitigation Measures: Effect on the Use of Federal Grants for Noise Mitigation Projects,”** (p. 22).



# Federal Aviation Regulations

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## Part 150 Airport Noise Compatibility Planning

In Appendix A of FAR Part 150, land use compatibility with various sound levels is presented in table format. For example, residential land use is considered only compatible with noise levels under 65 Ldn. Commercial land uses, such as bus transfer stations and retail spaces, can be compatible with higher noise levels between 70-75 Ldn. The loudest noise areas at 85 Ldn and above are only compatible with land uses such as mining and forestry. In short, without an accurate and site-specific noise study, including an NEM, the airport will find itself trying to cure an “unidentified disease” with possibly the “wrong medicine.”

**TABLE 1**  
**LAND USE COMPATIBILITY\* WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS**

<i>Land Use</i>	<i>Yearly Day-Night Average Sound Level (L<sub>dn</sub>) in Decibels</i>					
	<i>Below 65</i>	<i>65-70</i>	<i>70-75</i>	<i>75-80</i>	<i>80-85</i>	<i>Over 85</i>
<i>Residential</i>						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
<i>Public Use</i>						
Schools	Y	N1)1	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
<i>Commercial Use</i>						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
<i>Manufacturing And Production</i>						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
<i>Recreational</i>						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

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

**KEY TO TABLE 1**

SLUCM	Standard Land Use Coding Manual.
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land used and related structures generally compatible; measures to achieve NLR or 25, 30, or 35 dB must be incorporated into design and construction of structure.

Without the aid of a federally funded noise compatibility study, many airports must rely on the use of the land use planning tools (see “Part 2: Airport Compatible Land Use”) and, most importantly, the support of airport users.

## **Airport Noise: We Can Make a Difference**

Through a concerted effort, and by demonstrating your sensitivity to the concerns expressed by the community as it relates to airport noise, your relationship with those affected by airport noise can be significantly improved. We must be willing to VOLUNTARILY take the steps necessary to be thoughtful to our fellow community members. Should voluntary efforts not be considered important to the airport, you may find your airport facing local legislation to fix the problem, and this solution isn't always in the best interest of the airport or its users.

Several noise control strategies can be used from an operational standpoint. They include designated ground runup areas, the use of preferential runways when applicable, use of maps displaying noise-sensitive areas, specific pattern procedures and altitudes, and maximum safe climb on takeoff. More specifically, the following ideas might be applied voluntarily to improve the noise impact at your local airport once you know where the noise-sensitive areas are located:

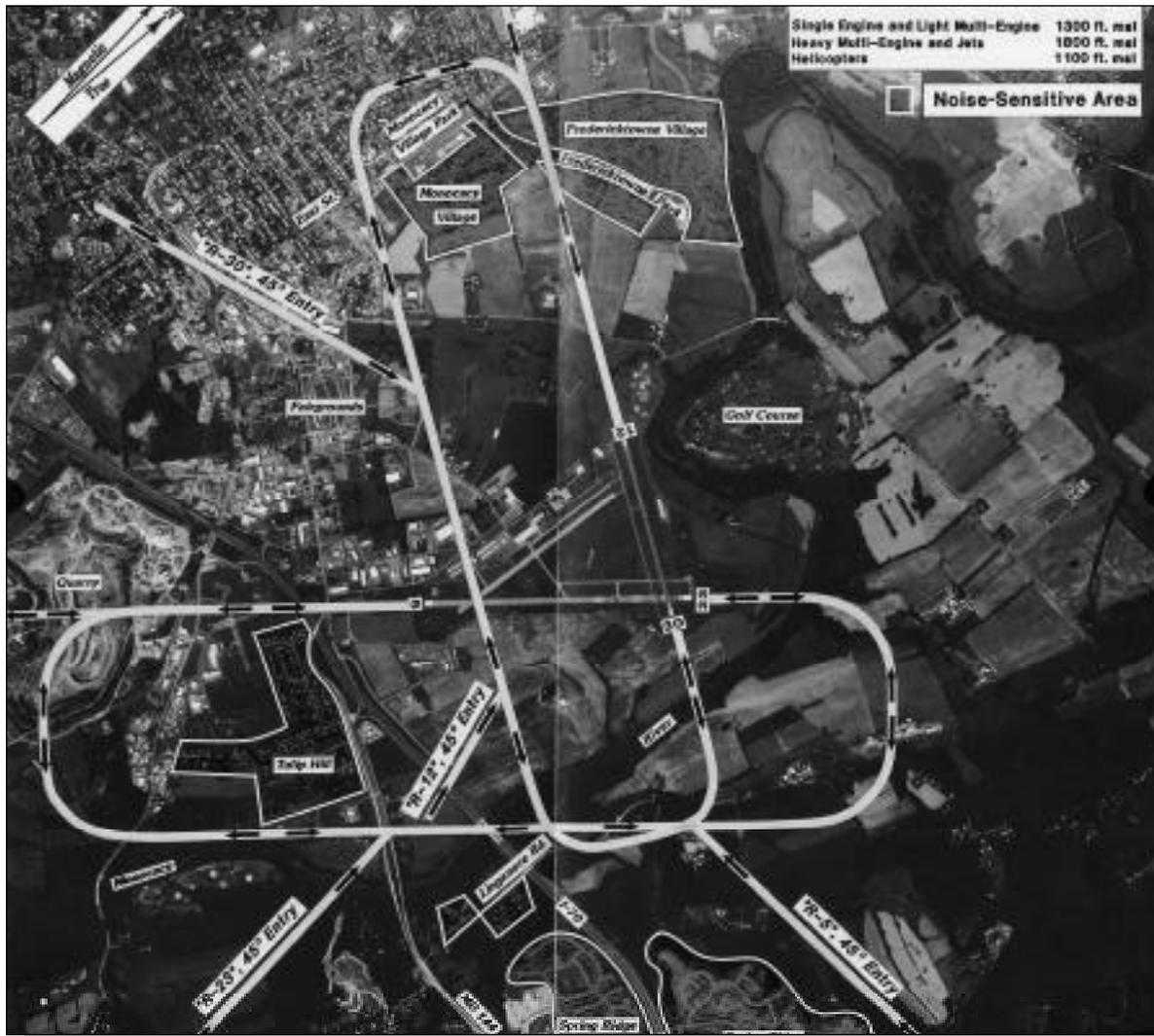
- Decide to undertake a noise-control planning effort.
- Use basic noise-control planning that should sequentially identify the noise problem.
- Address funding issues.
- Set up a working team composed of airport management, airport users, and representatives of the community concerned about the noise.

Subsequent steps could include defining the role of the team members and the scope of the planning effort, considering noise control opportunities, evaluating possible mitigation measures, creating a final plan, and, of course, adopting and implementing it.

## **What Can We Do?**

As Pilots—

- ✪ Be aware of noise-sensitive areas, particularly residential areas near airports you use, and avoid low flight over these areas.
- ✪ Educate yourself on any voluntary noise arrival and departure procedures that have been developed at the airport; this could include specific traffic patterns and altitudes. These procedures are normally created in coordination with local pilots to safely minimize noise impacts to the surrounding communities.
- ✪ In constant-speed-propeller aircraft, do not use high rpm settings in the pattern. Prop noise from high-performance singles and twins increases drastically at high rpm settings.
- ✪ On takeoff, reduce to climb power as soon as safe and practical.
- ✪ Climb after liftoff at best-angle-of-climb speed until crossing the airport boundary, then climb at best rate.
- ✪ Depart from the start of the runway, rather than intersections, for the highest possible altitude when leaving the airport vicinity.
- ✪ Climb out straight ahead to 1,000 feet or so (unless that path crosses a noise-sensitive area). Turns rob an aircraft of climb ability.
- ✪ Avoid prolonged runups, and if possible, do them inside the airport area, rather than at its perimeter.
- ✪ Try low-power approaches, and always avoid the low, dragged-in approach.
- ✪ If you want to practice night landings, stay away from residential airports. Do your practice at major fields where a smaller airplane's sound is less obtrusive.



Courtesy of City of Frederick, MD

As Flight Instructors—

- ✈ Teach noise abatement procedures to all students, including pilots you take up for a biennial flight review. Treat noise abatement as you would any other element of instruction.
- ✈ Know noise-sensitive areas, and point them out as you come and go with students.
- ✈ Make sure that your students fly at or above the recommended pattern altitude.
- ✈ Practice maneuvers over unpopulated areas and vary your practice areas so that the same locale is not constantly subjected to aircraft operations.
- ✈ During practice of ground-reference maneuvers, be particularly aware of houses, schools, or any other noise-sensitive areas in your flight path.
- ✈ Stress that high-rpm prop settings are reserved for takeoff and for short final but not for flying the pattern. Pushing the prop to high rpm results in significantly higher levels of noise.
- ✈ If your field is noise sensitive, endorse your students' logbooks for landing at a more remote field, if available within a 25-nm range, to reduce touch-and-go activity at your airport.

### As Fixed-Base Operators—

- ✦ Identify noise-sensitive areas near your airport, and work with your instructors and customers to create voluntary noise abatement procedures.
- ✦ Post any noise abatement procedures in a prominently visible area, and remind pilots who rent your aircraft or fly from your airport of the importance of adhering to them.
- ✦ Mail copies of noise abatement procedures with monthly hangar and tiedown bills. Make copies available on counter space for transient pilots.
- ✦ Assure your instructors are teaching safe noise abatement techniques.
- ✦ Call for use of the least noise-sensitive runway whenever wind conditions permit.
- ✦ Try to minimize night touch-and-go training at your airport if it is in a residential area. Encourage the use of nonresidential airports for this type of training operation.
- ✦ Initiate pilot education programs to teach and explain the rationale for noise abatement procedures and positive community relations.

### For the Surrounding Community—

- ✦ Send a copy of the noise abatement procedure established for your airport, along with a brief explanation of its purpose, to the local newspaper. Let the public know PILOTS ARE CONCERNED.
- ✦ Ensure the pattern, approach, and departure paths are designated on official ZONING AND PLANNING MAPS so real estate activity is conducted in full awareness of such areas.
- ✦ Lobby for land use zoning and building codes in these areas that are compatible with airport activity and will protect neighboring residents.
- ✦ Stress, publicize, and communicate the value of the airport to the community and how its operation adds to the safety, economy, and overall worth of the area.
- ✦ Sponsor “airport days” at the airport to involve nonfliers with the business and fun of aviation and possibly attract potential new pilots.
- ✦ Encourage beautification projects at the airport. Trees and bushes around the runup and departure areas have proven effective in absorbing ground noise from airplanes.

## **FAA Noise Policies**

The FAA’s mission is the development and maintenance of a safe, efficient, and environmentally compatible air transportation system. Since 1968 with an amendment to the Federal Aviation Act of 1958, the FAA has been authorized to develop both noise regulations and standards; aircraft noise issues have been a major factor in the success of FAA’s mission. Under the legislation, the FAA had to respond to Congress and industry in three basic areas:

1. Control of noise at the source - the aircraft itself.
2. Control of air traffic into and out of airports.
3. Technical and financial assistance to airport sponsors for airport noise and compatible land use planning.

The success of any airport noise program is contingent upon a cooperative working relationship among the airport sponsor, local government, users of the airport, and the adjacent community. Without this vital relationship, the airport noise problem remains just that - a problem.

To this end, the FAA has developed guidelines and regulations to foster this cooperative effort while establishing a systematic policy addressing the issue of controlling noise. A few of the major FAA regulations and advisory circulars include the following documents:

- 1A. Federal Aviation Regulations Part 150, "Airport Noise Compatibility Planning." Established in 1983, this FAR implements Title I of the Airport Safety and Noise Abatement Act (ASNA) of 1979 by establishing regulations for airport operators who elect to develop an airport noise compatibility plan.

**AVIATION SAFETY AND NOISE ABATEMENT ACT OF 1979**

**Public Law 96-193; 94 Stat. 50; 49 U.S.C. App. 2101 et seq.**

**AN ACT** To provide assistance to airport operators to prepare and carry out noise compatibility programs, to provide assistance to assure continued safety in aviation, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Aviation Safety and Noise Abatement Act of 1979".*

**AIRPORT NOISE AND CAPACITY ACT OF 1990 <sup>1</sup>**

**SEC. 9301. SHORT TITLE.**  
This subtitle may be cited as the "Airport Noise and Capacity Act of 1990". [49 U.S.C. App. 2151 note]

**SEC. 9302. FINDINGS.**  
The Congress finds that—

- (1) aviation noise management is crucial to the continued increase in airport capacity;
- (2) community noise concerns have led to uncoordinated and inconsistent restrictions on aviation which could impede the national air transportation system;
- (3) a noise policy must be implemented at the national level;
- (4) local interest in aviation noise management shall be considered in determining the national interest;
- (5) community concerns can be alleviated through the use of new technology aircraft, combined with the use of revenues, including those available from passenger facility charges, for noise management;
- (6) federally controlled revenues can help resolve noise problems and carry with them a responsibility to the national airport system;

- 1B. In FY 1992, the FAA began administering new FAR Part 161, which was issued in 1991. Part 161 implements provisions of the Airport Noise and Capacity Act of 1990 (ANCA) by establishing a national program for reviewing airport noise and access restrictions on Stage 2 and Stage 3 aircraft operations. Part 161 also advises airport operators on how ANCA and Part 161 apply to the airport noise compatibility planning process conducted under FAR Part 150.

2. Advisory Circular 150/5020-1, "Noise Control and Compatibility Planning For Airports" (1983).
3. Advisory Circular 36-1G, "Noise Levels for U.S. Certification and Foreign Aircraft" (1997).
4. Advisory Circular 36-3G, "Estimated Airplane Noise Levels in A-Weighted Decibels" (1996).
5. Advisory Circular 36-4B, "Noise Certification Handbook" (1988).
6. Advisory Circular 91-36C, "Visual Flight Rules (VFR) Near Noise-Sensitive Areas" (1984).
7. FAR Part 36 - specifies maximum noise levels for turbojet aircraft during approach, takeoff and along the runway sideline.
8. Advisory Circular 91-53A, "Noise Abatement Departure Profiles" (1993).
9. Federal Aviation Administration - Southern Region, "Land Use Compatibility and Airports," September 1999. (<http://www.faa.gov/arp/app600/5054a/landuse.htm>).

The objectives of each of the above documents are to reduce and prevent noncompatible land uses around airports, establish standardized methods of measuring aircraft noise, and provide specific guidelines to evaluate land use compatibility.