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THE CONTROL OF AIRPORT NOISE IN THE UNITED STATES: AN OVERVIEW

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INTRODUCTION

Airport noise and its potential impact upon neighboring communities is a recognized environmental problem in the United States. There are several factors that contribute to this potential problem. The first involves aircraft and airports since the number of airports, aircraft and their operations continue to grow in absolute terms, oftentimes requiring the physical expansion of facilities and more off-peak hour operations. Secondly are the adjacent communities which also are developing, with an increasing trend to convert residential land to higher densities for multi-family housing.

The result is frequently conflict. Although the extent and magnitude of the problem is unclear, noise does impact the quality of life and economic welfare of the community. Similarly, the growth of the airport activity oftentimes has been limited resulting in aircraft operational restrictions at differing sized airports in many geographical settings.

Purpose

The purpose of this study is to assess methods for controlling aircraft noise in airport communities rather than to emphasize litigation as a basis of resolution. This analysis includes examining the various control strategies possible within the airport boundaries as well as off-airport controls that are feasible. Such analysis is based on examining noise related solutions being applied at airports within the U.S.

Methodology

Although the purpose of this study is to be comprehensive as possible, it was not feasible to review all airport communities, but rather examine a cross-section. Several sources of information were utilized for this purpose, including federal, state, local resources as well as the author's data base.

The compilation of airport related controls were prepared for selected counties and cities. Such controls dealt with three primary categories: aircraft restrictions, aircraft operations, and land use. There were 141 municipalities and twenty-seven counties evaluated.

Findings

Specific airport related controls were categorized according to aircraft restrictions, aircraft operations, and land use.

A. Aircraft Restriction

Aircraft restrictions address controls directly applicable to the aircraft. These controls can, in most instances, reduce significantly or eliminate the noise as a source.

1. Run-up Noise. Controls for run-up noise involve on-ground aircraft operations. Such run-up noise activity may be associated with ground maintenance and repair of aircraft. Run-up noise restrictions instituted by an airport or political jurisdiction may deal with: restrictions in the geographic area where run-up operations may occur, the time of occurrence, the duration of run-up events, aircraft type permitted, and/or the permissible noise emission level.

2. Flyover Noise. This category deals with the actual noise levels that a political jurisdiction may impose upon aircraft. Such a level can be applicable to a single event, individual flyover, or alternatively, may apply to an aggregate number of aircraft over time. Typically this involves a peak noise level applicable to any individual aircraft operating beyond the airport boundaries, usually as part of a takeoff or landing procedure.

3. Aircraft Type. This restriction may apply to the type of aircraft that is permitted to operate at any given airport. The criteria for restriction can vary from the aircraft weight (eg. gross weight), engine type (eg. propeller-reciprocating, jet engine), type of airplane (eg. fixed wing prop or jet assisted, rotary wing), use of aircraft (eg. certified air carrier, business, military), or manufacturer/model (eg. Gulfstream II, Citation, etc.).

4. Time of Day. Aircraft restrictions may apply to the time in which aircraft are permitted to operate these time of day restrictions referred to as curfews. A curfew or time use restriction typically limits the hours in which an airport may permit flight operations to occur. Such curfews can be applied to a class or number of aircraft permitted to operate in a given time period. In the most restrictive situation the political jurisdiction may eliminate any aircraft activity between certain operational hours.

B. Aircraft Operations

Noise control approaches in this category deal with the manner in which aircraft are permitted to operate. They are generally useful as a method to reduce rather than eliminate a noise source.

1. Glide Slope. The glide slope refers to the angle of the aircraft along a path as it comes in to land. For noise abatement purposes the steeper the angle of the glide slope, the less noise generated in potentially noise sensitive areas. The steepness of the glide slope is limited by operation safety, which is paramount. Oftentimes a two segment approach is used, with the final glide slope being 3°.

2. Flight Track. The flight track is the projection onto the ground plane of the three dimensional flight path of aircraft. There is a flight track for both approach and departure activities. For noise abatement purposes, the flight track can be useful in positioning the aircraft in space relative to ground or land uses.

3. Preferential Runways. Depending upon the size of the airport, and its airport runway configuration, certain runways may be situated in a more noise sensitive area than others. A potential method for minimizing noise impact is to utilize a particular runway for takeoff and/or landing purposes that will generate the lowest noise level over populated land areas of operation. Such a runway may be preferred because the flight track takes the aircraft over water or a mountainous unpopulated area, etc. Due to aircraft activity and climatic conditions, among other factors, a preferential runway system may not be feasible.

4. Flight Altitude. Flight altitude is an important factor in airport sound propagation and the impact on airport communities. Political jurisdictions have dealt with the issue in some situations by establishing a minimum flyover altitude permitted for certain, or all, categories of aircraft. Frequently, these altitude restrictions are applied to nighttime hours of operation.

5. Reduced Thrust. There are several operational procedures on departure for aircraft, which consist of three distinct phases or segments. The first segment is initiation of takeoff roll with high thrust and small-to-moderate flap settings, initial climbout and gear retraction. The second segment, depending upon takeoff procedure, the aircraft will retract flaps or cleanup and reduce or cut back the thrust to a specified setting.

C. Land Use

Land use controls are those which may apply to the off-airport community for noise abatement purposes. Even though this deals with land and its management, land should be considered as three dimensional (airspace, ground space, subterranean space).

1. Comprehensive Plan. The comprehensive plan, sometimes referred to as the general or master plan, usually is an official public document adopted by a municipality. This plan is a policy guide to decisions about physical development, consequently it is concerned with land use management practices.

2. Zoning. To be effective, the comprehensive plan must be implemented. The urban planner has available a variety of techniques to accomplish this objective, of which zoning is the most popular. Zoning is a legal technique that regulates various aspects of land use development.

3. Building Code. A building code prescribes the minimum standards for the construction of structures. This code, legally adopted by the local governing body, is designed to guarantee the health and safety and welfare of the community. The building code, for example, can require that all residential structures constructed within the areas impacted by aircraft noise be insulated to meet a certain sound transmission class (STC).

4. Site Design. It is important that potentially noise impacted sites be sensitively designed. This requires that a review procedure be established through a public agency whereby the environmental factors, among others, be properly considered and integrated into the plan.

5. Environmental Impact Review. The review of possible environmental impacts can be a direct part of the site design process. In many instances such a review process is an extension of site design, but goes much farther. This process is frequently modeled after the National Environmental Policy Act (NEPA).

6. Real Estate Sales Disclosure. It is becoming increasingly common for people to consider environmental land use impact questions when they are negotiating the sale or lease of property. In some cases such information is made available by a real estate firm as part of a property profile.

REFERENCES

1. Clifford R. Bragdon, Municipal Noise Legislation, Atlanta: Fairmont Press, 1980.

2. Clifford R. Bragdon, "Airport Noise Abatement in the U.S.", American Society of Civil Engineers, May 26, 1982.

3. Patricia Cline, Airport Noise Control Strategies, FAA, May, 1983.

10. EMISSION: NOISE SOURCES

11. Noise-generating devices (including components & subassemblies)
12. Stationary noise sources (noise generation and control)
13. Moving noise sources (noise generation and control)
14. Specialized industrial machinery and equipment