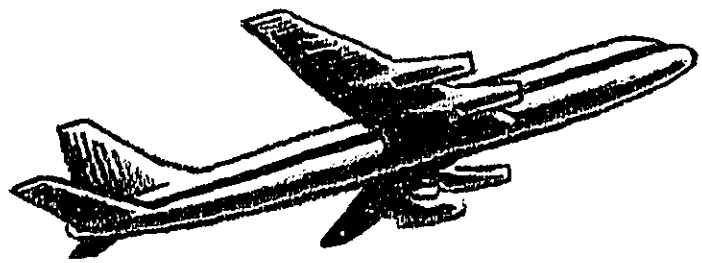
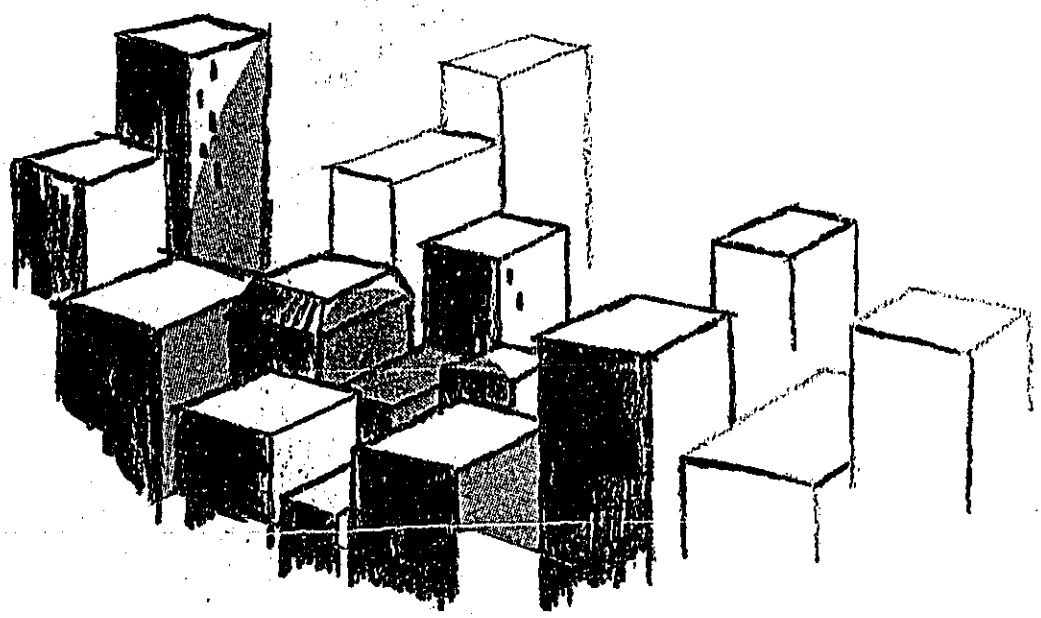
ENVIRONMENTAL PLANNING PAPER



AIRPORT ENVIRONS: LAND USE CONTROLS



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
OFFICE OF METROPOLITAN PLANNING AND DEVELOPMENT
OFFICE OF PLANNING ASSISTANCE AND STANDARDS

Environmental Planning Paper

AIRPORT ENVIRONS: LAND USE CONTROLS

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DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D. C. 20410

ASSISTANT SECRETARY FOR
METROPOLITAN PLANNING AND DEVELOPMENT

May 1970

Dear Public Official:

The impact of jet aircraft noise has been a growing problem during the past decade and will continue to be with us during the foreseeable future. Nowhere has the problem been felt more acutely than in our cities and metropolitan areas, and it is therefore fitting that the Department of Housing and Urban Development play a leading role in seeking solutions to this problem. In national and international deliberations, HUD has sought to bring the tools of land use planning and land use control to bear on achieving solutions to conflicts between airports and other land uses, to defining appropriate kinds of airport locations within the metropolitan framework, and to protecting both the airports and nearby residences from encroachment by each other. I am very pleased, therefore, to make this paper available for use by States and municipalities across the Nation in evaluating and solving their own airport problems.

With the publication of this document, we are inaugurating a new series of Environmental Planning Papers. This series will cover a variety of environmental problems and proposals and will, we hope, contribute meaningfully to the improvement of the quality of life for all of our citizens. President Nixon and Secretary Romney have expressed great concern about environmental quality, and we shall continue to seek a variety of means both to prevent its degradation and to provide a positive enhancement of living conditions for the center cities, the metropolitan areas, and the Nation as a whole.

Samuel C. Jackson

INTRODUCTION

This Environmental Planning Paper on "Land Use Controls" results from efforts undertaken in the fall of 1969 to develop a U. S. position on the subject for a Special Meeting of the International Civil Aviation Organization (ICAO) on "Aircraft Noise in the Vicinity of Aerodromes," held in Montreal, Canada, from November 25 through December 16, 1969. The ICAO conference agenda included six interrelated items: 1) description and measurement of aircraft noise; 2) human tolerance to aircraft noise in the vicinity of aerodromes; 3) noise certification; 4) criteria for establishment of aircraft noise abatement operating procedures; 5) land use controls; and 6) ground run-up noise abatement procedures.

The U. S. positions on the above Agenda items were prepared by Working Groups of the Interagency Group on International Aviation, Ad Hoc Group on Noise, chaired by the Department of Transportation. The Working Group on Land Use Controls consisted of representatives from the Department of Housing and Urban Development, the Department of Transportation, and the Department of Health, Education and Welfare; industry was represented by the Air Transport Association and the Airport Operators Council International.

The Working Group was chaired by James F. Miller, Chief of the Transportation, Environmental and Urban Design Branch in HUD's Office of Metropolitan Planning and Development. The U. S. delegation to the ICAO meeting included a principal spokesman for each agenda item, as well as resource persons on each of the topics. Richard H. Broun,

Acting Director of the Environmental Planning Division in HUD, was the principal spokesman on land use controls.

In terms of land use planning and controls, the ICAO meeting reached the following general conclusions:

- Land use planning and control could contribute materially to solving the aircraft noise problem, although it is recognized that existing airports provide limited opportunities in this area.

- There are a variety of approaches to defining noise zones around airports, some involving very few zones and some involving a considerable number, all of which are related to the noise sensitivities of specific kinds of land uses. The meeting agreed that a minimum of three such zones should be established for land use planning purposes. This position is identical with current U.S. practice in this area.

- Detailed information regarding land use compatibility was presented by several Nations, and it was agreed that ICAO should publish guidance material on this subject.

- The possibility of assigning maximum noise levels to noise zones was discussed, but it was decided that there were too many local and national variations to permit standardizing these levels on an international basis. However, it was agreed that ICAO should publish the ranges of noise levels being considered by various Nations for such use.

- A variety of methods for controlling land use (zoning, easements, purchase) were discussed, but it was concluded that there were too many national variations in land use administration and control to hope to reach any standard approach.

It is clear that there is no one single solution to the variety of aircraft noise problems facing the Nation and its urban communities. The goal of a quieter airport and community can be achieved only through a coordinated effort: by reducing noise at the source through quieter engines, by revising aircraft operational procedures to lessen the noise impact and avoid populated areas, and by developing a program of land use planning and controls to achieve compatibility between the airport and its neighbors.

This Environmental Planning Paper points out some of the problems, methods, and prospects for achieving the goals of a quieter environment.

LAND USE CONTROLS

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LAND USE CONTROLS

1. THE PROBLEM

1.1. The Airport Environment

Nearly two-thirds of the total United States population now live in Standard Metropolitan Statistical Areas (SMSA's).* From 1960 to 1968 the population of 212 areas defined as SMSA's in 1960 grew by 15.6 million persons, an increase of 14 percent during this period as compared to a growth rate of six percent for the non-metropolitan population. Furthermore, since 1960 almost all of the metropolitan population growth has taken place outside of the central cities, and a majority of metropolitan residents now live in suburban areas. To accommodate this large population influx into the Nation's metropolitan areas, vast land areas are required for residential and associated land uses. In addition to absorbing the largest share of the Nation's population growth, the SMSA's also contain about one-fourth of all local government units in the Nation.

Concurrent with population growth and an increasingly significant shift of population into metropolitan areas is an ever-increasing demand for air transportation in these same metropolitan areas. In 1968, the U. S. air lines transported 131 million domestic passengers. A recent study made by the Air Transport Association

*The concept of an SMSA is that it is an integrated economic and social unit with a recognized large population nucleus. The U. S. Bureau of the Budget population criterion for an SMSA is that it has a central city, or central cities of 50,000 or more, plus functionally related adjacent areas.

of America forecasts 635 million domestic passengers in 1985, an increase of more than 480 percent. In the United States, 70 percent of all air passengers are enplaned at airports within 21 large Air Transportation Hubs. The metropolitan areas in which the 21 Hubs are located had approximately 67 million persons in 1965 and accounted for over one-half of the total metropolitan population in the Nation. A study of the individual airports in the 21 major Hub areas shows that all are to some degree surrounded by incompatible land uses, and prospects are that the continued competition for land will increase conflicts between the airports and their neighbors.

It is against a backdrop of increasing population growth, increasing airport operations and activity, and the multi-jurisdictional nature of the noise exposure problem, that solutions for compatible development between the airport and its neighbors must be found.

1.2. The Need for a Comprehensive Planning Context

Airport planning must be recognized as an integral part of an areawide comprehensive planning program. The location, size and configuration of the airport need to be coordinated with patterns of residential and other major land uses in the area as well as with other transportation facilities and public services. Within the comprehensive planning framework, airport planning, policies and programs are coordinated with the objectives, policies and programs for the area in which the airport is located. The social

and economic impact, together with the environmental effects of airport development and operations, can then be evaluated in order to guide development to make the airport environs compatible with airport operations and, conversely, physical development and use of airports compatible with existing and proposed patterns of land use. To the extent there is a choice, decisions on runway alignment, and airport expansion and volume and type of use are as essential to ameliorating and preventing environmental conflicts as are the control and guidance of surrounding development to render it more compatible with the airport.

"Land use controls" is a term which describes only a portion of the total planning process, and even highly innovative controls can have little impact unless they are imposed within the context of sound policies and careful planning. "Planning for compatible land use/airport relationships" more adequately describes the process directed toward achieving an optimum relationship between an airport and its environs.

The compatible land use approach must also be related to noise alleviation made possible through engine modifications, aircraft certification, and revised operational procedures. None of these noise alleviation approaches should be regarded as a first resort, after which the others might be explored if still necessary. All relevant avenues must be considered and applied to the problem in a coordinated fashion. Further, land use controls must be understood to apply also to the airport itself, in terms of both maximum

acreage and intensity of use, so that the airport is compatible with the area in which it is located and that airport changes and operations do not continually expose new areas to noise.

1.3. Conflicting Development Pressures

The applicability of conventional land use controls and planning concepts must be considered in light of an aircraft noise situation that has become more critical over time. The impaction of urban airports by surrounding development is proceeding simultaneously with the expansion of runways and terminal facilities and with a tremendous surge in the level of air traffic. The conflicting pressures for both the further expansion of our transportation system and for urban and metropolitan growth in the United States are so strong that a tendency towards further impaction of airport environs is almost inevitable. The increased exposure of sensitive activities to unacceptable noise levels, however, is not inevitable if some combination of source, flight, and land use actions is pursued to minimize the exposed area or reduce its sensitivity.

Rapid metropolitan growth, rising land acquisition costs, and increasing amounts of acreage now required are eliminating site selection options for new airports that were available just a few years ago. Therefore, the use of innovative approaches to land use controls and development, as well as the proper application of existing controls, is urgently needed.

A satisfactory compromise between conflicting development pressures cannot be reached if airport needs are considered separately from the needs of the noise-affected communities for other equally important activities, some of which are highly noise sensitive. All of these uses are competing with metropolitan airport systems for an increasingly scarce commodity--developable urban land. Thus, the costs and benefits of airport development must be weighed against those associated with the neighboring uses that may be incompatible with airport operations.

1.4. Preventive and Remedial Strategies for Aircraft Noise Abatement

Any consideration of land use planning and controls as a noise abatement measure must take into account (1) the necessity of solving the very serious noise problem in communities that already exist around many airports, and (2) the necessity of preventing the same situation from developing around other airports. Thus, the planning process should take into account the substantially different levels of opportunities for achieving land use compatibility near existing airports in built-up areas, as distinct from those in areas not yet developed. Efforts, therefore, should be directed to developing and implementing both preventive and remedial programs to achieve land use compatibility. A preventive measures program should enable the governmental units to act expeditiously to keep appropriate areas surrounding existing and proposed airports free from incompatible uses in the immediate, as well as the long-range future and should be given highest priority. There is a particularly urgent need

for preventive measures around the many urban airports becoming impacted by development, and information should be disseminated to localities and the public on the potential extent of the aircraft noise problem and the need for comprehensive planning and action.

In a remedial situation, resources and controls should be applied first to those areas most severely affected by unacceptable noise levels from individual aircraft. The clear zone concept might very well be applied to these areas of very severe noise exposure. The large scale conversion of non-compatible land uses to ameliorate aircraft noise problems will require a long time and large expenditures. The extent of remedial situations in some airport areas is so great that to significantly reduce the severely exposed areas will require the major application of noise reduction measures at the source, that is, through engine modifications and through changed operating procedures.

1.5. The Question of Abatement Costs

The extent to which a community is affected by aircraft noise varies from airport-to-airport, depending upon such factors as runway orientation, size of airport, type of aircraft using the airport, frequency of operations, proximity of other airports, etc. What is generally misunderstood is the scale of the noise-affected area. It is not uncommon for communities eight miles away from the airport to experience some effects.

That choices among specific noise abatement measures will be difficult stems from the rigors of quantifying the social and economic costs of aircraft noise. The costs and benefits of the measures intended to alleviate it are also elusive. Much of this problem is due to lack of knowledge about the most appropriate ways of measuring noise and human response. The means for evaluating human response to aircraft noise is being considered under ICAO Agenda Item 2. The establishment of limits of acceptability to perceived noise under various conditions will assist in determining the choices and benefits of different land use strategies. Although "acceptable" noise levels for people and activities need considerable research and refinement, it is clear that a great many persons are now being exposed to unacceptable levels. Cost determination problems and less than perfect measurement techniques are no justification for the postponement of major steps that can be taken in the direction of noise abatement. Research and action must proceed hand in hand.

The trade-offs between "on-the-ground" and "in-the-air" solutions, or mix of solutions to aircraft noise alleviation will require a cost-benefit analysis. The alternatives must be considered on the basis of such factors as severity of noise, scale and density of exposed areas, and mode of relief. Major consideration should also be given to the scope of the alternatives; that is, whether they benefit a single airport or the entire airport system. For example, land use controls around an airport would benefit the single area while source noise reduction would benefit all airports used by the aircraft.

2. EXISTING APPROACHES TO COMPATIBLE LAND USE DEVELOPMENT

There are many techniques for regulating development or bringing about conversion or modification of existing land uses to achieve greater compatibility between the airport and its environs. Some of these may be controls, such as zoning or building and housing codes; other methods influence development through acquisition or the taxing power. This section is intended to provide only a general discussion of the most common approaches in the United States. A detailed study should be made of the full-range of land use approaches currently being used with documentation of the successes and failures in their application.

2.1. Characteristics of Land Development Decisions in the United States

Decisions regarding land development involving land use controls are characterized by the fact that they are made at the local level and are individual in character. Local actions are often made on the basis of narrow considerations which may ignore many important areawide or metropolitan goals. The most common local issues are the return that the owner or developer wants to obtain on his property, the local government's interest in increasing the tax base, and the interests of the residents in maintaining or improving the value of their homes. Generally, these decisions reflect the desire to maintain the community in its present physical form and to avoid radical changes and risk-taking in fostering new kinds of development. For the airport environs, as well as for the total metropolitan development pattern, the cumulative total of such local decisions can seriously degrade a sound comprehensive planning approach and development policy.

2.2. Zoning

The State of Minnesota has taken a bold step by recently enacting a law that will place authority for zoning around the proposed Minneapolis-St. Paul jetport in the hands of an areawide agency, the Metropolitan Council. The noise contours extending outward from the airport will in effect delineate areas affected by different ranges of noise exposure. No use will be permitted in an area subjected to levels of noise higher than considered acceptable for that use. The Metropolitan Council is to develop land use criteria and guidelines for the use and development of an "airport development area" around new airport sites. Local zoning and land use controls must be consistent with these criteria and guidelines, and the Council has the authority to make such amendments to insure consistency.

Such an approach may overcome the problem of multi-jurisdictional interests in the airport environs which has prevented effective zoning in many places in the United States. What the Minnesota approach amounts to is, of course, the transfer of zoning powers to some higher governmental level such as an areawide planning agency or the state, with the designated public agency exercising the authority to ensure compatibility between airports and their neighbors.

Local jurisdictions with zoning power (usually cities, towns and sometimes counties in the United States) have rarely taken effective zoning action needed to alleviate this problem through

zoning because a given airport often affects several jurisdictions, and the coordination of zoning is difficult. Moreover, zoning has proven extremely vulnerable to development pressures and local politics. Another problem is that the interests of the affected communities are not always consistent with the needs and interests of the airport operator, as well as with each other. Within each community there is usually a desire for a larger tax base, population growth, and rising land values, and these goals are often in conflict with the need to preserve the airport environs for "non-sensitive" activities.

The need for zoning based on the noise sensitivity of various land uses and activities is frequently self-evident in close proximity to the airport, although such zoning farther away might require the development of more sophisticated guidelines on this subject than are presently available. A complication is the vast difference between activities that fall into the same zoning category and the varying noise sensitivity that would result, not from the activity itself, but from the construction characteristics of the building that houses it.

Zoning is not retroactive and does not affect pre-existing uses that will be adversely affected by airport operations. Through the zoning process, nonconforming uses may be removed; however, this requires a long time during which the uses are amortized, and it is unlikely that such zoning provisions would have much impact on development patterns on a large scale. For this reason

zoning is most effective at airports that are not yet impacted by buildings. Also, uses proposed for vacant land normally have some relation to the market demand for such activities and zoning for compatible uses, such as commerce or industry, may be considered an impermissible expropriation if there is no established need for these functions: however, experience indicates that most airports create exactly that type of demand.

2.3. Building Codes and Soundproofing

For new construction, it is technically possible to build near airports with satisfactory interior noise levels and often this is practicable for activities carried on entirely indoors. Determining factors are whether the airport location values equal or exceed insulation costs, or whether other suitable building sites in the general area do not exist or are extremely scarce or expensive. Among types of structures which may be feasible to locate near airports are commercial office and industrial buildings and hotels.

Criteria for permissible interior noise levels need to be developed and translated into specific performance standards for the amount of acoustical insulation which will be required in different noise zones for various categories of buildings. Incorporation of such standards into building codes, and the knowledge that they will be enforced, would offer important protection to the public and give developers a basis for estimating the cost differentials of building at various distances and directions from airport operations. As with zoning, practical application of soundproofing standards

in building codes would presuppose the existence of reliable noise contours and assurance that the noise will not exceed the levels assumed in establishing soundproofing requirements.

Except in very unusual circumstances, structures such as housing, schools and hospitals should not be built in present or prospective high noise areas even if adequate insulation from outside noise is economically feasible. Residences free from high noise is needed for children's play and other outdoor family activities.

Ex post facto insulation of homes adversely affected by aircraft and other forms of noise is simply not sufficient protection for the average citizen. Too many individuals and families can unknowingly buy and rent in noise exposed areas and only later learn of the expense they must undergo to take ameliorative action. It is much more desirable to control insulation requirements for such buildings, if they must indeed be constructed in such areas, from the outset. While there will be difficulties in getting sound insulation requirements incorporated in building codes for new construction; these are slight compared with the problems of effective soundproofing for existing buildings, particularly housing. Dwellings in these areas often are of light construction which would be very expensive to soundproof. Research and controlled prototype soundproofing are not far enough advanced to give a basis for confident prediction, but even if houses in high noise areas are of masonry construction, insulation and air-conditioning may cost more than the value of the additional rents or sales prices which could be obtained.

2.4. Negotiated Acquisition, Eminent Domain, and Redevelopment

If airport environs zoning is not feasible for either legal or political reasons, then the airport authority (or some other jurisdiction such as an areawide planning agency or the state airports commission) will have to rely on the purchase of noise-affected properties to a much greater extent. As in the case of zoning, acquisition of land prior to its development is obviously preferable to postponing action until a remedial situation exists. Most airport authorities already have eminent domain powers and the practice of purchasing easements is well established.

The use of the eminent domain power to acquire development rights over land within noise exposed areas around an airport would be enormously costly and would be beyond the fiscal resources of practically all airport operators, as well as most local governments. If, however, airport authorities or other designated public agencies were sufficiently funded, they could use eminent domain power to acquire development rights over land within the noise exposed areas around the airport. The purchase of easements may often prove to be a satisfactory noise abatement strategy and would be less expensive than outright acquisition.

Where extensive reuse of land is required, an extension of the urban renewal program authority and funds for this purpose would be worth exploring. This technique raises many questions, however. Substantial additional funding would be required, and problems of relocation and neighborhood disruption would have to be handled in terms of benefits to the whole area.

3. INNOVATIVE CONCEPTS FOR COMPATIBLE LAND USE DEVELOPMENT

The following discussion presents some examples of innovative concepts that could assist development of compatible land uses near airports. Other techniques will continue to be required until the problem is solved.

3.1. Joint Airport-Environs Development

A joint airport-environs development approach merits attention and evaluation to determine its applicability for developing the airport environs. The joint airport-environs development concept is based on the fact that separation between the noise generated components of an airport and adjacent land uses frequently requires enormous amounts of land which is difficult to keep in a state of non-development often due to the economic growth pressures generated by the airport itself. It would, therefore, be desirable to commit the surrounding land to a more intensive form of development which is compatible with and could be developed jointly with the airport. This would then permit capitalizing on the growth generated by the airport and recovering, through increased land values and the development of income producing properties, some of the cost of developing the airport proper. There is some precedent for this revolving fund provision and for the joint development concept in the United States, which is presently being pursued in a somewhat different form for freeways and related development by both the Department of Housing and Urban Development and the Department of Transportation.

The Minnesota legislation, cited in Section 2.1., has an element of tax sharing which could reduce competition for development fostered by the airport. This provision provides that, upon the agreement of 80 percent of the governmental units having territory in the airport development area, these units can share property tax revenues generated from growth of the area.

3.2. Noise Encroachment Zones

Since one of the major problems in controlling land uses around airports is the fragmentation of zoning powers among many individual municipalities, it would be desirable to develop an overriding mechanism, probably administered by the state government, which could be applied on top of or in addition to local zoning. A precedent for such action may be found in the flood encroachment zones which have been established by some states and which provide for the delineation of encroachment lines on either side of a streambed. Within these lines, structures may be prohibited and other conditions attached for the use and development of the properties. Using this principle, it might be possible for states to delineate noise encroachment zones within which it would be similarly illegal to construct or develop incompatible uses. This might be restricted to only certain uses or might preclude any urbanization of the area.

3.3. Building Code Noise Attenuation Districts

Insulation requirements should be part of the local building codes, without which the building permits cannot be issued. This becomes

an even more powerful tool when it is linked to an occupancy permit and an appropriate housing code. One of the problems with noise insulation requirements is that they are not appropriate or required in many portions of the city and would simply operate to inflate the costs of housing, which is already too high in many areas. However, it is equally obvious that homes and other noise sensitive uses will continue to be built in noise affected areas simply because of the demand for residential building sites in convenient locations. This being the case, it would be desirable to develop selective noise attenuation districts within which insulation would be required as a condition of issuing the building permit. The local municipality can delineate such districts around airports, railroad yards, expressways, and other such noise generators in a manner similar to the delineation of fire prevention districts, which is now practiced in most larger municipalities.

4. A COMPREHENSIVE PLANNING APPROACH

4.1. The Planning Environment

The inter-jurisdictional and metropolitan-wide nature of the airport influence requires that planning for both the airport and its impact be metropolitan in scale. Comprehensive planning is taking place in each of the metropolitan areas in the United States, fostered at the Federal level by a combination of financial assistance for comprehensive planning and requirements for the approval of certain grants. A U. S. Bureau of the Budget

Circular No. A-95, developed to implement provisions of the Intergovernmental Cooperation Act of 1968, requires that all Federal aid for development purposes be consistent with and further the objectives of State, regional, and local planning. The Circular incorporates previous Government-wide planning requirements: one of these requires that applications for Federal assistance for a wide variety of public facility projects in metropolitan areas be submitted for review and comment by the areawide comprehensive planning agency regarding the relationship of the proposed project to the planned development for the area. Projects for airport planning and construction aided under the Federal Aid to Airports Program (FAAP) are subject to this review process.

While the planning requirements and criteria have given additional impetus to areawide and metropolitan planning, such processes have also been assisted by the Department of Housing and Urban Development under Section 701 of the Housing Act of 1954. Since 1966, additional emphasis has been given to areawide airport systems planning which places the areawide aviation requirements within the context of the proper provisions for all land uses, access, other modes of transportation, and public facilities for the total area in which all airports serving the area are located. Within the State of California, for example, three major studies are under consideration. The Southern California Association of Governments is developing a study of the airport systems requirements for a ten county area around Los Angeles. In northern

California, a similar study is proposed for the counties around San Francisco. State-wide airport needs are also being considered in a state initiated study.

Airport systems planning activities more recently have included consideration of the impact of the airport on the surrounding communities. In planning for the impact of the Dallas-Ft. Worth Regional Airport, for example, the North Central Texas Council of Governments has taken a long range view and is considering the full spectrum of opportunities and impact problems posed by the airport development. An airport environs study in that area, partly funded by the Department of Housing and Urban Development, will prepare impact projections, translating this data into local government estimates for the anticipated supply and demand for services and activities. The study will consider the question of land use compatibility, building insulation, and local controls in addition to the facility and service requirements of potential development that is expected to be generated by the airport.

4.2. Elements of a Comprehensive Planning Approach

Formulation of a land use policy for the development or redevelopment of noise exposed areas for uses which are compatible with the projected noise levels is essential to an areawide noise abatement program. Acceptable land use strategies for a given airport situation must be derived from a total noise abatement policy and based on established noise abatement goals. The policy must weigh the political and economic feasibility of

trade-offs among major alternatives such as noise source reduction, operating procedures, and airport relocation.

Research and development efforts on methods of reducing noise at the source and modifying flight paths and operating procedures to bring about further reductions should proceed simultaneously with similar investigation of airport-community land use strategies. It is expected that significant achievements in source reduction and aircraft operating procedures that can be made as a practical matter will not eliminate the noise impact completely in most major airport areas. The residual areas will have to be dealt with through the insulation of structures, land use conversion, land use controls, and land acquisition. The land use strategy, or combination of strategies to be used must be based on a comprehensive planning approach and consider both the requirements of the airport and of the neighboring communities. Such planning requires the close collaboration among planning agencies, public officials and the airport operator and will, presumably, lead to an agreement on the effective size of the airport as well as the use of adjacent properties.

An essential element of the planning for the airport environs is the definition of the noise exposure in the airport vicinity through the development of Noise Exposure Forecasts, or other acceptable measures. In order to assess the benefits of "in-the-air" solutions at study airports, the projected Noise Exposure Forecasts should provide for tradeoff analyses whereby

the relative effectiveness of changes in aircraft engines and operating procedures can be computed through the examination of land use and related data. The tradeoff contours should reflect changes that have technical and economic practicality within the planning period.

A characterization of the area surrounding the airport through a survey of land use and related data will provide the basis for an assessment of the noise impact and possible land-based solutions. There are four major steps in this process.

4.2.1. Determine existing and expected noise exposure problems

Within existing and projected Noise Exposure Forecast areas, it is necessary to examine land use and related data to determine: a) total number and use of properties within the noise exposed zones together with the noise sensitivity of the various land uses; b) number and major structural characteristics of buildings exposed; c) number and characteristics of people exposed; and d) market value of residential and other noise sensitive properties. The inventory should identify those specific land uses which will be most adversely affected by noise and those which can be modified or otherwise changed to make them more compatible with the expected noise levels. Particular attention needs to be given to special noise sensitive activities such as schools and hospitals. Within the

residential areas, information on the distribution of housing types, quality and type of construction, value of structures is essential for estimating costs of alternative land use strategies. Structures may be modified and insulated against noise, and the cost of this alternative requires data on type of construction, condition and the number of openings.

Population data are also essential to an evaluation of the aircraft noise problem. In addition to knowing the distribution of population within the noise exposure areas, it is also well to know any specific population components which may be more adversely affected than others. An analysis of the rates of housing occupancy turnover and of changes in values should be determined in areas exposed to noise and compared with those in similar but unexposed locations in the region. Minority and other specific group concentrations in the exposed area should be identified, along with their rates of growth in the area in reference to growth and occupancy in the remainder of the metropolitan area.

4.2.2. Review actions that have reduced or intensified the community aircraft noise problem

The identification of major development actions by the airport operator and community that have affected the noise exposure problem is intended to isolate causes

which may be remedied to ameliorate the situation. Attempts to control development in noise exposed areas should be evaluated to determine the successes and failures of these approaches. An analysis of complaints as recorded by the airport operator and local officials can often define noise problems in greater detail than the Noise Exposure Forecasts, which are a composite incorporating many factors. Complaint reports can often reflect local conditions that noise contours cannot anticipate. Complaint profiles, however, are subject to many sources of bias, and whether a person complains may be a function of the intensity of the annoyance or such other factors as knowledge of the responsible agency or a feeling that the complaint will result in action. Despite this unreliability, complaint records are helpful in pinpointing the specific kinds of aircraft operations and procedures which cause the greatest annoyance.

4.2.3. Identify land use related strategies for compatible development and redevelopment

The range of land use alternatives that may be appropriate for a given airport location needs to be identified and the costs estimated for each. Among these are: a) the preservation or provision of open space, b) zoning and other land use controls, c) redevelopment, d) insulating existing buildings, e) insulating new buildings, and f) purchase of noise easements. The impact that each of

these measures would have on the growth, development and operation of the airport must be determined. Legal review of enabling legislation and court decisions affecting such local regulatory measures should be investigated, as should the authority of the airport operator to alleviate, ignore, or otherwise affect the impact of noise in the neighboring communities.

4.2.4. Assess relative usefulness and cost of alternative land use related strategies

Each of the land use alternatives available should be assessed to determine its feasibility for attaining and preserving compatible land use development. Based on long-term analyses and projections of economic trends, space requirements, and land use for the metropolitan area, estimates can be obtained of anticipated non-residential development in the noise exposed areas and the potential for the location of additional compatible use in the Noise Exposure Forecast areas, considering the effects of diverting such development from other locations. Such analyses should also consider the impact of the reuse of land in the affected area on the region and the communities in the immediate environs with specific attention given to: a) economic impact as it relates to employment patterns and tax base, b) social impact, including relocation problems, c) effects of land conversion on existing and proposed community land use

patterns and the provision of public facilities, and d) compatibility with local planning proposals in these locations.

The foregoing process should lead to land based recommendations to reduce airport-community noise conflicts. Land based solutions, however, will need to be considered in relation to other possible options for reducing the total noise exposed area through engine modification and operating procedure changes. The land use strategy should include: a) estimate of cost: b) funding sources; c) timetable and phasing of the program. In addition, attention should be given to modifying and initiating appropriate codes and ordinances and to the potential use of state and Federal programs to implement the airport environs policy plan.

Under the auspices of the Land Use/Airports Panel of the U. S. Interagency Aircraft Noise Abatement Program, the Department of Housing and Urban Development and the Department of Transportation are jointly providing four grants for Metropolitan Aircraft Noise Abatement Policy Studies designed to develop recommendations for short and long term relief from aircraft noise in specific airport areas. Individual studies will be conducted by the Tri-State Transportation Commission concerning the John F. Kennedy International Airport in New York City;

the Northeastern Illinois Planning Commission for O'Hare International Airport in Chicago; the Capital Region Planning Agency regarding the Bradley International Airport in Hartford, Connecticut; and the East Central Florida Planning Council concerning the Cape Kennedy Regional Airport in Melbourne, Florida. The four areas were chosen to reflect a cross section of airport situations. It is anticipated that the results of the studies will form the basis for general approaches which could be used to guide land development in many aircraft noise situations.

4.3. Alternative Land Use Strategies

Land use related strategies for aircraft noise abatement involve the control of future uses of land around the airport, alteration of current incompatible uses, and the acoustical treatment of structures to reduce annoyance and interference to the occupants where this is feasible. The objectives of the land use program should be: a) to prevent any increase in residential population or other noise sensitive uses within areas severely affected by aircraft noise, and b) to relocate sensitive uses or to provide acoustic insulation and associated structural treatment to protect people from noise.

In summary, the management of land uses in these noise exposed areas, whether through the control of existing vacant land or the

redevelopment of currently non-compatible uses, will require a comprehensive approach which involves planning, political processes, funding of programs, use of zoning and other legal/ administrative instruments. The decision to implement any noise abatement strategy, whether it be through operational procedures, quieter engines, or through land use change and management, will involve a balancing of interests between those who would prefer unrestricted expansion of airport operations and maximum engine efficiency, and those who would prefer no deterioration in the quality of the urban environment. The management of an adequate aircraft noise abatement program must balance these goals and develop a plan which can be mutually accepted by the various parties.

5. AREAS REQUIRING FURTHER STUDY

Progress has been made toward both the definition of noise exposed areas and the development of complementary approaches to alleviate the community noise problem through operating procedures and engine modifications. There are, however, many unanswered questions and areas requiring further research, particularly in the area of compatible land use planning and controls. The benefits from noise reduction through the modification of the aircraft engine and through the changing of flight paths in profile can be assessed through the areal impact reduction as delineated by Noise Exposure Forecasts. In seeking compatibility with the airport environs through land use controls, building insulation, and redevelopment of non-compatible uses, three major areas need additional attention to determine the impact of aircraft noise:

5.1. The Effect of Noise on Property Values

It has been often stated that values are increasing in the airport environs. But are they rising faster, at the same rate, or slower than similar properties in unexposed locations? The other factors, such as location and access, that affect property values need to be isolated so that the impact of the noise can be determined. The investigation should measure the change over a considerable period, at least since the introduction of jet aircraft at the airport under study.

5.2. Compatibility of Land Uses with Varying Levels of Aircraft Noise

Some land uses, such as residences and hospitals, are known to be incompatible with the high levels of aircraft noise. On the other hand, many uses, because of the high internal noise levels, are compatible with much higher external noise. In between are a wide range of uses which may be located in areas of varying noise levels; these need more explicit definition in relation to alternative Noise Exposure Forecast contours. Attachment A provides a tentative classification of land uses by noise sensitivity, and has been developed to assist planning agencies in conducting the Metropolitan Aircraft Noise Abatement Policy Studies (MANAPS). This system of noise sensitivity classification does not take into account the possible modification of structures to reduce interior noise. Although specific ranges of acceptable noise levels have not yet been assigned to the sensitivity ratings, the tables may prove useful as a guideline and as an initial effort.

5.3. Human Response

Are adverse reactions of people to aircraft noise based solely on subjective dislike of the noise rather than demonstrable damage or impairment (psychological as well as physical) resulting from extreme noise conditions? There have been studies of the effects of noise (particularly industrial) on work task performance, but attention needs to be given to the broader issue of the effects of noise on humans. As an example, some standards for residential property have been based on occupational (hearing-loss) levels. It must be recognized that these levels are based on 8-hour exposures and on some risk taking--for which wages are paid and for which compensation is available. Residential standards would be based on quite a different perspective--one which is designed not only to preserve hearing and a healthful environment but also to enhance everyday activities, including speech and sleep, and to minimize annoyance from intrusive sounds.

6. SUMMARY

The comprehensive planning process for compatible land use and airport development is directed toward achieving an optimum relationship between an airport and its environs. As such planning for compatible land use in the airport environs and planning for the airport itself should be integral parts of an areawide comprehensive planning program whereby airport policies and programs are coordinated with objectives, policies and programs for the area in which the airport is located.

The compatible land use approach must be related to noise alleviation made possible through engine modification, aircraft certification, and revised operational procedures. None of these noise alleviation approaches should be regarded as a first resort, after which the others might be explored if still necessary. All relevant avenues must be considered and applied to the problem in a coordinated fashion. Research and development efforts on methods of reducing noise at the source and modifying flight paths and operating procedures to bring about further reductions should proceed simultaneously with similar investigations of airport-community land use strategies.

The conflicting pressures for both the further expansion of the air transportation system and for urban and metropolitan growth in the United States are so strong that further impaction of airport environs is almost inevitable. Therefore, the use of innovative approaches to land use planning and controls for development, as well as the proper application of existing controls, is urgently needed. Land use controls must apply also to the airport itself, in terms of maximum acreage and intensity of use, so that the airport is compatible with the area in which it is located and so that changes in the character of the airport and its operations do not continually expose new areas to noise. The costs and benefits of airport development must be weighed against those associated with perhaps incompatible neighboring uses. Further, the costs and benefits of "on-the-ground" and "in-the-air" solutions must be assessed to develop a total program to reduce aircraft noise impact.

Land use strategies should take into account the substantially different levels of opportunities for achieving land use compatibility near existing airports in built-up areas as distinct from those in areas not yet developed. A preventive measures program should enable the governmental jurisdictions to act expeditiously to keep appropriate areas surrounding existing and proposed airports free from incompatible uses in the immediate, as well as the long-range future, and should be given highest priority. In remedial situations, noise reduction strategies can be prohibitively expensive. In such locations, resources and controls have to be applied first to those areas most severely affected by noise levels.

Local actions are often made on the basis of narrow considerations which may ignore many important areawide or metropolitan goals. The fragmented nature of private and public decision-making in the United States that affect an airport and its surroundings has implications for land use controls. Most forms of land use control are more effective at airports that are not yet impacted by buildings. The need for zoning based on the noise sensitivity of various land uses and activities is frequently self-evident near the airport, although such zoning farther away might require the development of more sophisticated guidelines on this subject than are presently available.

The management of land uses in noise exposed areas, whether through the control of existing vacant land or the redevelopment of currently non-compatible uses, will require a comprehensive approach which involves planning, political processes, funding of programs, zoning and other

legal/administrative instruments. The decision to implement any noise abatement strategy, whether it be through operational procedures, quieter engines, or through land use change and management, will involve a balancing of interests between those who would prefer unrestricted expansion of airport operations and maximum engine efficiency, and those who would prefer no deterioration in the quality of the urban environment. An aircraft noise alleviation program must balance these goals and develop strategies which can be accepted and implemented by the various interests.

ATTACHMENT A

Metropolitan Aircraft Noise Abatement Policy Studies

LAND USE - AIRCRAFT NOISE COMPATIBILITY CLASSIFICATION

Noise Code	SLUCM* Code	Category
	1	RESIDENTIAL
1[1/]	11x[2/]	Single family
1	11x	2-4 family
2	11x	Multi-family apartments
2	12	Group quarters
2	13	Residential hotels
1	14	Mobile home parks or courts
2	15	Transient lodgings
2	19	Other residential, NEC [3/]
	2	INDUSTRIAL/MANUFACTURING
4	21	Food and kindred products
5	22	Textile mill products
4	23	Apparel
5	24	Lumber and wood products
4	25	Furniture and fixtures
5	26	Paper and allied products
5	27	Printing, publishing and allied products
5	28	Chemicals and allied products
5	29	Petroleum refining and related industries
	3	INDUSTRIAL/MANUFACTURING
5	31	Rubber and miscellaneous plastic goods
5	32	Stone, clay and glass
5	33	Primary metals
5	34	Fabricated metals
3	35	Professional, scientific and controlling instruments
4	39	Miscellaneous manufacturing, NEC

*Standard Land Use Coding Manual, Urban Renewal Administration, Housing and Home Finance Agency and Bureau of Public Roads. Department of Commerce, First Edition, January 1965. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, fifty cents. (Appropriate codes indicated where possible.)

Noise Code	SLUCM* Code	Category
	4	TRANSPORTATION, COMMUNICATIONS AND UTILITIES
5	41	Railroad, rapid rail transit
5	42	Motor vehicle transportation
5	43	Aircraft transportation
5	44	Marine craft transportation
5	45	Highway and street right-of-way
5	46	Automobile parking
3	47	Communication
5	48	Utilities
4	49	Other transp., communications & utilities, NEC
	o[4/]	COMMERCIAL/RETAIL TRADE
5	51	Wholesale trade
5	52	Building materials retail
3	53	General merchandise retail
3	54	Food retail
4	55	Automotive retail
3	56	Apparel and accessories retail
3	57	Furniture, home furnishing retail
3	58	Eating and drinking places
3	59	Other retail, NEC
	o	PERSONAL AND BUSINESS SERVICES
3	61	Finance, insurance and real estate
3	62	Personal services
3	63	Business services
4	64x	Auto repair services
3	65	Professional services[5/]
4	66	Contract construction services
3	o	Indoor recreation services
4	69	Other services, NEC
	o	PUBLIC AND QUASI-PUBLIC SERVICES
2	67	Governmental services
1	68	Educational services
1	711	Cultural activities
1	651	Medical and other health services
4	624	Cemeteries
2	69x	Nonprofit organization, incl. churches
2	o	Other public and quasi-public services, NEC

Noise Code	SLUCM* code	Category
	o	OUTDOOR RECREATION
3	761x	Playgrounds and neighborhood parks
3	762x	Community and regional parks
3	712	Nature exhibits
4	722	Sports assembly
4	741x	Golf courses, riding stables
4	743,744	Water based recreation areas
3	75	Resorts and group camps
2	721	Entertainment assembly
3	o	Other outdoor recreation, NEC
	o	AGRICULTURE, MINING AND OPEN LAND
5	81,NEC	Farms, except livestock[6/]
4	815-817	Livestock farms
5	82	Agricultural related activities
5	83	Forestry activities
5	84	Fishery activities
5	85	Mining activities
5	91	Undeveloped land
5	93	Water areas

FOOTNOTES:

1/ Noise Code 1 contains the most noise sensitive land uses; Noise Code 5 the least sensitive. Noise classification does not reflect use modifications, such as building insulation, which may permit establishment of use in zone of higher noise levels.

2/ "x" after SLUCM number means it represents a category broader or narrower than, but generally inclusive of, the category described.

3/ NEC - Not elsewhere classified.

4/ "o" denotes no closely comparable grouping or category in SLUCM code.

5/ Ordinarily medical services would be subsumed under this heading, but noise sensitivity considerations led to a separate listing.

6/ This split of SLUCM's "Agriculture" (81) stems from the noise sensitivity of livestock.

(The Noise Codes for some of the land uses in the Commercial/Retail Trade, Personal and Business Services, Public and Quasi-Public Services, and Outdoor Recreation categories have been modified subsequent to initial development as a Working Paper for the International Civil Aviation Organization Conference.)

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