To the Graduate Council:

I am submitting herewith a thesis written by Edward J. Williams entitled "A Case Study of the Orlando International Airport, Airport Noise Control-Land Use Compatability Planning Process." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science in Planning.

George E. Bowen, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

A CASE STUDY OF THE ORLANDO INTERNATIONAL AIRPORT, AIRPORT NOISE CONTROL-LAND USE COMPATABILITY PLANNING PROCESS

A Thesis

Presented for the

Master of Science in Planning

Degree

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ABSTRACT

Aircraft and airport related noise are the most pervasive of the environmental effects of airports and the most difficult to resolve. Airport related noise is one of the primary factors in determining the compatibility of land use in the airport environs. The Airport Noise Control and Land Use Compatibility (ANCLUC) planning program was developed to address the noise and land use compatibility problems that result from airport operations.

The development of the ANCLUC planning program and the definition of the airport noise problem is reviewed in Chapter I. Chapter II examines the noise problem experienced at Orlando International Airport and the establishment of an ANCLUC planning program to address that problem.

The major components of the ANCLUC program in theory and as executed at Orlando International Airport are examined in Chapters III through VII with an emphasis on identifying the strengths and weaknesses of the programs. Chapter VIII discusses recommended improvements to the process.

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CHAPTER I

INTRODUCTION AND HISTORY OF AIRPORT COMPATIBILITY PLANNING

Airport Noise as a Problem

Aircraft noise is a significant annoyance to six to seven million Americans who reside on approximately nine hundred thousand acres of land exposed to levels of aircraft noise that create a significant annoyance (above a Noise Exposure Forecast value of 30). Of this number, approximately six hundred thousand reside within areas that are severely impacted by aircraft noise; that is, areas in excess of N.E.F. 40.[1]

The reaction of people to noise differs widely. It is difficult to derive a simple mathematical formula that accurately represents human reaction to noise annoyance. It remains uncertain whether people, in reacting to aircraft noise, are more annoyed by the number of aircraft noise events, the noise levels of individual events, or psychological fears of aircraft accidents which they associate with the aircraft noise.

Noise is the most pervasive of the environmental effects of airports and the most difficult to solve. "Aircraft noise is a problem for which there is not yet and may never be a single solution of

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[1] Federal Aviation Administration, Aviation Noise Abatement Policy, U.S. Department of Transportation, November, 1976, p. 17.

demonstrated feasibility."[2] Airport related noise is considered a problem when it adversely affects the normal activities of adjacent residents and development. Airport noise is one of the primary factors in determining the compatibility of land use in the airport environs.

Incompatible development as used in this thesis was residential use, schools, churches, hospitals, and places of assembly that could be adversely affected by noise impacts or that would result in catastrophic loss of life in the event of an accident . That is not to say that certain types of commercial, industrial, and other uses are always compatible but generally they can be made compatible. Exception to this has been noted throughout the study.

At the time of this study, the problem of incompatible development in areas surrounding airports had become a matter of increasing public concern. The causes of the problem were many and interrelated, including:

1. The introduction of jet powered aircraft and the development of other high performance aircraft has resulted in increased noise levels covering greater amounts of land use.
2. The dramatic increase in the use of aircraft as a mode of transportation. Over the past two decades the air transportation industry has maintained a growth rate substantially higher than the rest of the economy.
3. The United States has experienced immense population growth and population shifts which have required additional housing. The availability of improved land near airports with access roads and utilities already in place has attracted developers to these areas.

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[2]Michael Meshenberg, Planning the Airport Environment, PAS Report No. 231 (Chicago: American Society of Planning Officials, 1968), p. 5.

4. Communities are becoming more aware and vocal about the noise and safety problems and are applying pressure on public officials and airport administrators to do something about it.[3]

The public usually associates airport encroachment and noise with large air carrier airports but the problem exists for small general aviation airports as well, and it could possibly get worse. The sheer number of general aviation airports, approximately fourteen thousand, presents a much greater potential for incompatible land use development than all the existing air carrier airports combined in terms of land area affected.[4]

Aircraft noise disturbs normal activities of airport neighbors, their conversation, sleep and relaxation, and degrades their quality of life. Depending on the use of land contiguous to the airport, noise may affect education, health services, and other public activities. Aircraft noise can cause subtle social and psychological harm and, in some cases, direct danger to physical health, though not to the vast majority of people exposed.

In response to these health considerations, community reaction to aircraft noise has been increasingly expressed in the courtroom where homeowners have received awards for nuisance and inverse condemnation.[5]

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[3]G. Eatman and B. Martin, Methods of Compatible Land Use Planning for Airports (Raleigh, N.C.: North Carolina State University, May 1977), pp. 1-3.

[4]Federal Aviation Administration, Airport Capacity Criteria Used in Preparing the National Airport Plan, U.S. Department of Transportation FAA-AC:150/5060-1A, July 1968.

[5]Charles Haar, Land Use Planning: A Casebook of the Use, Misuse, and Re-Use of Urban Land, 3d ed. (Boston: Little, Brown and Co., 1976).

During the period 1970 to 1975, airport proprietors paid over twenty-five million dollars in legal judgments or settlements in noise related suits and spent over three million dollars in legal fees, expert testimony, and similar defense efforts.[6]

Partially as a reaction to such claim suits, some airport proprietors acquired substantial residential areas near their boundaries. The largest such program was undertaken by the Los Angeles International Airport. Los Angeles International spent over one hundred and thirty million dollars to purchase private residences and planned to spend an additional twenty-one million dollars on soundproofing schools and other public buildings near the airport.[7] The problem of airport noise and its effects on surrounding land use is real, significant, and of increasing magnitude.

Development of Airport-Land Use Compatibility Planning

The aviation and planning professions have attempted to develop a comprehensive airport-land use compatibility planning process that can address the safety, noise, and land use problems associated with airport facilities. The development of airport compatibility planning has proceeded in phases that correspond to the changing nature and magnitude of the compatibility problems.

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[6] FAA, Aviation Noise Abatement Policy, p. 18.

[7] Federal Aviation Administration, FAA Policy on Facility Relocations Occasioned by Airport Improvement or Changes, U.S. Department of Transportation, FAA-AC: 150/5300-7B, 1972.

Pre-1950

Early attempts at ensuring land use compatibility around airports were rather simple. The airport operator would go out beyond the developed urbanized area to be served by the proposed airport and would purchase sufficient land for runways and associated facilities. In some instances, extra land for future expansion was also acquired. Inevitably, as soon as the airport began operations, growth and development, including residential development, would begin to surround the airport. Such development is considered incompatible due to its sensitivity to the noise and safety impacts associated with airport operations. The extent and proximity of residential uses and the number and timing of airport flights defines the magnitude of the compatibility problem. Additional attempts at compatibility planning during this period were limited to protecting airspace approaches through height regulations and other regulations to prohibit uses that might interfere with navigation or pilot visibility.

1950-1960

During the early 1950s, the Doolittle Commission Report[8] added a new and important dimension to airport-land use compatibility planning--that of protecting airport neighbors from the potential danger of airport crashes by establishing clear zones off the end of runways. The zones were to be cleared extensions at each end of a runway that would be a one-half mile in length and one thousand feet in width on

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[8]U.S., President's Airport Commission, The Airport and Its Neighbors (Washington, D.C.: Government Printing Office, 1952), p. 25.

either side of the runway center. Clear zones have become an integral part of airports and were a major step in restricting residential development or other obstructions from an identified area near airports.

1960-1970

During the decade of the 1960s, new responsibility for airport noise and land use compatibility planning were defined in large measure by statutory and case law. The principal responsibility was assigned to the Federal Aviation Administration (FAA) under the Federal Aviation Act of 1958,[9] as amended. The FAA used its constitutional and statutory powers to preempt the areas of airspace use and management, air traffic control, and aviation safety.[10]

Throughout the 1960s, Congress broadened the authority of the FAA to regulate aircraft for the purpose of noise abatement. The additional authority was granted in direct response to increasing public concern about airport related noise and the constraints such concern posed for the continuing development of the air transport system.

The basic authority for federal regulation of aircraft noise is Section 611 of the Federal Aviation Act.[11] The FAA acted promptly in implementing Section 611. On November 18, 1969, it promulgated the first aircraft noise regulation, Federal Aviation Administration

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[9] 49 U.S.C. 143.

[10] 14 C.F.R. Parts 21-43, 61-67, 71, 73, 75, 91, 93, 95, 97, 121-149.

[12] 49 U.S.C. 143.

Regulation, Part 36,[12] which set limits on noise emissions of large aircraft of new design. The preamble of Part 36 announced the basic policy on source noise reduction and a logically phased strategy for bringing it about. Part 36 standards would be the basic standards for aircraft engine noise and were initially applicable to new types of aircraft. As soon as the technology was demonstrated, the standard was to extend to all newly manufactured aircraft of already certificated types. Ultimately, when the technology was available, the standard would extend to aircraft already manufactured and operating (retrofit). The third step would require modification or replacement of all aircraft in the fleet which did not meet Part 36 noise levels. At the time of this writing, the first two steps had been completed; the third step was in progress.

1970-1982

Despite previous efforts at airport noise and land use compatibility planning, it was apparent that an increasing number of people were living in areas exposed to aircraft noise. A large percentage of that group was living in the vicinity of an airport and was severely impacted by aircraft noise. The FAA finally concluded that a more comprehensive approach than mere promulgation of new regulations was necessary. Several FAA reports indicated that further reductions in aircraft and airport related noise impacts could only be achieved through the joint efforts of aircraft proprietors, aircraft users,

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[12]Federal Aviation Regulation, Part 36, 14 C.F.R. 36 (1969).

aircraft manufacturers, local government and the affected citizens.[13] The result of the FAA's new resolve was the Airport Noise Control-Land Use Compatibility (ANCLUC) pilot program.

The ANCLUC program was announced in the jointly issued Department of Transportation and Federal Aviation Administration Aviation Noise Abatement Policy (ANAP).[14] The intent of the policy was to reduce significantly the adverse effects and impacts of aviation noise and to achieve a substantial degree of noise compatibility between airports and their environs. Recognizing the magnitude and complexity of the task, the federal noise policy identified:

> the legal and proper responsibility of the airport proprietor, air carriers, aircraft operators, aeronautical manufacturers, state and local governments and the private citizen. The ANAP emphasized that the full benefit of an ANCLUC plan would be realized only if the proper actions and responsibilities are taken by all participants.[15]

The Airport Noise Control-Land Use Compatibility Program

The ANCLUC program was to be an innovative, state-of-the-art planning process that sought to achieve an acceptable balance between the needs and tolerances of the airport and its neighbors. The ANCLUC program emphasized a sound planning process that should result in both a physical plan to guide development and a realistic and feasible implementation program.[16]

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[13] FAA, Aviation Noise Abatement Policy, pp. 1-3.

[14] Ibid., pp. 1-10.

[15] Ibid., pp. 1-3.

[16] Federal Aviation Administration, Airport Noise Control and Land Use Compatability, FAA Order, U.S. Department of Transportation, September 1977, p. 3.

The physical plan would describe the location of the airport's noise, fully reflecting the agreed upon noise control actions and the basic land use and development pattern that would be compatible with the airport's impacts, while reflecting the community's planning, goals, and needs. The physical plan was envisioned as being a detailed part of the local comprehensive plan.

The implementation program was to be a detailed course of action which would execute and accomplish the plan. Strategies were available to reduce and control airport noise, prevent the creation of new incompatibilities, and resolve existing incompatibilities. A typical program would include an implementation schedule, the proposed financing scheme and draft documents and ordinances for adoption by the appropriate government or agencies with responsibility for accomplishing each of the various parts of the plan.

The ANCLUC planning process contained the typical elements found in most planning processes. The overall ANCLUC program and the local ANCLUC plans contained stated goals and objectives to guide the process. The planning process was based on a common methodology that relied on sound methods that were consistent with existing standards of technology and expertise. The ANCLUC planning process relied heavily on citizen participation in all phases of the plan and implementation formulation. Other major elements of the ANCLUC program were the alternatives analysis, plan adoption, and implementation--elements necessary to successfully complete most planning processes.

Purpose of the Thesis

The ANCLUC program was recognized by the planning profession, aviation interests and citizen groups as the state of the art in airport noise-land use compatibility planning as a result of its innovative approach of joining aircraft operational planning with land use planning. The program was respected for its comprehensive approach to a multifaceted and extremely complex problem. A measure of its success was that it was completed quickly and successfully at over twenty airports across the country.

The planning process the ANCLUC program was basically a sound planning process with the necessary ingredients to encourage success. It attempted to be coordinated and comprehensive by involving all relevant parties in a planning process that encompassed the examination of the noise impact created by the operation of the airport, the analysis of alternative noise impact reduction techniques and land use compatibility measures, and the recommendations of a plan of action.

The ANCLUC program had the financial resources, technical expertise and citizen interest and involvement that are necessary for success. The range of alternatives and mitigating measures available to reduce the noise problem and ensure land use compatibility were so extensive that results were anticipated. The program had commitments from the range of participants with the necessary authority and obligation to facilitate implementation of the agreed upon noise abatement plan.

Despite being considered the state-of-the-art approach to airport-land use compatibility planning, the conclusion of a joint Federal Aviation Administration, Environmental Protection Agency, and Department of Transportation evaluation was that the OIA ANCLUC was a failure.[17] The overwhelming consensus of the agencies, professionals, and citizens involved in the program was that it was a failure. The detailed how and why of the failure will be discussed in each section of the thesis; however, some of the major failures of the program include the following:

1. The ANCLUC program at OIA did not allow for the continuous and rapid development of the airport in a manner compatible with the surrounding development as anticipated by the Greater Orlando Aviation Authority.[18]

2. The ANCLUC program did not result in the development of short and long term operational alternatives that the airline industry could agree to[19] or that would solve the noise problem of the residents.[20]

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[17]Federal Aviation Administration, Airport Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 91-193, Secretary of Transportation Report to the United States Congress, October 1981.

[18]Interview with John Wycoff, Executive Director, Greater Orlando Aviation Authority, July 1981.

[19]Interview with Walt Ferrari, ANCLUC Representative, Airline Transport Association, July 1981.

[20]Interview with Sonny Poff, President, Residents Opposed to Airport Roar (ROAR), July 1981.

3. The ANCLUC program did not result in the development of an effective land use control strategy to preclude incompatible development or solve the existing compatibility problems.[21]

4. The ANCLUC program failed to develop understanding and cooperation with the adjacent residents or encourage meaningful public participation.[22]

The purpose of this thesis was to identify and analyze the major factors that resulted in the failure of the ANCLUC program at Orlando International Airport. The institutional, procedural, and methodological problems that led to, caused, or contributed to the failure were investigated and analyzed in order to assist planners in other communities avoid the same failure, to offer alternatives to the OIA ANCLUC to correct identified deficiencies, and to recommend changes to the overall ANCLUC program.

This thesis is a descriptive case study that replicated the relevant features of the ANCLUC study. As in all case studies, the emphasis is on the major factors that had significant impacts and not on the myriad of details.

Statement of the Problem

The airport noise-land use compatibility planning process is a continually evolving process that attempts to address a very real and growing problem. The ANCLUC program was the state-of-the-art program

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[21] Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, July 1981.

[22] Ibid.

that incorporated innovative techniques and methods in a sound comprehensive planning process. It was recognized by airport and land use planners as the best program available to address airport noise-land use compatibility problems. However at the Orlando International Airport the program did not achieve the anticipated results. With all of the necessary techniques and resources to encourage success, the program was a failure.

When a major planning program such as this fails, it is important to understand the reasons for that failure so that they can be corrected, or so that they will not be duplicated in other programs. Early efforts at airport-land use compatibility planning were improved by this type of analysis and evaluation of the successes and failures of programs. Those efforts added to the body of knowledge and theory of airport-land use compatibility planning.

The identification of the major factors that resulted in the failure of the OIA ANCLUC can be categorized in three ways: (1) failures of the overall FAA designed Airport Noise Control-Land Use Compatibility Program, (2) failures of the OIA ANCLUC program design, and (3) failures of the OIA ANCLUC program as implemented.

The systematic study of those major factors should result in an improved ANCLUC program. This study was further guided by the following questions:

1. Can the major factors that contributed to the failure of the OIA ANCLUC be identified?
2. Are the major factors a result of problems or deficiencies in the overall FAA ANCLUC program, the specific OIA ANCLUC design,

the specific OIA ANCLUC program execution, or some combination of the above?

3. Are there specific planning principles, methods, techniques, or recommendations that could improve the overall ANCLUC program and/or the OIA ANCLUC program?

Study Methodology

The study will answer the research questions by examining the program in five main components:

1. The program, organizational structure, and participants.
2. Operational alternatives.
3. The citizen participation program.
4. Land use planning alternatives.
5. The implementation program.

This study documents how each component was supposed to function in theory in the FAA ANCLUC program, how it was designed to function in the OIA ANCLUC program, and how it actually functioned in the OIA program. Each chapter contains a comparative analysis of the three components to identify problem areas, inconsistencies, and concerns.

The study design required an extensive literature search of the FAA ANCLUC program and guidelines to document how the program was to function in theory. Interviews with FAA staff who had participated in the design, implementation, and evaluation of the program were used to supplement the literature search.

In addition, an extensive literature search was used to document the OIA ANCLUC study design and work program, with supplemental interviews of those who participated in the design.[23]

To document what actually occurred in the OIA ANCLUC, the author relied on a variety or primary data and sources as well as personal observations, attendance at and the minutes of the various committee, subcommittee, and public meetings, and review of the reports and documents generated during the OIA ANCLUC.

The identification and analysis of the major factors, inconsistencies, and problem areas were primarily based on the observations of the author and the key participants in the study. During the first three months of the study, the author was a participant observer due to staffing constraints within the Orange County Planning Department. After the staffing constraints were resolved, the author was allowed by the participants to continue to monitor the program as a nonparticipating observer for the remaining thirty-three months of the study. The status as a nonparticipating observer provided direct access to all meetings and work sessions and provided the opportunity to collect a great deal of the data by direct observation.

A case study is an attempt to explain a phenomenon that has already occurred. It is critically important to understand the limitations of this type of ex post facto research. The lack of control over the independent variables during the study greatly increases the possibility of erroneous and misleading interpretation of the research data. To

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[23]A list of interviews is contained in the Bibliography.

minimize the error in the author's observations and interpretations, extensive interviews were conducted with the key participants in the study.[24] The results of this study relied very heavily on the data generated in those interviews. The individuals that were interviewed were chosen because of their role in developing and conducting the OIA ANCLUC study. The policy and decision makers were also interviewed due to the importance of their actions to the success or failure of the program. The opinions of those interviewed may be somewhat biased because of their close personal and vocational involvement in the program. However, all were highly qualified and respected professionals who were able to discuss the issues in what appeared to be an objective manner.

Interviews were chosen over questionnaires because they offer a better opportunity under the circumstances of the study to probe, expand, and clarify responses. Interviews are the best instrument available for understanding people's behavior, intentions, feelings, attitudes, and reasons for their behavior. That understanding was critical to the success of this study.

Structure of the Thesis

Chapter I has described the airport noise problem, its impact on the airport environment, and past planning programs that were designed to address the airport noise-land use compatibility issue. The development of Orlando International Airport, a description of air

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[24] A list of interviews is contained in the Bibliography.

traffic activity, the development of the airport environment, and the initiation of the OIA ANCLUC are described in Chapter II. Chapters III through VII outline the FAA ANCLUC program design, the OIA program design, the OIA program execution, and the comparative analysis for each of the major program components:

1. The program, organizational structure, and participants.
2. Operational alternatives.
3. Citizen participation program.
4. Land use planning alternatives.
5. The implementation program.

The final chapter presents the author's conclusions and recommendations based on the analysis if the FAA and Orlando International Airport ANCLUC program.

CHAPTER II

ORLANDO INTERNATIONAL AIRPORT

Background

Airport Location

The Orlando International Airport (OIA) is located approximately ten miles south and east of downtown Orlando in Orange County, Florida, as shown in Figure 1. Access to the sixty-five hundred acre site is primarily by the Beeline Expressway (SR 528) and Semoran Boulevard (SR 436). Two twelve thousand foot long runways oriented in a north-south direction are located west of the new forty-eight gate terminal complex that was nearing completion at the time of this study. The existing land uses in the vicinity of the airport were predominately vacant undeveloped land to the east and south, residential development to the north and northwest, and a naval training base and scattered industrial uses to the west, as shown in Figures 2 and 3. The Orlando International Airport was experiencing rapid growth as a result of Central Florida's status as a major tourist destination.

History of Airport Activity

The predominance of activity at the Orlando International Airport from 1940 through 1970 was by the United States Air Force. During the early 1970s as military activity was reduced, growth in the Orlando area, including the opening of Walt Disney World and other Central

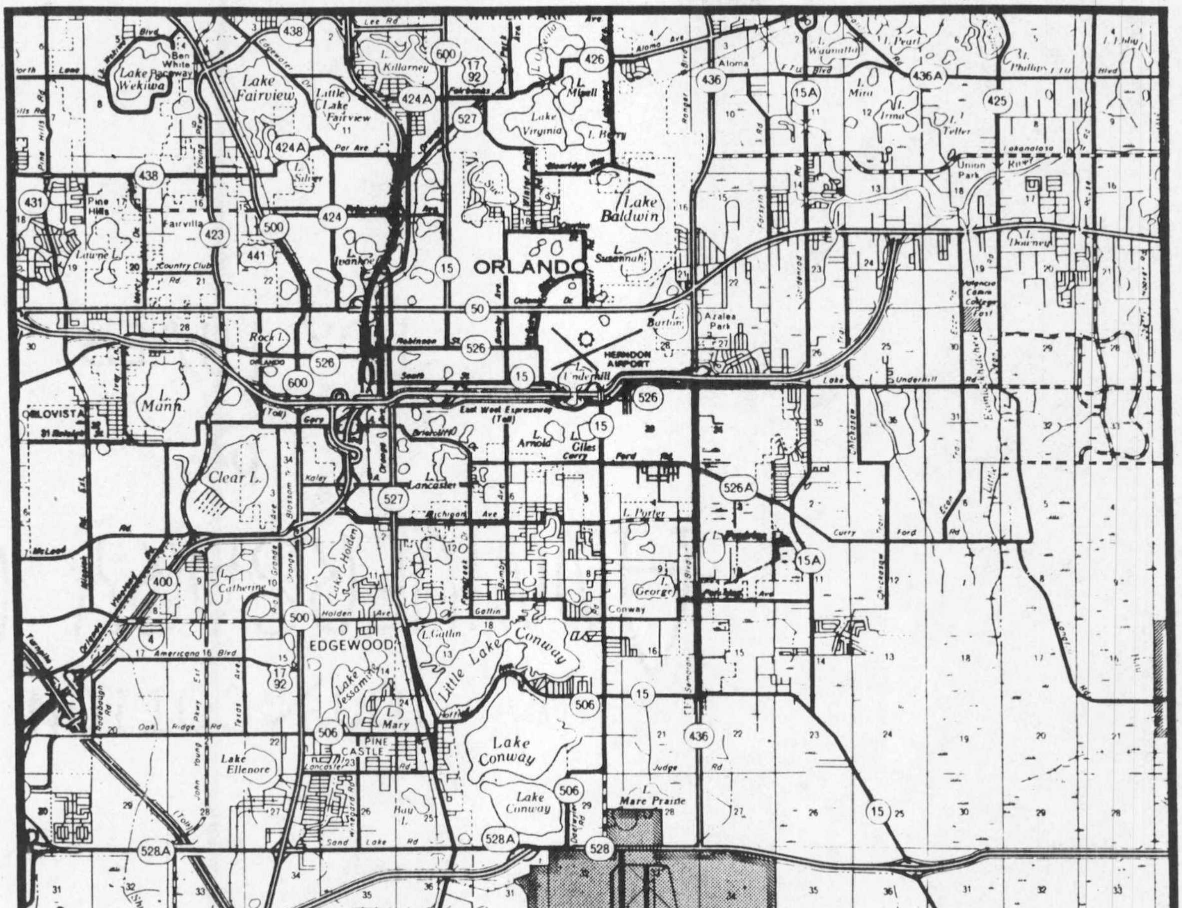
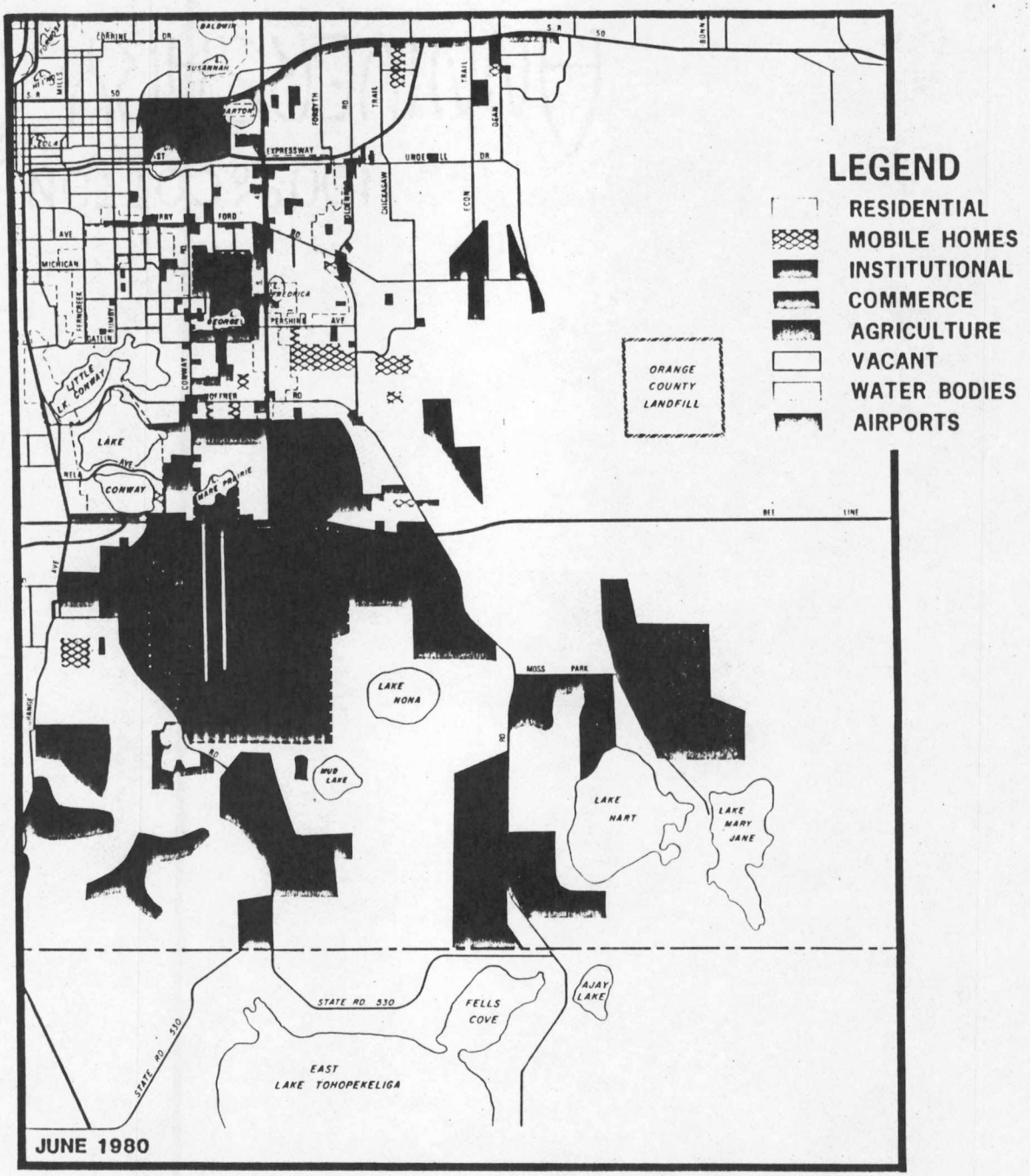


Figure 1. Vicinity map.



SOURCE: ORLANDO INTERNATIONAL AIRPORT
ANCLUC PROGRAM

Figure 2. Generalized existing land use.

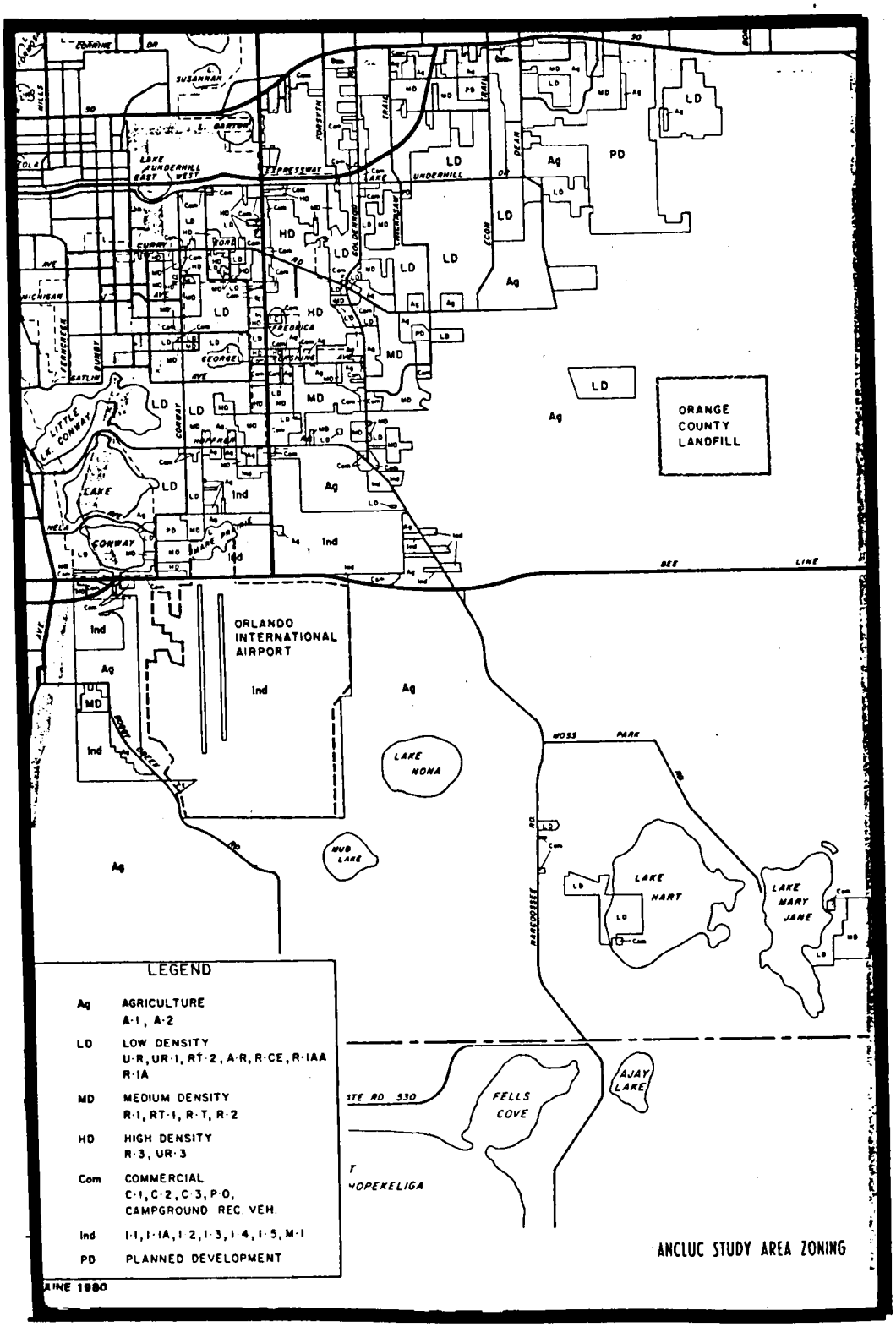


Figure 3. ANCLUC study area zoning.

Florida tourist attractions, contributed to an increase in commercial aviation activity. By 1975 four commercial air carriers--Delta, Eastern, National, and Southern--were serving Orlando by providing approximately 166 air carrier and charter operations[1] per day and 3.34 million passengers per year.[2]

Deregulation of the aviation industry by the Civil Aeronautics Board in 1978 caused a sharp increase in the number of airlines serving Orlando International Airport. By the end of 1979, eleven air carriers were serving OIA, providing 340 air carrier and charter operations daily bringing 6.54 million passengers per year to the area.[3]

Similar increases in air cargo and mail service have occurred recently. Air cargo increased 100 percent from slightly over twenty million pounds per year to over forty-two million pounds per year in 1979. Air mail dramatically increased to between six and seven million pounds per year.

Projections indicated a continued trend toward increased air carrier activity. The increased air activity increased the potential for noise conflicts with existing and projected development.

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[1] An aircraft operation is a takeoff or landing. Thus each aircraft serving an airport represents two operations.

[2] Peat, Marwick, Mitchell and Co., Economic and Air Trade Analysis for Orlando Jetport (Orlando: Peat, Marwick, Mitchell and Co., July 27, 1976).

[3] Peat, Marwick, Michell and Co., Analysis of Airfield and Airspace Capacity, Orlando International Airport (Orlando: Peat, Marwick, Mitchell and Co., August 1979), pp. 1-8.

History of Flight Corridors

The areas most noticeably affected by aircraft noise were north and northwest of OIA. Included in those areas were the city of Belle Isle, portions of Edgewood, the southern portion of the city of Orlando, and unincorporated Orange County, as shown in Figure 4.

During the Air Force years and prior to 1977 aircraft typically headed due north or south on approach and departure. However, in early 1977 a potential conflict of flight tracks[4] between general aviation aircraft at Herndon Field, located eight miles due north of OIA, and takeoffs of air carrier aircraft to the north from OIA resulted in a major change in aircraft flight corridors.

The Federal Aviation Authority Air Traffic Control Tower directed that aircraft taking off to the north from OIA turn either to the northeast or northwest to avoid that conflict.[5] Since a majority of flights had western destinations, their flights were directed to take a westward turn. The result of this change was that a significant number of aircraft were being directed over the most densely populated area in the vicinity of the airport. The decision of the FAA to take this action was one of safety versus noise, with safety of the traveling

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[4]Flight tracks are the ground projections of aircraft. Aircraft do not follow precise lines. The flight track actually represents the approximate centerline of a flight corridor. This corridor is very narrow as aircraft approach the runway, but widens as altitude and distance from the airport increases.

[5]Interview with Howard Cone, Chief, FAA Air Traffic Control Tower, August 1978.

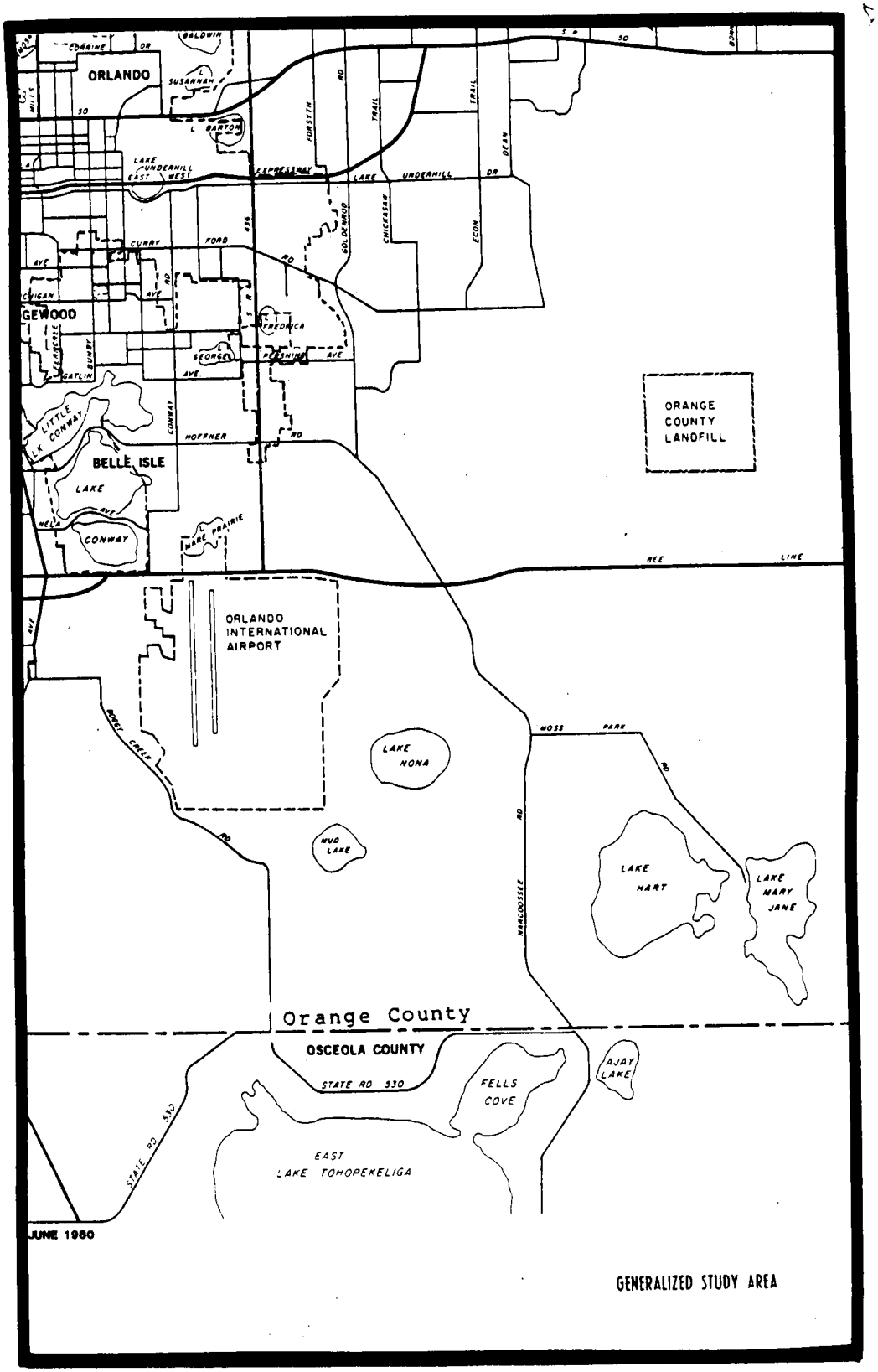

Figure 4. Generalized study area map.

public taking precedence.[6] This change was vigorously opposed by many of those residents who were being exposed to higher aircraft noise levels. This conflict between aircraft noise and land use represents one of the prime short-term problems which needed to be addressed by the ANCLUC study.

Due to the presence of virtually undeveloped land to the south of existing runways, no unique operational restrictions were imposed on aircraft in that area. Aircraft began to turn about four miles south of the beginning of the takeoff in the direction of their ultimate destination, as shown in Figures 5 and 6.

Initiation of Airport Noise Control-Land Use Compatibility (ANCLUC) Study

The rapid growth and expansion of service at OIA was occurring at the same time that residential development was encroaching on the airport. The increase in aircraft operations and passenger volumes quickly exceeded the capacity of the terminal facilities at OIA. In early 1975 a Facilities Master Planning effort was initiated for the construction of a new terminal complex.[7] The need for an Airport Noise Control-Land Use Compatibility (ANCLUC) study became apparent during the preparation and review of the environmental assessments for the new

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[6] Ibid.

[7] Greiner Environmental Sciences, Inc., "Proposed Improvements to Orlando International Airport," Development of Regional Impact Report for Orlando International Airport (Orlando: Greiner Environmental Sciences, Inc., July 1977), pp. 1-10.

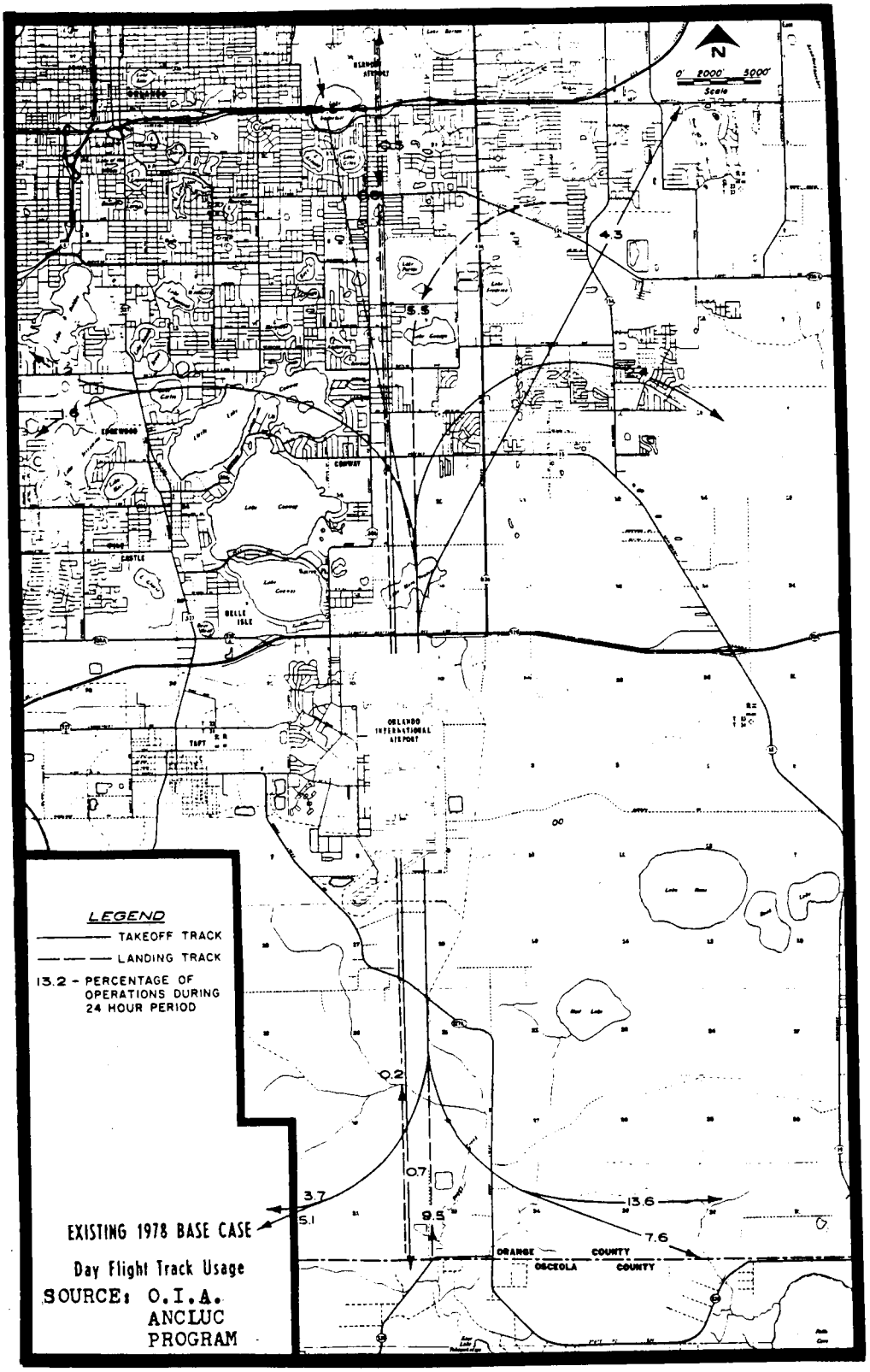

Figure 5. Existing 1978 base case--day flight tract usage.

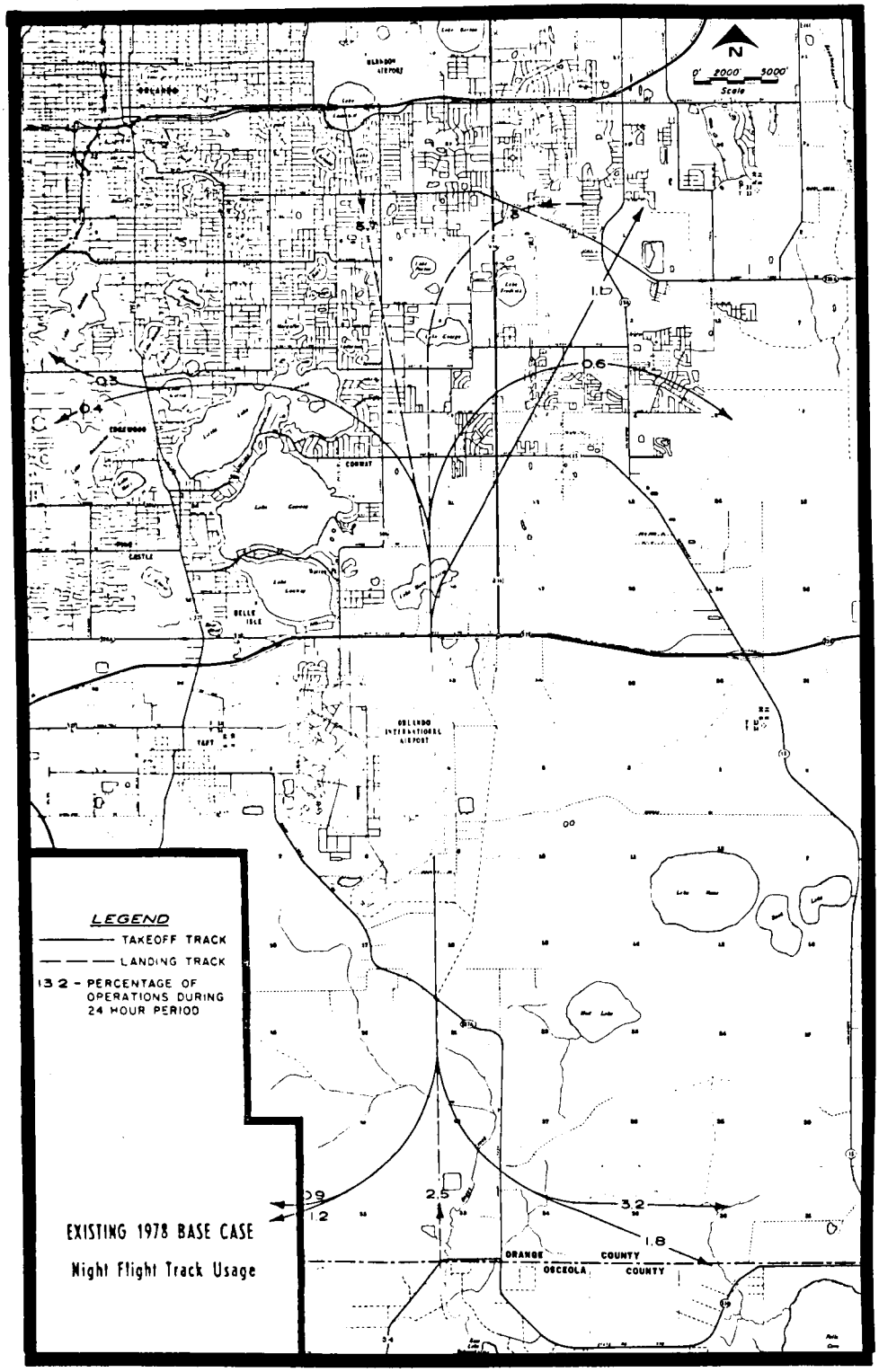

Figure 6. Existing 1978 base case--night flight tract usage.

terminal complex. Concern was voiced at that time over the levels of aircraft noise being generated and the ability to prevent incompatible development activities within the noise influence area.

The Greater Orlando Aviation Authority (GOAA) was the agency responsible for administering all OIA activities. The GOAA approached the Board of County Commissioners of Orange County with a proposal to cosponsor an ANCLUC study for Orlando International Airport. Orange County was the most appropriate entity to cosponsor the study because a majority of the affected areas were in unincorporated Orange County. The entire study area included portions of two counties and three municipal entities, each with separate land use control authority. The participation and cooperation of the various local governments was essential to the completion and implementation of the study.

The ANCLUC grant proposal was submitted by the cosponsors and was quickly approved for funding by the FAA in January 1978.[8] The program which was designed to last one year was scheduled to begin in July 1978.

Scope of Work

The Federal Aviation Administration required that a comprehensive and definitive description of the work to be accomplished be submitted and approved. The FAA allowed maximum flexibility in the development of a scope of work for an ANCLUC study in the belief that the airport proprietor and the impacted community could be more effective in designing a program which would meet the local needs. The FAA's basic

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[8] Letter from James E. Sheppard, Chief, FAA Miami District Office, to OIA, Official Notification of Grant Award, January 23, 1978.

requirements for an acceptable workscope[9] included consideration, analysis, and execution of the following:

1. Development of effective communication between the airport owners and users and the surrounding community.
2. Determination of existing noise impacts due to current airport and aircraft operations.
3. Determination of current and potential noise sensitive land use.
4. Consideration and recommendation in a timely manner of alternatives to reduce noise resulting from current and projected operations based on an analysis of appropriate aircraft operational, airport development, and land use controls.

An extremely detailed work program[10] was submitted and approved by FAA staff at the Regional Office in Miami and by the staff at the National Headquarters in Washington, D.C. The general schedule of the various activities in the work program are shown in Figures 7 and 8. The initial efforts in the work program were to get the program established and organized and to collect basic data to determine the baseline noise and land use conditions. The second major effort was to develop draft and final aircraft operational and land use control

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[9]Federal Aviation Administration, Format for Organizing Airport Noise Control and Land Use Compatibility Studies, U.S. Department of Transportation, FAA-AC: 5900-4, 1977, pp. 1-7.

[10]Greiner Environmental Sciences, Inc., Scope of Work and Summary of Costs--Airport Noise Control Land Use Compatibility Plan, Orlando International Airport (Orlando: Greiner Environmental Sciences, Inc., March 8, 1978), pp. 1-37.

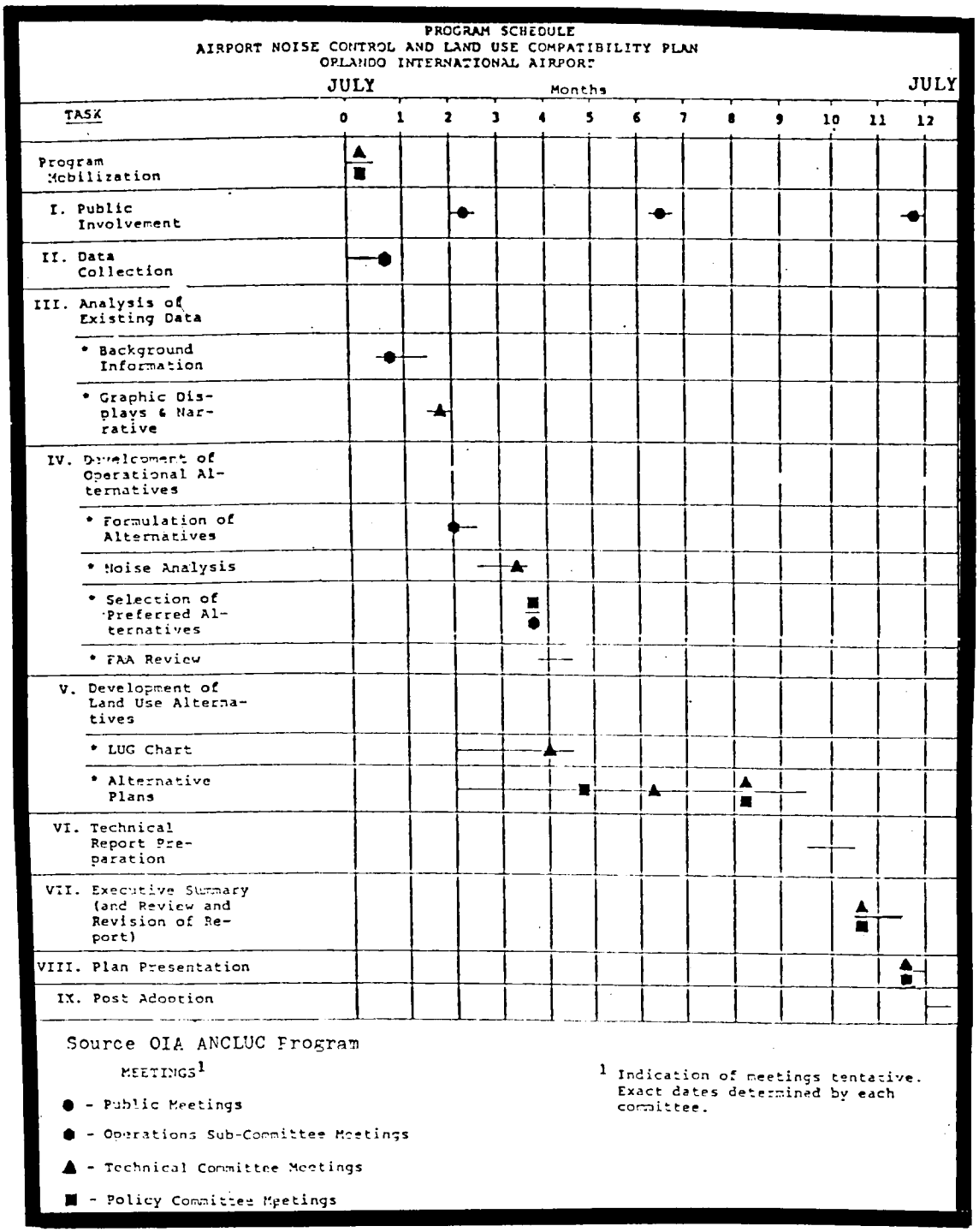

Figure 7. Program schedule.

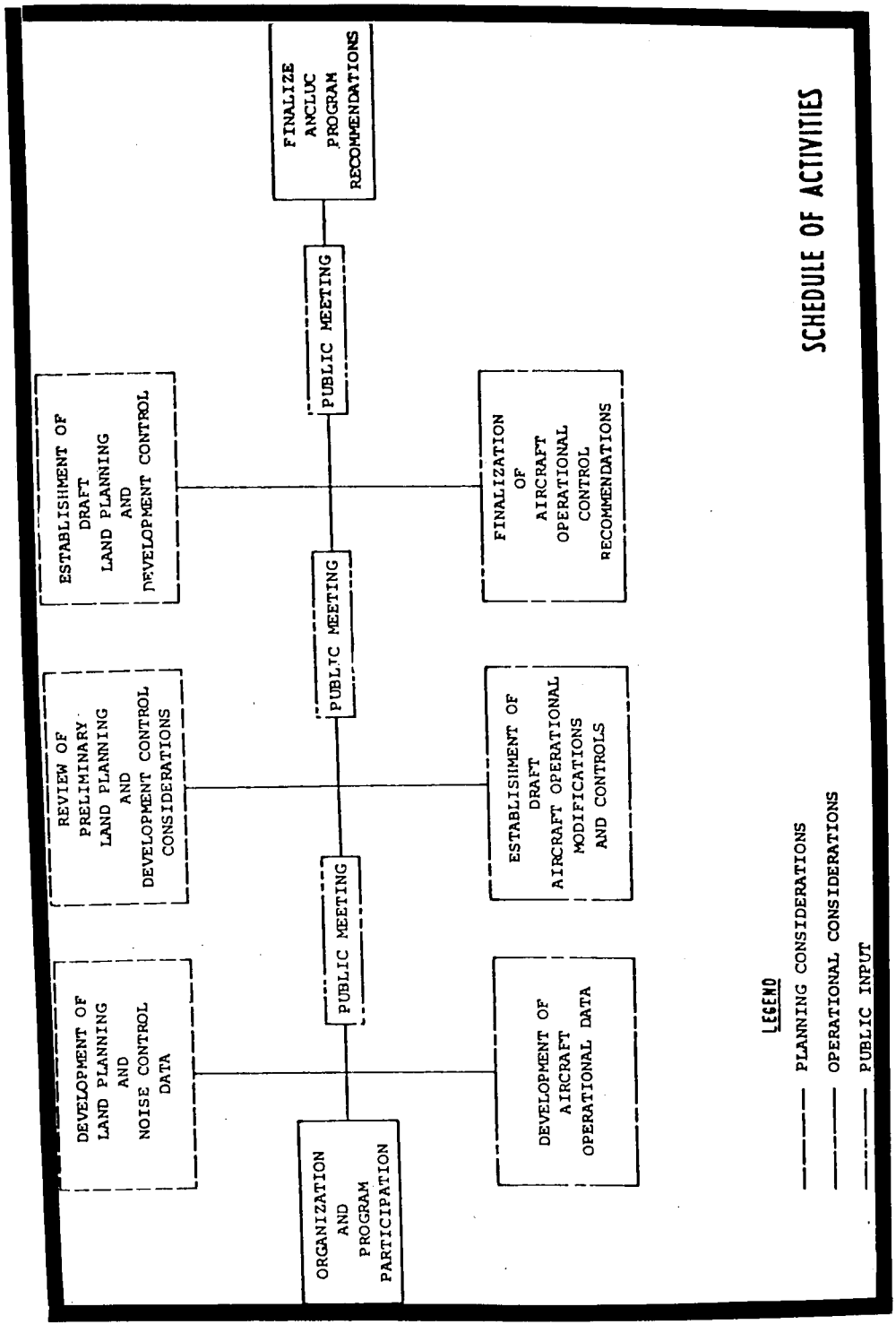

Figure 8. Schedule of activities.

alternatives. Throughout the process, the ANCLUC program was to seek actively public input and would also provide the public all necessary information concerning the status of activities at key thresholds during the program. However, the work tasks and overall study did not proceed according to the approved work program and time schedule. Figure 9 generally indicates the actual sequence of events that occurred. The proposed one-year study actually required over three years to complete. Comparison of the proposed and actual sequence of activities gives a general indication of the major problem areas. The major data collection was to be completed prior to initiation of the ANCLUC study. However, halfway into the study an additional six months were required to revise and update the study data. The development of the operational alternatives was anticipated to be completed in three months. That element of the study actually required twenty months. Development of the land use alternatives was to be completed in eight months but actually required fifteen months. The plan adoption process was to be completed in one month and actually required three and a half months.

The remaining chapters of this investigation examine the various elements of the work program to identify and analyze the major problem areas that developed. Emphasis has been placed on identification of the major factors within each element which led to the failure of the ANCLUC study at Orlando International Airport.

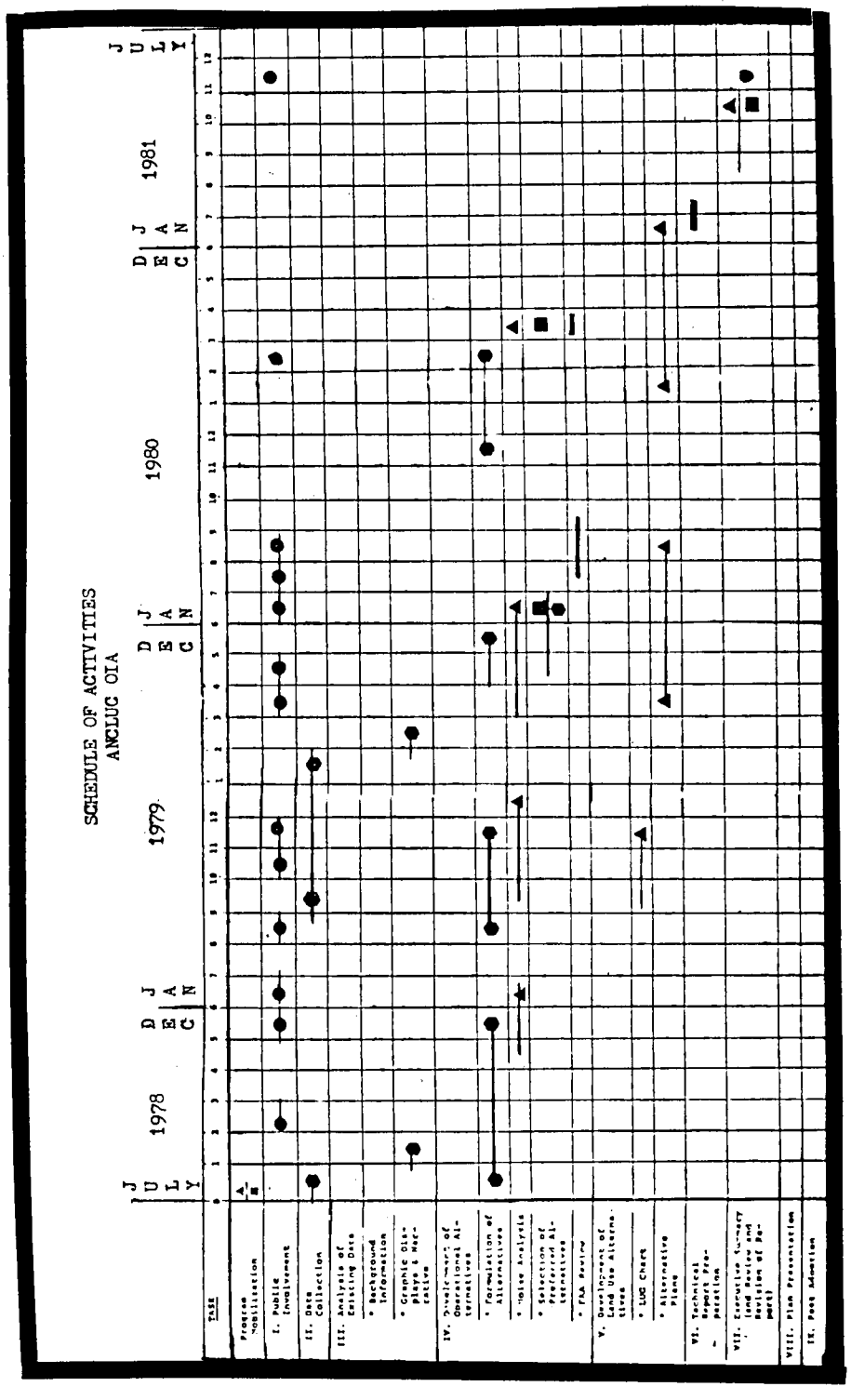

Figure 9. Actual sequence of events.

CHAPTER III

PROGRAM, ORGANIZATIONAL STRUCTURE, AND PARTICIPANTS

The ANCLUC Program in Theory

The ANCLUC program was an attempt by the FAA to acknowledge the reality of a complex division of legal authority, practical responsibility, and interests among airport proprietors, the FAA, state and local governmental agencies, airport users, aviation manufacturers, and private citizens in aviation noise abatement. The program required the involvement of all relevant parties in a planning process that would examine the noise impact created by the operation of the airport, analyze alternative noise impact reduction techniques and land use compatibility measures, and recommend a plan of action.

A major priority of the ANCLUC program was to promote public understanding so as not to raise expectations beyond the levels that flight safety, technology, and reasonable cost-effectiveness make possible.[1] While emphasizing the constraints of technology, productivity, and financing, neither the Aviation Noise Abatement Policy nor the ANCLUC program clearly defined those constraints. Implementation of the plan of action by those parties with the jurisdictional authority was a cornerstone of the ANCLUC program.

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[1] Federal Aviation Administration, Noise Control Plans, U.S. Department of Transportation, FAA Order 1050.11, June 1977, p. 3.

The ANCLUC program was to be a multidisciplinary approach that would give planners an equal basis with airport operators and aviation professionals in devising controls to resolve aircraft noise and land use conflicts.[2] Participants were allowed maximum flexibility under the ANCLUC guidelines to exercise individual judgment on the workscope, local citizen participation, analytical methods, consideration of alternatives, and recommendations.

The basic requirement of each study was to identify and graphically depict the noise impacts associated with the airport through the use of contours of equal noise exposures. Variation in the noise impact contours were assessed as resulting from various aircraft operational and land use controls should be assessed and the preferred alternative adopted after extensive public involvement. The final work product and plan would include clearly identified existing and proposed areas of high noise impact represented by noise contours.

ANCLUC Program at Orlando International Airport

The Orlando International Airport ANCLUC was initiated to respond to the noise problems identified during the development and review of the environmental impact assessment for the new terminal complex. The ANCLUC study was intended to investigate both the short term and long term noise relief options and land use control measures available for OIA. Consistent with FAA policy, the program was open to all who wished to participate. Formal committees and subcommittees were

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[2]Kenneth Deleno, "How to Control Airport Noise," Planning 46 (November 1980):22-23.

established to direct and complete the study and to allow input by all affected local municipalities, the neighboring communities, the aviation industry and federal, state, and local officials involved in land use and environmental control. The major objective of the program was the implementation of noise abatement and land use control measures that would provide immediate relief from aircraft noise as well as provide the long term control measures necessary to achieve compatible land development.

Analysis of the ANCLUC Program

The FAA ANCLUC program and the OIA ANCLUC program were consistent in their objectives and approach. Both programs relied on the identification of existing noise zones, development of aircraft operational alternatives to minimize the size and location on the noise contours, and the development of land use controls to ensure compatible development within the noise zones.

Both ANCLUC programs recognized the fact that aircraft generate considerable noise and were designed to address that problem. An equally important fact about aircraft is that they do crash occasionally and those crashes frequently reach the magnitude of major disasters in terms of lost lives and property damage. Both ANCLUC programs totally ignored the safety aspects of airport and aircraft operations.

The rationale for this oversight could be traced only to what the author interpreted as an institutional bias of the Federal Aviation Administration. One of the basic responsibilities of the FAA was regulatory control of the aviation industry in all matters of safety.

However, the FAA emphasized that the primary responsibility of the agency was to promote the aviation system in this country. Recognition or identification of any type of safety zone in areas adjacent to the airport, in the FAA's opinion, would result in undue concern or panic, possible lawsuits, or airport constraints and would not be in the best interests of promoting aviation transportation.[3]

Further evidence of the total disregard and institutional bias against public discussion of safety issues was found in the FAA ANCLUC guidelines for aircraft operational alternatives analysis. In determining appropriate operational alternatives for an area, the FAA would not allow any type of safety comparison or ranking.[4] All operational alternatives that were examined were determined to be "safe" or "unsafe" with no differentiation of the degree of safety. Alternative A was determined to be safe or unsafe. If Alternative A was determined to be safe, it could not be compared with or considered to be safer than Alternative B or Alternative C if they had been determined to be safe. Under no circumstances could an alternative be discussed or ranked against other alternatives from a safety perspective.

The institutional bias of the FAA concerning public discussion of safety and deletion of safety considerations from ANCLUC raises issues and concerns about FAA commitment to resolving airport problems and concern about the comprehensive nature of the program.

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[3] Interview with John W. Reynolds, Environmental Planner, Office of Airport Planning and Programming, Federal Aviation Administration, May 1981.

[4] Interview with Rick Alberts, Greater Orlando Aviation Authority Airport Consultant, Greiner Environmental Sciences, Inc., May 1981.

FAA ANCLUC Guidelines for Organizational Structure and Participants

The objective of the ANCLUC planning process was to produce meaningful recommendations to reduce noise impacts on people which could subsequently be implemented by those parties with respective jurisdictional authority. In order for the ANCLUC program to be a success it would have to bring together all affected and responsible parties to participate in the noise abatement planning process. More importantly, measures would have to be taken to ensure that all parties accept their responsibilities during the planning process to adopt and implement the recommendations arrived at through the process.[5] Considerable attention to the complex division of legal authority and practical responsibility for noise abatement among the various participants was reflected in the FAA guidelines.

Cooperation and implementation by all of the participants were vital to the success of the ANCLUC program. The importance of these components was reflected in the FAA approach to ANCLUC which was based on two basic premises:

1. The primary obligation to address the airport noise problem is a local responsibility.
2. Only if each party assumes responsibility and acts on the basis of complete cooperation will an ANCLUC program achieve

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[5] FAA, Noise Control Plans, p. 1.

significant and measured progress in reducing the impact of aircraft noise on airport neighbors.[6]

The FAA Aviation Noise Abatement Policy set forth the legal and proper responsibilities of the various participants in addressing the aviation noise problem. Specific areas of noise control responsibilities were as follows:

1. Federal Aviation Administration. FAA personnel were to attend and participate in all technical working sessions to provide appropriate program guidance and FAA policy interpretation. FAA staff was responsible for review and comment on all proposals and approval of those abatement proposals within FAA guidelines and jurisdiction.

2. Airport proprietor. The airport proprietor was to voluntarily initiate the ANCLUC plan, establish a scope of work for the plan, accomplish the data gathering, provide technical analysis, coordinate outside participation, and prepare the necessary reports and documentation. The airport proprietor was also responsible for implementing the resulting plan in cooperation with local jurisdictions, air carriers, and general aviation.

3. Airport users. This group included the various airlines and their representatives--the Air Transport Association (ATA), the Airline Pilots Association (ALPA), the National Business Aircraft Association (NBAA), and the Aircraft Owners and Pilots Association (AOPA). The participation of these groups was essential to provide the technical

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[6] FAA, Airport Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 96-193, p. 4.

expertise required in considering aircraft safety, operational capability, and economic constraints. The airport users would provide input and guidance regarding their specific operations and procedures at the airport. They would cooperate to the fullest extent possible regarding operational modifications needed to effect a successful plan and they would participate in the resulting implementation plan.

4. State and local governments. State and local governments were to participate in the planning process by providing existing and projected land use information for determining areas of incompatibility. They would participate in both the land use and aircraft operational alternatives for the noise abatement plan and would act "decisively and responsibly" to implement the recommended compatible land use controls for existing and forecast noise impact areas. Participation of the local government was so critical that the FAA guidelines recommended that the ANCLUC study be cosponsored by the airport proprietor and the local government having jurisdiction.

5. Local noise impacted citizens. Citizens were to participate to the maximum extent possible in the ANCLUC planning and working groups and provide input regarding public response to aircraft noise.[7]

Orlando International Airport Organizational Structure and Participants

The OIA ANCLUC program, consistent with FAA policy, was open to all who wished to participate. Information developed throughout the program

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[7] FAA, Aviation Noise Abatement Policy, pp. 49-60.

was received from and shared with the public, elected officials, affected federal, state and local agencies, airlines, pilots, and other interested groups. In order to obtain data, exchange ideas, and develop recommendations a series of committees and subcommittees were established, as shown in Figure 10.[8]

The Policy Committee was comprised of those who, through their positions as elected officials or through appointed offices, were able to implement recommendations in the form of policy. The committee included representatives from each of the municipal governments in the impact area and the Director of GOAA. The function of the committee was to provide general policy guidance for study direction and provide direct liaison with each of the municipal governments.

The Technical Coordinating Committee was comprised of all affected land planning agencies, environmental review agencies, and aviation related groups. The primary purpose of this committee was to provide technical assistance, input, and evaluation during preparation of the plan and to provide assistance in plan presentation.

The Operations Subcommittee was established to consider alternative air traffic control options and was comprised of those who were directly involved in the control of aircraft into and out of Orlando International Airport.

The Public Involvement Subcommittee was established to coordinate the activities of the study with the affected citizens, to conduct

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[8]Greiner Environmental Sciences, Inc., Orlando International Airport, ANCLUC Workprogram (Orlando: Greiner Environmental Sciences, Inc., January 1978), p. 2.

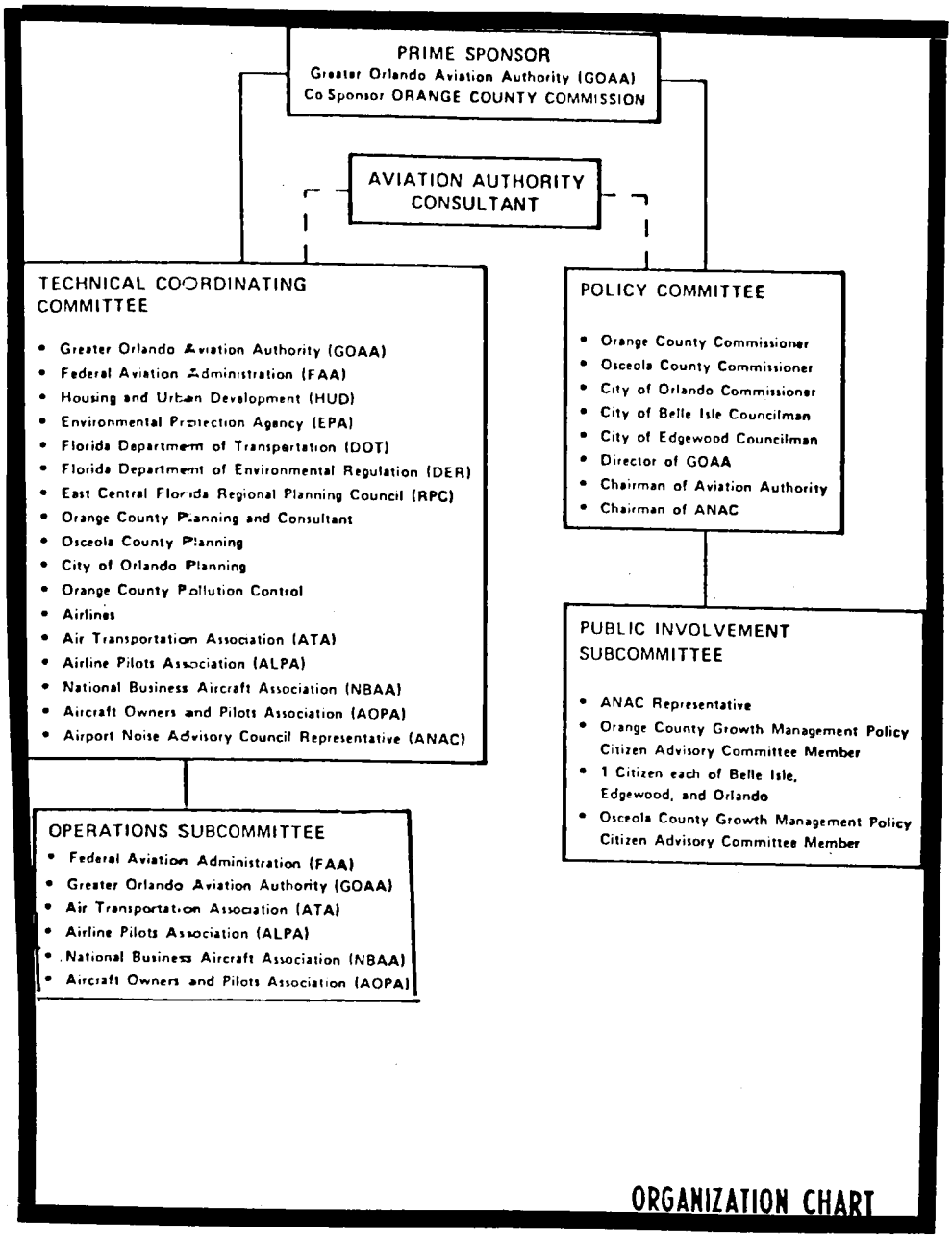

Figure 10. Organizational chart.

public meetings, and to ensure that the local citizenry was made a part of the ANCLUC process.

Analysis of Organizational Structure

Examination of the organizational structure and responsibilities of the participants in both the FAA and OIA ANCLUC programs resulted in the identification of several major issues and problem areas.

The Operations Subcommittee was charged with the responsibility for developing the operational alternatives and controls for the program. The recommendations of the subcommittee would determine the location and magnitude of noise impacts resulting from aircraft operations at the Orlando International Airport. Examination of Figure 10 shows that the local government agencies and the residents affected by aircraft noise were not represented on that subcommittee. The FAA guidelines specifically identified the need for both groups to be involved in the development of the operational alternatives as well as in the development of the land use alternatives. The members of the Operations Subcommittee successfully opposed the inclusion of both groups on the subcommittee. Eventually, the local planners and residents were allowed the opportunity to review and comment on the subcommittee's recommendations. Without participating in the actual development of the alternatives, the recommendations of the subcommittee were not likely to be supported by the excluded groups.

The affected citizen groups were also excluded from the Technical Coordinating Committee of the OIA ANCLUC. It was the author's observation that the citizen groups had valuable input for that

committee to consider but were unable to have direct contact with the committee during work sessions.

The FAA and OIA ANCLUC programs both assigned responsibility for the citizen participation element to the airport proprietor and not to the planning professionals involved in the study. This designation seems inappropriate. While all airport proprietors may be capable or qualified to conduct a successful citizen participation program, it appears to be more logical and appropriate to assign that responsibility to the agency or agencies with the pertinent experience and expertise. These are usually planning professionals. Planners are typically involved with citizen participation in various forms in all of their planning processes and programs. The planning profession has also been responsible for many of the innovations and techniques used in citizen participation programs.

The GOAA exercised its authority and responsibility for the Citizen Participation Program by creating a Public Involvement Subcommittee consisting of four residents from the noise impact area. Members of the committee were not paid for their services and each member had other career and family responsibilities. It is difficult for the author to understand how four residents would be able to conduct an entire citizen participation program as large and as complex as required in the ANCLUC program, especially when little staff time and resources were allocated to assist the committee. The responsibilities of the committee were as follows:

1. To organize and conduct all public meetings and hearings.
2. To convey all relevant aspects of the study to the potentially affected residents.
3. To convey the input of the residents to the technical, operations, and policy committees.

Analysis of Program Participants

An examination of the role of the participants, their rationale for participating in the study, and identification of the institutional biases each participant brought to the study provides an insight into several of the major factors which resulted in the failure of the OIA ANCLUC program.

FAA Staff

FAA regional staff participation in specific ANCLUC studies was considered essential to the successful completion of those studies. FAA Airport Planners and Air Traffic Control personnel were required to attend all working sessions in order to provide appropriate guidance and understanding of FAA policy. Evaluation of FAA staff participation at Orlando International Airport[9] indicated that the FAA personnel assignments and training had not kept pace with the overall commitment set forth in the Aviation Noise Abatement Policy. The FAA staff was

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[9] Interviews with Manuel Rodriguez, FAA Representative to OIA ANCLUC Study, Miami Regional Office, April 1979; Rick Alberts, GOAA Airport Consultant, Greiner Environmental Sciences, Inc., May 1981; and Timothy Wilson, Airport Planner, Orange County Planning Department, October 1981.

cooperative and enthusiastic[10] but they had not received adequate training in noise abatement activities, nor in citizen participation programs. There were major differences of opinion and interpretation among FAA staff and FAA air traffic personnel regarding FAA policy concerning responsibility and authority to establish noise abatement priorities and procedures. The lack of training and conflicting interpretations required the other participants in the study to seek second and third opinions from other FAA regional offices, often without resolving the original conflict.

Many of the study participants were of the opinion that the FAA was merely enunciating a broad policy direction in ANCLUC and then were leaving it to the other nonfederal participants to proceed as best they could with less than adequate direction from FAA.[11] The lack of adequate FAA direction was reflected in their response to one of the major noise abatement recommendations of the OIA ANCLUC study. In the space of two weeks, the FAA staff changed its position and recommendation on a development proposal for noise abatement five times, finally leaving the issue unresolved. FAA was requested to make a determination if construction of dual diagonal runways could be considered in the ANCLUC study for noise abatement--initial FAA memo dated April 9, 1979, was negative, second memo dated April 16, 1979, was positive, third memo dated June 21, 1979, was negative, fourth memo dated June 23, 1979, was

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[10]Telephone interview with John W. Reynolds, Environmental Planner, Office of Airport Planning and Programming, FAA, October 1980.

[11]Ibid.

positive, and the final memo dated June 30, 1979, left the issue unresolved until further study.

The FAA staff did not participate in the program to the extent expected by the other participants.[12] FAA staff did not attend any of the public hearings or meetings with the adjacent residents. As a result, they received the input of the residents secondhand. Similarly, FAA response to the concern of the residents was often secondhand from the GOAA consultant. Misinterpretation and miscommunication often resulted from this type of situation.[13] Also contributing to limited participation in the program was the lack of available manpower at the Miami Regional Office. The available manpower was further restricted due to their heavy workload, including staffing requirements for ANCLUC studies at four adjacent regional airports in Fort Lauderdale, Orlando, Cincinnati, and Atlanta.[14]

The Greater Orlando Aviation Authority and the ANCLUC Consultant

The Greater Orlando Aviation Authority retained an airport consultant to accomplish the data collection, technical analysis, coordination of participants, and drafting of reports and recommendations. The GOAA staff continued to provide the overall guidance and policy direction in areas of airport operations, airport contractual agreements, and off airport community relations. GOAA did

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[12] Ibid.

[13] Ibid.

[14] Interview with Manuel Rodriguez, FAA Representative to OIA ANCLUC Study, Miami Regional Office, April 1979.

not play a larger role in the study due to a preoccupation with airport operations, the new terminal construction, and a lack of commitment to noise abatement.[15]

The preoccupation of GOAA staff with the operation of the existing airport and the construction activity for the new terminal facilities was understandable the existing terminal was operating over capacity and the recent Civil Aeronautics Board deregulation of routes had almost doubled the number of operations and had increased the number of airlines serving OIA from four to eleven in a matter of months.[16]

The admitted lack of commitment to the noise abatement program by the GOAA was extremely confusing to the author since it had sponsored the ANCLUC program and its media and public information campaign emphasized a commitment to noise abatement. The GOAA's lack of commitment to noise abatement was a result of a strong institutional bias based on a belief that Orlando International Airport did not have a severe noise problem.[17] While the Air Transport Association (ATA) agreed with that position, the residents and other participants in the study disagreed.[18]

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[15]Interview with John Meacham, Director of Aviation, Greater Orlando Aviation Authority, July 1978.

[16]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report (Orlando: Greiner Environmental Sciences, Inc., February 1981) p. 11.

[17]Interview with John Meacham, August 1978.

[18]Summary of Minutes, Operations Subcommittee Meeting, February 20, 1979.

It was unusual for the GOAA to sponsor an ANCLUC study to solve a noise problem that they did not believe existed. The GOAA offered the following reasons for undertaking the study even though they did not accept the need for it.[19] The primary reason was that the FAA would approve the funding for the new terminal complex if GOAA would conduct an ANCLUC study. GOAA needed the grant money to begin construction. GOAA saw the ANCLUC study as a way to prevent potential lawsuits in the future if noise were to become a problem. GOAA felt it would be more cost effective to fund their share of the study than to pay to fight lawsuits and pay damage claims. GOAA felt that while the ANCLUC was being conducted, the terminal construction could continue without major opposition.

The GOAA spent a great deal of time and effort considering both sides of the ANCLUC issue. GOAA considered not participating in ANCLUC because there was fear that the ANCLUC study would generate additional noise controversy or even create noise controversy where it did not exist, and because the GOAA had a concern over the legal liability of identifying noise impact areas. GOAA also felt that the program would not be implemented because FAA had not committed sufficient funds for implementation. GOAA was concerned that implementation of aircraft operational noise abatement measures would result in airport capacity constraints, delays, unacceptable operational constraints, increased fuel usage, and increased operating costs.

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[19] Interview with John Meacham, August 1978.

The deciding factor in the GOAA's deliberations was FAA's approval funds to construct the new terminal contingent upon an ANCLUC study being conducted.[20] The lack of commitment by GOAA, its perception of possible negative impacts from the study, and its doubts concerning the ability and desirability of implementing the study's recommendations were major factors contributing to the failure of the OIA ANCLUC.

The GOAA decision to hire an airport consultant who was not from the area caused additional problems during the ANCLUC study. The GOAA consultant did not, in many instances, have a knowledge of the concerns and political intricacies of the local community.[21] It has been the author's observation that such a knowledge is extremely critical when dealing with sensitive aspects of noise impacts and off-airport land use considerations.

Airport Users

The airline operators and general aviation's participation in the study was essential as they provided technical expertise concerning aircraft safety, operational capability and economic constraints. At OIA, the airlines participated to a greater extent than general and business aviation industries. It was the author's observation that the airlines took a very defensive and negative position on all operational changes while the general aviation and pilots associations were much

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[20] Ibid.

[21] Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, January 1981.

more positive and supportive of operational changes for noise abatement.[22]

The airlines, through their representative, the Air Transport Association (ATA), adopted a defensive position for several reasons, some of which were similar to GOAA's. The airlines argues that:

1. noise abatement recommendations would result in additional costs and operating expenses for them;
2. the ANCLUC study was a drain on their resources in terms of manpower and travel expenses;
3. the ANCLUC study would create more noise controversy than existed prior to the study; and
4. when compared to other airports such as National, Kennedy, La Guardia, and Boston, Orlando did not have a noise problem.[23]

The ATA rationale was not accepted by the citizen groups. The citizen groups argued that the airport noise problem was typical of many systems causing environmental problems. It was a system in which one element (the airlines) imposed costs on another element (residents in the airport area) without a mechanism for recovering those costs from those who did the damage. If efforts such as ANCLUC shifted some of the legitimate costs back to the airlines, then the residents felt it was

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[22]Minutes of the Operations Subcommittee and Technical Coordinating Committee, July 1978 through July 1981.

[23]Interview with Walt Ferrari, ANCLUC Representative, Airline Transport Association, July 1978.

justified.[24] The FAA's response to the complaint of the airlines was that the airlines were the generators of noise so it was not unreasonable to expect them to participate in efforts to mitigate noise at the site. An important aspect of the complaint of the airlines was that many of the airlines were already in a poor financial position and were unable to accept increased costs whether they were legitimate or not.

The various airlines did not participate directly; rather, they were represented by the ATA, which was the airline trade association. This relationship created numerous problems for the completion of the study in a timely manner. Whenever an operational alternative was agreed upon or a compromise reached by the various participants, the ATA did not have the authority to commit the airlines to that agreement. The entire process would be delayed while the ATA cleared the proposal with each individual airline. Usually one of the airlines would not agree to the proposal and the whole negotiation process would have to begin again.

Local Government

The participation of local government was so critical that FAA guidelines recommended that the ANCLUC grant be cosponsored by the airport proprietor and local government with land use authority in the impact area. Orange County chose to cosponsor the study for a variety of reasons.

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[24] Interview with James Erwin, Vice President, Residents Opposed to Airport Roar (ROAR), December 1979.

In the past, Orange County and the airport were antagonistic to each other. Orange County perceived this cosponsored study as a chance to overcome earlier problems. The OIA was owned by the City of Orlando but the residents that were being impacted were in unincorporated Orange County. The Board of County Commissioners (BCC) felt that if the interests of the residents of unincorporated Orange County were to be represented, they would have to take an active role and cosponsor the study. The BCC saw the ANCLUC study as an opportunity to obtain valuable data to assist in making critical land use decisions.[25]

The BCC, in agreeing to cosponsor the ANCLUC study, committed over one hundred thousand dollars in staff and consultant fees to the program. The Planning Department was designated as the lead agency with other departments to assist as needed. The Planning Department was chosen because of their expertise in land use, zoning, facilities planning, compatibility issues, and citizen participation. The existing Planning Department staff had little or no expertise in noise abatement or airport/aircraft operations. The lack of staff expertise required the hiring of an additional staff member with experience in airport operations and the hiring of a consultant to assist the staff in their technical review. It was the author's observation that the lack of staff expertise was critical, because major operational decisions and study directions were made early in the study when staff was unable to

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[25]Interview with James Sellen, Director, Orange County Planning Department, November 1979.

respond adequately. The results of those early decisions would create problems later in the study.[26]

The County's decision to cosponsor the ANCLUC study was not favorably received by all of the citizen groups. By cosponsoring the study, the County created an image or perception of being in league with the airport. Local residents found it very difficult to believe that the County was representing their interests.[27] The Planning Department was only able to overcome this perception problem after the study was half completed. "Tremendous staff effort was expended to change the perception of the residents that the County staff's efforts were on their behalf and not blindly in favor of the airport."[28]

Citizen Groups

Several citizen groups representing tens of thousands of residents were actively involved in the ANCLUC study. Some of these citizen groups had opposed various development proposals at Orlando International Airport. It was the author's observation that many of the residents had come into the ANCLUC study with preconceived ideas and biases. These biases were exhibited by the adversary approach that they took in dealing with the airport and the airlines. Every proposal or recommendation was thought to be another effort by the GOAA to take

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[26]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, November 1981.

[27]Interview with James Erwin, Vice President, Residents Opposed to Airport Roar (ROAR), November 1981.

[28]Interview with James Sellen, Director, Orange County Planning Department, November 1979.

advantage of the residents. The adversary approach that the residents exhibited resulted in the GOAA and the ATA reacting in a similar manner. Observation by the author revealed that neither the residents nor the aviation interests entered the ANCLUC planning process with a cooperative attitude as envisioned by the FAA guidelines.

CHAPTER IV

OPERATIONAL ALTERNATIVES

FAA Operational Alternatives

The ANCLUC program relied on a variety of noise impact reduction techniques to reduce the adverse impacts of noise associated with airport operations. The techniques included airport operational policy restrictions, airport development alternatives, preferential runway use, aircraft takeoff and approach profiles, and aircraft takeoff and approach procedures. The noise reduction techniques were limited to varying degrees by consideration of safety, technology, economics, efficiency of airspace management, efficiency of airport operations, airport capacity, and by various legal ramifications.[1] The FAA further emphasized that even the implementation of all possible noise reduction measures would still not result in a completely quiet airport. The degree of success of aircraft and on-airport operational measures was limited and controlled by the amount of incompatible development which encircled the airport. If areas adjacent to an airport are 80-90 percent developed, there is little that can be accomplished by operational changes.

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[1] Federal Aviation Administration, Airport Noise Control and Land Use Compatibility Planning under the Planning Grant Program, U.S. Department of Transportation, FAA Order 5900.4, September 1977.

The focus of the ANCLUC planning process was primarily on reducing the noise impacts of airport on the surrounding environment through an assessment of noise abatement procedures and land use controls which should maximize airport-community compatibility. A basic requirement of the program was to conduct the noise assessment and graphically depict the noise impact through the use of contours of equal noise exposure. The first step the noise assessment was to develop the data inventory needed to estimate the existing and projected future noise impacts. The data requirements included the airport traffic mix, runway use percentages and patterns, aircraft scheduling by type and time, aircraft loading, departure and arrival route, and flight profiles. The collection of these data required the coordination and cooperation of the airport proprietor, the airlines and other airport users, and the FAA Tower Control Staff. These data were essential in developing the key noise-related assumptions on which the study was based.

To assess the levels of noise, these data and assumptions were incorporated in the FAA approved Integrated Noise Model (INM).[2] This state-of-the-art modeling technique depicts the various noise contours using the Day-Night Average Sound Level (Ldn) metric.[3] The FAA also required that on-site noise level monitoring be conducted to aid in the calibration of the model.

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[2]Federal Aviation Administration, FAA Integrated Noise Model, Version I (INM-1), U.S. Department of Transportation, FAA Report No. EQ-78-01, January 1978.

[3]Appendix A contains aircraft noise estimating methodologies.

After the existing noise contours and problem areas were identified, the model is used to test the operational alternatives that were proposed to reduce the magnitude and location of airport noise. A description of the various operational alternatives and measures follows.

Operational Policy Restrictions

Operational policy restrictions were those measures placed on airport users by an airport proprietor to control noise during certain sensitive times of a day or to reduce the cumulative noise impact. Such restrictions could be controversial and involve legal determinations regarding unjust discrimination or undue burden on interstate or foreign trade and could have far reaching consequences on the national air transportation system.[4]

A curfew was a restriction on certain noise producing operations during the night hours from 10 p.m. to 7 a.m. The INM was programmed to treat every night operation as the equivalent of ten daytime operations so an ANCLUC plan could show a significant reduction in overall noise contours with the imposition of a curfew. The 10:1 nighttime penalty was to account for the greater intrusiveness of noise during the quieter night hours when people were trying to sleep. Curfews have been vigorously opposed by the air transport industry.

Time-of-day restrictions were to limit certain types of high noise activities such as training exercises or engine maintenance run up to specific time periods.

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[4]FAA, Aviation Noise Abatement Policy, pp. 31-34.

Maximum noise level limitations were to prohibit the use of aircraft that produced a noise level considered in excess of that level which was acceptable to the local community. Such restrictions are rarely successful due to legal challenges.

Airport Development Alternatives

Airport development alternatives are any type of airport construction, including new runways, taxiways and holding/run up aprons that provide more flexibility in operations, redirect noise into more noise compatible areas or more equally distribute noise. This category includes relocation of engine run up areas, construction of noise barriers and construction of runway extensions, the purpose of which is to reduce or redirect ground operational noise away from airport neighbors. Typically, the more expensive the development alternative, the less likely it is to be implemented.[5] However, such expense should be weighed against large scale land acquisition or possible airport relocation that could result. Airport development alternatives may encounter physical site limitations or encounter permit and development approval problems for any additional construction at an airport that is considered highly controversial on the basis of noise even if that development would alleviate noise impacts.

Aircraft Operational Alternatives

Aircraft operational changes offerred significant potential for immediate redistribution and redirection of aircraft noise. The

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[5] Ibid., pp. 6-10.

aircraft operational changes involved direct operation of the aircraft and the air traffic control system. Alteration of either of these for noise abatement or any other reason other than safety could quickly become controversial. The application of these alternatives was site specific and they could be applied in combination.

Preferential runway use involved the use of specific runways which directed aircraft over less noise-sensitive areas. The major limitation on this alternative was safety considerations. Construction of new runways or extensions of existing runways for preferential use could be considered in the ANCLUC program.[6]

Takeoff and approach profiles, referred to as vertical controls, could be adjusted to place aircraft at a desired altitude with a desired power output, when the aircraft was over a specific noise sensitive area. They are implemented by the pilot through appropriate wing flap and power/thrust controls but are limited by technical and safety considerations.

Takeoff and approach procedures, referred to as horizontal controls, were designed to place aircraft over compatible land uses. These procedures were controlled by the FAA Air Traffic personnel based on safety and efficiency of operations and were subject to pilot acceptance. These alternatives frequently involve increased cost to the air carrier due to the increased fuel usage and operating times.

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[6] FAA, Noise Control Plans, pp. 5-7.

OIA ANCLUC Operational Alternatives

Prior to development and evaluation of operational controls, the OIA study had to identify existing noise impacted areas, verify the baseline noise condition, and develop existing noise contours. In order to establish the baseline conditions, the following data were collected:

Number of scheduled and nonscheduled aircraft operations. Detailed records of this information were collected during the five-month period, March through July 1978, by the FAA Air Traffic Control personnel.

Aircraft mix. The number of aircraft by type (DC10, 727, DC9, 747) which used OIA on a typical day. The mix was important because certain types of aircraft were noisier than others and had different operating characteristics. This information was available from the FAA Air Traffic Control personnel.

Flight track. Aircraft fly within various flight corridors, with the centerline of the corridor designated as the flight track. Review of written directives by Air Traffic Control and review of actual aircraft activity monitored on radar allowed identification of the flight corridors and flight tracks. While the vast majority of all aircraft follow the flight corridors, some stray as a result of weather, emergency situations, pilot error, or some other decision made by the pilot.

Flight track and runway utilization. The direction and percentage of the time that aircraft approach or take off from the airport along each flight track. Aircraft create different noise levels when taking off and landing; therefore, it was important to determine the distribution of takeoffs and landings. This information was available from the FAA Air Traffic Control Tower.

Stage lengths. The stage length is the distance that departing aircraft will travel to their next destination. Longer lengths will require more fuel which results in increased weight and lower takeoff profiles. This information was based on the 1978 schedule of departure destinations.

Nighttime activity. Records of the Air Traffic Control Tower indicated that 19 percent of the air carrier operations occurred at night between 10 p.m. and 7 a.m. These nighttime operations received a special noise penalty.

General aviation and military operations. When compared to commercial aviation, military and general aviation activity did not affect noise conditions significantly at OIA. However, due to their unusual operational characteristics, they were included in the baseline noise analysis.

Aircraft performance data. Additional information such as takeoff profiles, noise characteristics of each aircraft type, and thrust settings were established by the FAA for use in the Integrated Noise Model (INM) computer program.

FAR Part 36 compliance. The FAR Part 36 refers to the federal government's program of reducing noise generated by aircraft engines. Timetables were established requiring new aircraft to be at or below prescribed levels and existing aircraft to be modified or retrofitted to meet the standards. A portion of the national fleet had already been modified or replaced to meet those standards. In determining the baseline noise condition, it was important to determine the percentage of aircraft using OIA that met the reduced noise level standards.

Noise monitoring. A limited noise monitoring program was conducted in the vicinity of OIA during February 1979. The purpose was to gain an understanding of the relative noise impact of individual aircraft flyovers on the surrounding community. The general background and time average noise levels were noted in each area under different operating conditions. Hourly weather information, wind direction, wind speed, temperature, and relative humidity were obtained for the measurement periods from the Orlando Weather Service Office at OIA.[7]

Noise Modeling

The Integrated Noise Model (INM) was a computer program developed and approved for use in the ANCLUC program by FAA. The program combined all of the aircraft data and assumptions to graphically produce contours of equal noise exposure. The contours were suitable for providing comparisons between different projected conditions, provided that basic

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[7] Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan , pp. 29-34.

assumptions and data were consistent in all calculations. Total area, land use, and population within certain contours ccould be quantified to provide a comparison between alternate scenarios. Variables such as typography, weather, vegetation and operational changes can affect the size and shape of noise contours and can cause the contours to be different than under assumed conditions.[8] For purposes of the OIA ANCLUC program the noise contours should be considered representations of an average condition.[9]

Operations Subcommittee Analysis and Response

Collecting, verifying, and analyzing the aircraft data was completed in December 1978 and the noise contours for the baseline 1978 condition were developed. The existing 1978 contour is shown in Figure 11. The existing noise contours, together with the noise complaint data,[10] responses to questionnaires[11] and other input from the public[12] were analyzed by the Operations Subcommittee which identified the following problem areas:

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[8]Federal Aviation Administration, FAA Integrated Noise Model, A User's Guide, U.S. Department of Transportation, FAA Report No. EQ-78-03, January 1978.

[9]Telephone interview with Jerry Roberts, Airport Consultant, Greiner Environmental Sciences, Inc., January 1979.

[10]Approximately five hundred noise complaints were called in to the OIA Noise Complaint Phone Number between 1969 and 1979 (see Appendix B).

[11]Four hundred ten questionnaires were completed at a public meeting on December 12, 1978 (see Appendix C).

[12]Suggestions were made by the general public at a public meeting on December 12, 1978, and Aviation Noise Abatement Council meetings during 1978.

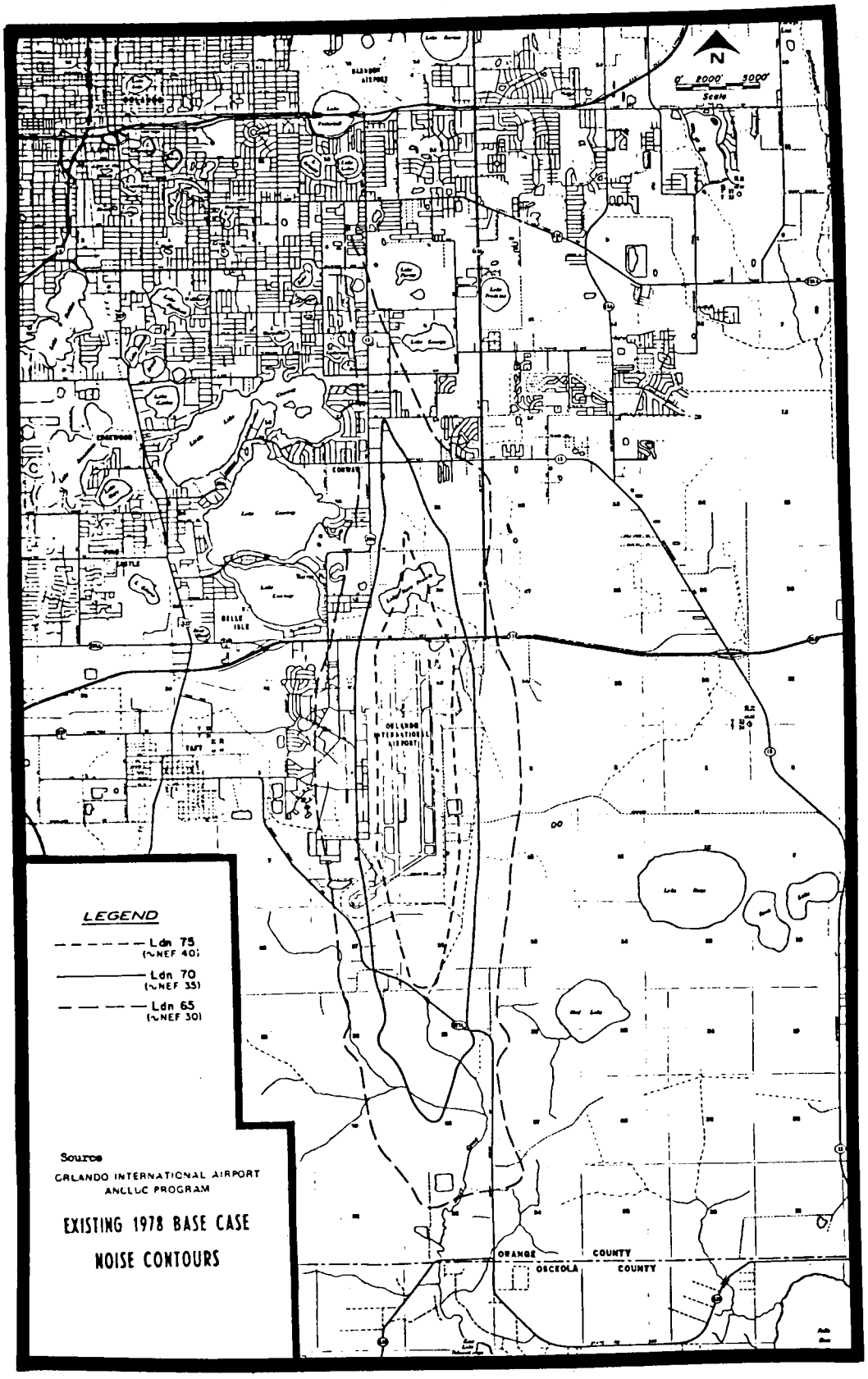

Figure 11. 1978 base case noise contours.

1. The most significant problem areas were north and northwest of the airport where the greatest population densities occurred.

2. With the exception of those living directly below the approach path, takeoff noise was considered to create more problems than approach noise. For those directly under the flight path, noise levels for both takeoffs and landings were perceived about the same.

3. Public input indicated that during approaches from the north, some aircraft approached at lower altitudes than others, thus creating more noise.

4. Residents of Belle Isle indicated that engine run up noise on takeoffs to the south created significantly high levels of noise under certain conditions.

5. The most vocal comment involved turns to the west over the Conway Lakes on northerly takeoffs and approaches from the west over the lake area. These turns had not occurred prior to 1976.

With the problem areas clearly identified, the Operations Subcommittee focused its attention on developing operational changes to mitigate these impacts. Operational alternatives for controlling noise over the short term were developed and the long term implications of alternate future runways orientations were analyzed. Recommendations in a draft form were made by the Operations Subcommittee and were presented to the other ANCLUC committees and the general public in January 1979.

The various citizen groups and the Orange County Planning Department reviewed the recommended operational alternatives and the existing noise contours. Both groups reacted very negatively to the noise contours and operational alternatives. The noise contours seemed

unusually small and the number and type of operational alternatives were very limited.

The Operations Subcommittee incorporated minor revisions recommended by the citizen groups and Orange County but chose to ignore the vast majority of their suggestions. The major issues which the citizens and Orange County wanted resolved included:

1. The Operations Subcommittee developed the long range operational alternatives incorporating one additional runway. The residents opposed this idea and proposed development of a dual diagonal runway system instead.[13]

2. The forecast aircraft traffic was done prior to CAB deregulation which, in Orange County staff opinion, resulted in an extremely conservative estimate of noise impacts. Orange County felt that "due to the inadequacy of the existing noise contours and aircraft forecasts that it was impossible for Orange County to impose permanent land use controls based on that information."[14]

3. All possible aircraft operational changes should be considered and documented whether the committee recommends them or not.[15]

The Operations Subcommittee issued a final report on April 9, 1979, without resolving the issues raised by Orange County and the citizen

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[13]Personal interview with James Erwin, Vice President, Residents Opposed to Airport Roar (ROAR), December 12, 1979.

[14]Letter from James Sellen, Director, Orange County Planning Department, to John Meachum, OIA Airport Manager, January 25, 1980.

[15]Response from Orange County to draft Operation Recommendation, January 5, 1979.

groups. Orange County and the citizen groups spent the next twelve months in efforts to have those issues incorporated into the study.[16]

A citizen group was formed to pursue the dual diagonal runway issue and became known as ROAR--Residents Opposed to Airport Roar. They sought and secured the support of various local governments including Orange County, Orlando, Winter Park, Belle Isle, and Edgewood, the support of Senators Lawton Chiles and Richard Stone, Congressman Bill Nelson and the League of Women Voters. As a result of ROAR's efforts, the GOAA eventually agreed to include the consideration of the dual diagonal runway system in March 1980, a full fifteen months after it was first proposed.

Orange County staff pursued the issues of aircraft traffic projections and consideration of other operational alternatives.[17] The GOAA finally agreed to revise the projections in December 1979 when the County threatened to challenge a bond issue for the new terminal complex in court. However, it was the author's observation that the GOAA was successful in preventing consideration of the vast majority of operational changes that Orange County and ROAR wanted incorporated into the ANCLUC study. The following is a summary of the operational changes to address the identified noise problems as recommended by the Operations Subcommittee in its final report.

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[16]Personal interview with James Sellen, Director, Orange County Planning Department, July 1980.

[17]Ibid.

Short Term Noise Controls North and Northwest of OIA

The final revised Operational Recommendations to reduce the problems caused by the northwesterly turns included:

Establishment of a Terminal Control Area (TCA) for the Orlando area. This form of air traffic control would require that only general aviation aircraft with special radar detection equipment would be allowed to use airspace in the vicinity of Herndon Field. By establishing the TCA, the "black hole"[18] problem could be controlled and aircraft would not be required to take northwesterly or northeasterly turns at low altitudes.

Relocation of the Herndon radar facility. By relocating the terminal radar facility from Herndon Field to the OIA, the "black hole" problem for all aircraft could be eliminated.

Development of a new runway. The development of a new runway would relieve the concentration of aircraft operations in the existing flight corridor and provide more flexibility in air traffic control procedures.

Aircraft Approach and Departure Procedures to Reduce Noise Impacts[19]

To reduce the noise impact resulting from northwesterly turns, the Operations Subcommittee's final report recommended that flight

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[18] A black hole is the area adjacent to and above a radar facility where the radar cannot detect aircraft.

[19] Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, pp. 4-6.

procedures should be modified to require all aircraft taking off to the north for western destinations to continue climbing for a distance of two miles north of the Bee Line Expressway before turning west. This would allow aircraft to gain altitude before turning west over more populated areas.

In order to reduce aircraft flyovers north of OIA, aircraft operations should be emphasized to the south. From 10 p.m. to 7 a.m., when conditions permitted, aircraft takeoffs should be directed to the south and landings to the north. This nighttime control could be accomplished due to the lower level of aircraft activity.

At night and when conditions required takeoffs to the north, they should be directed to a northeasterly heading as soon as possible after the flight track crossed the Bee Line Expressway.

During daytime hours, a southerly approach and departure procedure was recommended. This procedure would allow the majority of takeoff operations to occur over open land south of the airport. Landings would primarily occur over the more developed areas north of the airport. The landing operation was considered less annoying than takeoffs. In addition, the greatest benefits of the retrofit program would be in the landing mode of operations.

For landings occurring from the north, aircraft should be required to maintain higher altitudes on final approach when weather conditions permitted.

For those residents located immediately north of the existing runway system, there was little from an air traffic control standpoint that could be done to reduce noise. The GOAA might have to acquire these homes and relocate the families.

Methods to Reduce Takeoff Roll and Thrust Reversal Noise[20]

The City of Belle Isle, which was the community closest to the OIA runways, indicated that high noise levels within their community were experienced from engine run up on takeoff and thrust reversals on landings. To provide a measure of noise relief for these communities three short term actions were supported by the ANCLUC program.

1. At night, require all aircraft, with the exception of some landings to the south, to use the eastern runway which was farthest from those residents. This would require some aircraft to taxi approximately 1,500 feet further.

2. Require a runway displacement at the 10,500 foot point on the western runway. This would have the effect of placing the beginning of takeoff at a point 2,900 feet south of the Bee Line Expressway.

3. Continue the 990 foot displacement on the eastern runway on landings to the north. This would allow aircraft to fly slightly higher over areas north of the airport and would benefit those living closest to the airport.

Long Term Operational Alternatives[21]

The greatest amount of noise relief for those exposed to noise would result from the development of a new runway or runways at Orlando International Airport. New runway capacity would allow air traffic to be distributed on more runways and provides more flexibility to control noise in heavily populated areas.

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[20] Ibid., pp. 4-6.

[21] Ibid., pp. 6-7.

The Master Plan of OIA completed in 1977 identified a proposed third runway to be developed parallel to and nine thousand feet east of existing runways. The initial intent of the ANCLUC program was to develop long term noise controls based on this new runway. However, due to efforts by the residents and the Orange County Board of County Commissioners, development of a set of runways in a northeast/southwest direction (dual diagonal runways) had to be considered. The Operations Committee was required to conduct noise evaluations for both the parallel and dual diagonal runway systems.

A revised set of forecast data was prepared and provided the basis for long term operations at OIA. A series of long term controls were then investigated including aircraft turns, preferential runway use, alternative procedures for nighttime operations, and ground attenuating devices.

Alternative I. The Long Term Runway Alternative I assumed the development of a new parallel runway nine thousand feet east of the existing runway system. The following operational controls were recommended in conjunction with that runway system:

1. The westernmost runway would be used for nonjet aircraft only. This would substantially reduce the noise effects from the closest runway to affected neighborhoods.

2. During daytime hours, half the operations would be assigned to the existing eastern runway and the other half to the new parallel runway.

3. When wind permitted, aircraft operations should be emphasized to the south. This would place the landing mode which was the least

disturbing to the residents to the north of the airport and the noisier takeoffs to the south.

4. At night, operations should be emphasized to the south and when weather conditions or aircraft activity would not permit all activity to the south the use of the new third parallel runway should be emphasized.

5. Takeoff on the existing eastern runway to the north would be required to climb to an altitude of at least three thousand feet and a distance of four miles north of the airport prior to turning northwesterly.

6. The recommendations to reduce takeoff thrust and thrust reversal presented in the short term recommendations should be maintained.

Alternative II. Long Term Runway Alternative II assumed the addition of a new "dual diagonal" runway system. The operational controls associated with that alternative included:

1. To prevent noise in Osceola County, the predominance of landings should occur from the southwest and takeoffs to the northeast.

2. Since the dual diagonals provided the greatest capacity, virtually all of the daytime operations would occur on the new runways.

3. The use of the diagonal runway closest to the new terminal complex would be emphasized to minimize the aircraft taxi distance.

Analysis of the OIA Operational Alternatives

Data Collection

The first major issue in the operational alternatives element was in the data collection and analysis. When the existing 1978 base

condition noise contour was generated it was apparent that it was much smaller than the noise contours generated during the master planning effort for OIA. A reduction in noise contour size did not seem justified, especially since aircraft operations had almost doubled during the time period. In an effort to understand better the magnitude of the change in contours, the author compared the noise contours to complaint data previously referenced and described. Concern over the reduction in contour size seemed justified by the author's analysis, approximately 62 percent of all complaints were outside of the noise contours and 56 percent of complaint locations were outside of the noise contours. The difference in percentages by complaint number and location was explained by the fact that many locations reported more than one complaint during the study period. In an effort to understand the discrepancies in contour size and location, the author examined the data and assumptions that were input into the INM model as well as how the model utilized that data.

The five month period of data collection appeared to the author to be too short a period for meaningful analysis and forecast of future operations. The data collection and operation forecast were conducted prior to CAB deregulation, which had a significant impact on OIA. CAB deregulation caused the operational data to become outdated during the course of the study.

The applicability of the data from March 19 to July 1978 to normal year round airport operations was questionable. During the data

collection period wind direction was predominantly from a southerly direction with hardly any northerly winds. The runway utilization data for the five months shows a predominance of takeoffs to the south and landings from the north. These data do not reflect accurately the predominant runway utilization or direction of takeoffs and landings.[22] The study data were the exact opposite of the predominant conditions.

The majority of the data collection was done prior to initiation of the study, which created a perception problem and raised questions as to the validity of the data. As the study progressed, this basic data collection was constantly being scrutinized and questioned by participants who were unwilling to accept its validity.

Model Concerns, Issues, and Problems

The second major area of concern was the Integrated Noise Model (INM) and the assumptions on which it was based. The INM could not reflect various weather conditions or changes in weather conditions which have been shown to have a profound effect on noise impacts within an area.[23] The model could not replicate the effects of temperature and humidity inversions which trap and cause in-phase amplification of aircraft noise. Temperature and humidity inversions were quite common in the Orlando area.

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[22]Peat, Marwick, Mitchell, and Co., Analysis of 1985 Airfield and Airspace Capacity, Orlando International Airport.

[23]Telephone interview with Jerry Roberts, Airport Consultant, Greiner Environmental Sciences, Inc., January 1979.

Noise from aircraft is not only directed in front and in back of the aircraft, but there is a significant component of noise generated to the sides of the aircraft. The INM did not address or reflect this component of aircraft noise.[24]

The major deficiency of the model was its inability to measure or project low frequency noise known as aircraft rumble that results from thrust reversal on landing or run up noise on takeoff. This low frequency noise must be measured on a db(B) scale and cannot be measured on the db(A) scale used in the INM. The low frequency rumble was identified as a major problem in the OIA area.

Additional concern was generated as to the desirability and appropriateness of the INM because of its built-in variance of plus or minus 5dB and the model's inability to reflect changing power settings during takeoff and landing. The power setting is the primary determinant of noise generation. Power settings are changed several times during takeoff and landing, resulting in widely varying noise levels. The INM assumed an average power setting throughout the entire approach or departure which created a distortion in the noise contour.

The ability of the model to provide accurately existing and projected noise contours was further compromised by the data and assumptions used by the GOAA consultant. The data and assumptions that seemed suspect included number of aircraft and retrofit compliance.

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[24] Ibid.

The base data on the number of aircraft was so conservative that halfway through the study new data and forecasts were developed to rerun the model.

Regarding retrofit compliance, the INM was programmed to assume a higher percentage of FAR Part 36 quiet type aircraft than was actually occurring at OIA. The 1985 projection assumed 100 percent compliance with FAR Part 36. However, the deadline for compliance with FAR Part 36 regulations was delayed to 1987 with the possibility of the deadline being abandoned altogether. This assumption resulted in over a 30 percent reduction in noise impact area.[25] It appeared that too much emphasis was placed on retrofitting. The benefits of retrofitting are barely noticeable to the human ear. The forecasts did not reflect the percentage of foreign carriers using OIA that did not have to comply with FAR Part 36 or the number of DC8/707 and DC9/727 aircraft using OIA which were exempt from FAR Part 36 regulations.

The INM was programmed to allow operational changes that could only be accomplished if the Terminal Control Area and radar facilities were established at OIA. Neither action could be accomplished prior to 1985 due to funding constraints and construction scheduling.

The ANCLUC program guidelines required that noise monitoring be conducted within the study area in order to calibrate the model. The noise monitoring conducted at OIA was extremely limited on the number of

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[25]Telephone interview with John W. Reynolds, Environmental Planner, Office of Airport Planning and Programming, FAA, October 1980.

locations sampled and in the length of time actually monitoring aircraft. The major concern, however, was that the information which was collected during the monitoring program was not used to calibrate the model.[26]

The GOAA consultant added potential error to the process by programming the INM to have aircraft assigned to a flight corridor, follow the centerline or flight tract of the flight corridor. This programming technique resulted in extremely conservative noise contours, as shown in Figure 12(a). A more realistic approach would be to program the model to identify each flight corridor with several flight tracks and assign a percentage of the operations within the corridor to each flight track. Each flight corridor could be identified by three flight tracks with a 25 percent-50 percent-25 percent operations split, which would result in a more realistic representation of actual aircraft operations and more realistic noise contours, as shown in Figure 12(b).

The GOAA consultant did not program the model to analyze or incorporate ground maintenance areas or aircraft run up areas, both of which could significantly impact the resulting noise projections.

Operational Recommendation Concerns

Review of the draft, final, and revised Aircraft Operation Recommendations prepared by the Operations Subcommittee identified

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[26]Conversation with Rick Alberts, Greater Orlando Aviation Authority Airport Consultant, Greiner Environmental Sciences, Inc., during Technical Coordinating Committee Meeting, November 2, 1978.

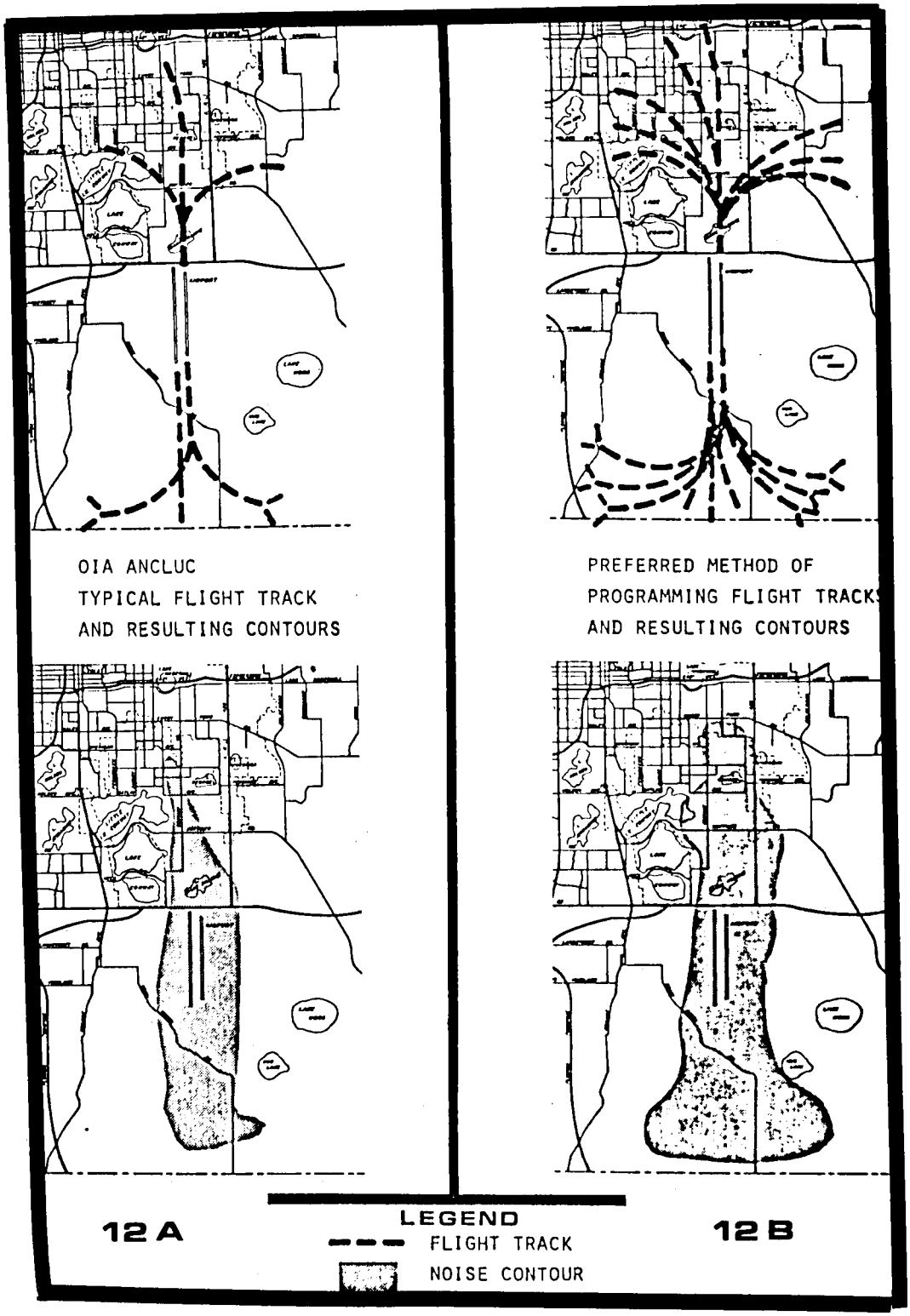

Figure 12. Flight track alternatives.

several issues and problem areas. The first draft report did not contain any background information that was essential in documenting the recommendations so that the other committees and citizen groups would understand and accept those recommendations. Specific information which probably should have been provided includes (1) a full description of the existing operational data on which all of the recommended changes were based, (2) a full description of the noise contour methodology and a discussion of the model's limitations in forecasting accurately noise impact areas, (3) an evaluation and documentation of all the operational alternatives considered by the committee, including the alternatives that were not recommended, and (4) the means by which the operational recommendations would be implemented, monitored, or enforced.

Without this information the other program participants and the general public found it difficult to understand the rationale for the recommendations. The Operations Subcommittee decided not to address these concerns and published a final Operation Recommendation Report in April 1979. For the next eighteen months the remainder of the program was delayed while Orange County and the citizen groups sought to revise the Operations Recommendations. Figure 13 compares the recommendations proposed by the Operations Subcommittee with the recommendations the various citizen groups and Orange County wanted analyzed.

Orange County planners were aware that many of the operational changes they were proposing were difficult from a legal and practical

RECOMMENDED BY OPERATIONS SUBCOMMITTEE	RECOMMENDED BY CITIZENS GROUPS THAT SHOULD BE CONSIDERED
1. AIRPORT RELATED a) Plant trees as noise barrier	1. AIRPORT RELATED a) Construct noise barriers at Belle Isle b) Construct noise barriers at end of runways
2. AIRPORT DEVELOPMENT a) Construct new parallel runway b) Establish terminal control area c) Relocate radar facilities	2. AIRPORT DEVELOPMENT a) Construct dual diagonal runways b) Consider abandonment of airport
3. AIRCRAFT OPERATIONS a) Takeoff to north for western destinations, climb two miles north of OIA before initiating turn b) Takeoff to north for all other destinations, take northeasterly heading as soon as possible c) During day, emphasize southerly approach and departure	3. AIRCRAFT OPERATIONS a) Takeoff to north for western destinations, circle 270° and eliminate turn over residential area b) Takeoff to north for all other destinations take immediate 60° turn in northeasterly direction c) Thrust cut back after takeoff and reduce flaps d) Consider time of day restrictions on noisy aircraft e) Consider curfews: 1) On all aircraft at night 2) On noisy aircraft at night 3) On noisy aircraft at any time f) Establish aircraft weight limits g) Relocate runup and maintenance areas h) Regulate time of ground operations

Figure 13. Short and long term noise abatement alternatives.

4. PREFERENTIAL RUNWAY USE a) At night emphasize operations to the south b) At night emphasize use of eastern runway c) Establish runway threshhold displacement on western runway and continue displacement on eastern runway d) When new parallel runways constructed, westernmost runway will be for non-jet aircraft e) New runway take half of all operations, easternmost runway take remainder f) At night, all operations to the north on new runway	4. PREFERENTIAL RUNWAY USE a) All operations should be on the dual diagonal runways
5. CLIMB AND APPROACH PROFILES a) Landings from north maintain higher altitude on final approach when weather permits	5. CLIMB AND APPROACH PROFILES a) Establish higher holding and maneuvering altitudes and raise the glide slope intercept altitude b) Require a steeper glide slope c) Require a two segment approach from 6° to 3° at three miles and 1000 altitude d) Require a two segment approach from 6° to 3° at one mile, 250-400 feet altitude under automatic control conditions e) Delay flap and landing gear extension.

Figure 13 (continued)

standpoint.[27] However, to achieve a thorough and comprehensive study on behalf of the public, those alternatives should have been considered and documented. In addition, the County planners requested documentation of the tradeoffs involved in implementation of the different operational alternatives. The planners felt that it was important to know if a particular alternative would reduce one noise contour but extend another, thereby providing some relief to one group of residents at the expense of another group.

Detailed analysis of the final revised operational recommendations by the Operations Subcommittee also raised numerous issues. The subcommittee chose not to consider many operational alternatives, including curfews and restrictions, eliminating them from consideration because they were often illegal and restrained interstate commerce and trade. Despite the subcommittee's report, curfews and restrictions were allowed in the ANCLUC program as the guidelines clearly state. Before they could be implemented, FAA must make a determination regarding their legality and appropriateness in a specific case. The GOAA and ATA were not willing to take a chance that curfews and restrictions might be appropriate and therefore did not submit a proposal for FAA consideration.[28]

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[27] Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, January 1981.

[28] Interview with Rick Alberts, Greater Orlando Aviation Authority Airport Consultant, Greiner Environmental Sciences, Inc., May 1981.

When the residents in ROAR first requested consideration of dual diagonal runways, it was the author's observation that the GOAA and Operations Subcommittee refused and opposed the request at every level of authority. The GOAA first held the position that consideration of dual diagonals was beyond the scope and purpose of ANCLUC. ROAR refuted that claim and secured an FAA policy position that supported their contention that consideration of new runways was well within the scope and purpose of ANCLUC. The GOAA had difficulty opposing the dual diagonal runway system, since the residents got the idea for the runways out of the approved OIA Master Plan. The dual diagonal runway system was one of several long range alternatives considered in the Master Planning process. GOAA then sought to eliminate the dual diagonal runways from consideration on the grounds that (1) the prevailing winds would prohibit the use of those runways, (2) the dual diagonals would reduce capacity at the airport and would create airspace conflicts with Herndon and Kissimmee Airports, and (3) the Florida Department of Environmental Regulation (FDER) would not allow the construction of the dual diagonals because the proposed location had severe environmental constraints.[29]

It was the author's observation that ROAR was successful in countering each of those arguments. It provided documentation that indicated that every major airport in Florida had diagonal runways and were not experiencing operational problems due to prevailing winds.

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[29]John Meachum, Summary of Minutes, Technical Coordinating Committee Meeting, April 9, 1979.

ROAR referenced the OIA Master Plan to demonstrate that the dual diagonals would increase the airport capacity and would not result in airspace conflicts with other airports as contended by the GOAA. Finally, ROAR was able to secure a FDER report which would allow the construction of the runway system without having adverse environmental impacts. After eighteen months, the legitimacy of ROAR's request was recognized and the dual diagonal system was incorporated into the ANCLUC study.[30]

Other serious concerns in the Operation Recommendations element of the study were not readily apparent to the general public or other program participants. The most serious problem was the inability to enforce the operational alternatives. The ATA and Airline Pilots' Association indicated that the operational changes would not be enforceable. The magnitude of the problem is shown by the following examples.

The operational recommendations depend on aircraft following narrowly defined flight tracks. However, the Director of GOAA or the Air Traffic Control Tower Chief can change those flight tracks at any given time and both were unwilling to commit to a contractual agreement that required enforcement of the recommended flight tracks.

In addition to the Director and the Tower Chief, individual pilots could change the flight tracks. Once an aircraft was airborne, the

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[30]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan.

pilot could deviate up to several miles within the general flight corridors. There was no way to penalize a pilot who did not follow the required flight path.

Airline pilots indicated that they would not follow the instrument landing procedures adopted for noise abatement.[31] They preferred to switch from the instrument landing approach to visual approach as soon as possible as they felt that this gave them more control of the aircraft. On visual approach pilots flew at altitudes much lower and noisier than was recommended for noise abatement.

Displaced thresholds and intersection takeoffs recommended by the Operations Subcommittee were not likely to be followed. The pilots preferred to take advantage of the full runway available to them.[32]

With OIA's twelve thousand foot long runways, thrust reversal was not necessary for safe stopping. However, the airlines continued to require the use of thrust reversal to reduce taxi distance which resulted in an operating cost savings to them at the expense of the adjacent residents.[33]

The existing noise abatement procedures for OIA, which included prohibiting all flights over the Conway Lakes, were never implemented.[34] It was questionable whether the GOAA would enforce the new operational

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[31] Summary of Minutes, Technical Coordinating Committee, April 9, 1979, pp. 1-6.

[32] Ibid.

[33] Ibid.

[34] Interview with Mayor (Belle Isle) Earl Diemund, Public Involvement Subcommittee and Aviation Noise Abatement Council, March 1979.

recommendations, especially since it did not agree with or support many of them.

Concern was also raised regarding many of the Operational Recommendations possibly misrepresenting the potential for noise reduction benefits. One recommendation stated that the construction of the new runway(s) would benefit noise reduction by reducing the percentage of operations on the westernmost runway adjacent to residential areas.[35] It was true that it would reduce the percentage of operations on that runway but it would not reduce the number of aircraft operations using that runway. Rather, the number of aircraft operations would actually increase on that runway, but those operations would be a smaller percentage of the total operation due to the tremendous increase in aircraft traffic. At the time of this study, the western runway carried 35 percent of the aircraft operations, or 105 operations a day. Projections were that by 1985 it would carry only 25 percent of the aircraft operations, which would be 150 operations based on a daily traffic estimate of 600 operations.[36] There would be a 10 percent decrease as a percentage of total operations but an actual 43 percent increase in the number of operations compared with 1982 conditions.

This created the situation where the operational alternative would not reduce noise in the existing neighborhood as the residents were led to believe, but merely shift the additional noise from increased operations to new areas.

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[35]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, pp. 6-7.

[36]Peat, Marwick, Mitchell and Co., Analysis of 1985 Airfield and Airspace Capacity, Orlando International Airport, pp. 1-20.

CHAPTER V

CITIZEN PARTICIPATION PROGRAM

FAA Requirements for Citizen Participation

The Aviation Noise Abatement Policy recognized that when communication between noise makers and noise receivers was inadequate or nonexistent, noise situations deteriorated rather than improved and were prone to result in some aggressive action on the part of the affected jurisdictions.[1] Community mobilization and legal actions had the effect of slowing existing airport development and virtually preventing the construction of any new major airports. Opposition groups were organized seemingly overnight; projects were challenged on environmental grounds; and in some cases, whole political power bases were changed based primarily on a position taken on an airport development.

The ANCLUC program defined citizen participation as an open process by which the rights of the citizen to be informed, to influence, and to receive an adequate response from government were reflected.[2] The Citizen Participation program required a representative cross section of affected citizens to interact with appointed and elected officials on all issues of airport planning and development. The citizens who

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[1] FAA, Aviation Noise Abatement Policy, pp. 50-54.

[2] Federal Aviation Administration, Citizen Participation in Airport Planning, U.S. Department of Transportation, FAA-AC 150/5050-4, 1975, pp. 108.

participated in the process identified and examined all reasonable alternatives and their consequences to assist the decision makers in choosing a course of action that they believed was needed and that they felt would best serve the needs and objectives of the community.[3] The FAA guidelines for citizen participation were based upon experience both within airport planning and the general field of urban planning. However, the guidelines were flexible so as to recognize that citizen participation in the public planning and decision making processes was a continually evolving process.

The basic objectives of the FAA Citizen Participation Program in the ANCLUC process were to improve the planning process, minimize controversy, and gain public support for the final plan. The FAA contended that the planning process could be improved through a clear identification of the citizens' views on all proposals that were developed in the planning process by assisting in the identification of the goals, objectives, and values of the affected community. Controversy could be minimized by identifying and resolving sensitive issues via citizen involvement before they became controversial. Citizen participation was also seen by the FAA as an educational process which informed the general public.[4]

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[3]Federal Aviation Administration, Airport Land Use Compatibility Planning, U.S. Department of Transportation, FAA-AC 150/5050-6, December 1977, Ch. 1, p. 5.

[4]Federal Aviation Administration, Citizen Participation in Airport Planning, U.S. Department of Transportation, FAA-AC 150/5050-4, 1975, pp. 1-5.

Public hearings have been the traditional means for involving the public in airport planning programs. However, a major shortcoming of this type of approach is that such hearings, although they allow the public to express its opinions, do not provide the best forum for continuing evaluation and discussion of alternatives and issues. To correct this deficiency, the FAA provided for two levels of citizen participation--a minimum level program for simple, noncontroversial studies and a comprehensive program suitable for complex and controversial studies. The minimal level program included a public information program and an optional series of public information meetings. The comprehensive program included a citizen planning group which was open to all interested citizens. This group was to work and interact with planners in identifying issues, relating them to community goals and values, and selecting alternatives. The comprehensive program also included a significant public information program. Due to the complexity and possible controversy involved in ANCLUC, the FAA required that the citizen participation program for ANCLUCs be the comprehensive program. The level of citizen involvement in ANCLUC should be proportionate to the complexity of the planning study and to the degree of public interest likely to be generated.[5]

The emphasis in the FAA guidelines was placed upon the early involvement of citizens in the planning process and early identification of potentially controversial issues or alternatives. Citizen

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[5]FAA, Airport Land Use Compatibility Planning, Ch. 1, pp. 5-6.

involvement has its greatest effect during the formative stages of the planning process, before irreversible decisions have been made and while the maximum number of alternative actions are still available. Citizen involvement should be encouraged as early as possible during the development of the work program. If citizens are involved from the beginning, the planners may proceed with reasonable confidence that their actions are in accord with the community needs and desires. Chances that recommendations may be overturned by adverse reactions at public hearings can be greatly reduced. Conversely, the frustration generated if citizens become aware that important decisions were made before they were invited to participate can quickly translate into distrust of the professionals and can lead to project opposition. The professionals also may react to public input that is provided late in the study with greater reluctance to make changes. The tendency instead is to defend previously determined courses of action rather than to explore any new information or views received.

The ANCLUC program should reflect a sensitivity to and a positive attitude towards citizen involvement in the planning process. The program participants must be indulgent of the extra time and effort that will be required. FAA experience in citizen participation has shown that the professionals involved in the program must gain the confidence of the citizens and overcome initial prejudices before any real progress can be made.[6] The FAA has not been able to ascertain which public

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[6]FAA, Citizen Participation in Airport Planning, pp. 8-10.

involvement methods and techniques are most successful. However, the results of their analysis indicates that airport planning processes with the most open and comprehensive public involvement programs paid dividends in improved public relations and public support of the airport development proposal.[7]

In technically complex studies such as ANCLUC, concern is often raised that the average citizen who may participate would not be able to grasp the technical data necessary to have meaningful input. The FAA has found that the average citizen is able to assimilate the technical data to a degree necessary to articulate proposals which he/she believes would relieve the noise problem.[8]

OIA Public Involvement Program

The formal citizen participation program for the OIA ANCLUC study was identified and found to be consistent with the FAA guidelines in the approved workscope.[9] The stated purpose of the program was two-fold. First, it was designed to gather input from the public concerning noise impacts resulting from operations at OIA. Second, the program was to facilitate public education by providing a forum for discussion of the

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[7] FAA, Airport Noise Compatibility Planning and Programs, Ch. III, p. 17.

[8] Ibid.

[9] Greiner Environmental Sciences, Inc., Orlando International Airport, ANCLUC Work Program, pp. 1-10.

identified problems, alternative solutions, and the reasoning behind the selection of a preferred alternative.[10]

A Public Involvement Subcommittee, consisting of four citizens from the affected areas, was to be responsible for the formulation of the Public Involvement Program and its execution. The subcommittee was responsible for advising local citizens of public meetings and for providing citizen input during the study period.

Three formal public meetings were held during the study in addition to a number of informal informational meetings. For the convenience of the residents, the public meetings were held in the evening at local schools in the general area affected by aircraft noise. At each of the meetings, information was available for review, formal presentations were given, and the meetings were opened for comments and suggestions by the general public.[11]

The first public meeting was held on December 12, 1978, at the Conway Junior High School which was located two miles north of the airport. The purpose of the meeting was to familiarize the general public with the ANCLUC program, to gain initial insight into the concerns expressed by the affected residents and to receive input on the acceptability of various land use control techniques. Between 200 and 250 residents were in attendance. In addition to receiving verbal

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[10] Ibid., p. 2.

[11] Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, p. 18.

comments at this meeting, a questionnaire[12] was given to all who attended. The questionnaire was designed to aid in the identification of high noise impact areas and the type of aircraft operations that were causing noise problems. It also provided residents an opportunity to suggest possible solutions. The focus of the first meeting was primarily on identifying the immediate noise problems for which short term solutions were needed. The responses to the questionnaire were tabulated and reviewed by the various committees. The information and recommendations that were received provided a great deal of the basis for the short term air traffic control changes that were recommended by the Operations Subcommittee.[13]

The second public meeting was held on March 14, 1979, again at the Conway Junior High School. The meeting was held to present the preliminary operational controls being proposed by the Operations Subcommittee to reduce the identified noise problems and to present preliminary concepts for land planning and development control. However, the primary interest of the residents who attended the meeting focused on an ultimate, long term control for aircraft noise which they felt would solve all of the noise problems associated with OIA. Over 1,100 residents affiliated with a newly formed group called ROAR, Residents Opposed to Airport Roar, attended the meeting. ROAR's proposal was that the best solution for the noise problem was to

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[12] A copy of the questionnaire is included in Appendix C.

[13] Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, pp. 1-2.

develop two new runways in a northeast/southwest orientation known as the dual diagonal runway system. Their reason for supporting this solution was that all takeoffs and landings from this new runway system would occur over areas which were undeveloped and would allow the existing runway system to be utilized infrequently or not at all.[14]

It was the author's observation that for the next twelve months, until March 1980, the GOAA and the airlines' representative, the ATA, opposed ROAR's efforts to have consideration of the dual diagonal system incorporated in the study. Finally, as a direct result of ROAR's efforts and Orange County's support of ROAR's position, the Greater Orlando Aviation Authority allowed the consideration of this alternative.

The scope and direction of the ANCLUC program shifted significantly as a result of this citizen mandated change. Prior to inclusion of the dual diagonal system, all long term operational alternatives were being developed based on the runway improvements recommended in the existing Master Plan for the airport. The Master Plan recommended a third parallel runway to be constructed approximately nine thousand feet east of the existing system.[15]

When the dual diagonal runway system was incorporated into the analysis, the ANCLUC program was six months past its deadline for

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[14]Summary of Minutes of Public Meeting for ANCLUC Study, March 14, 1979.

[15]Landrum and Brown, Orlando International Airport Master Plan (San Francisco: Landrum and Brown, 1977).

completion, with less than one third of the study finished. However, before the study could proceed further, an additional delay was required so that the following information could be developed or revised:

1. A preliminary study to conceptually locate the proposed dual diagonal runway system without adversely impacting significant wetlands in the area.
2. A preliminary cost estimate for the dual diagonal runway system.
3. A capacity study comparison of both the dual diagonal and third parallel runway systems.
4. Development of noise contours for both runway alternatives.
5. Population estimates within the high noise impact areas that result from both alternatives.
6. An aircraft operations forecast update to reflect the tremendous traffic increase as a result of CAB deregulation as requested by Orange County.[16]

Without these studies, a comparison of the noise and land use impacts between the two long term runway alternatives could not be evaluated. The various studies were accomplished and the ANCLUC program was reactivated in June 1980.

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[16]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, pp. 60-65.

The third formal public meeting was held at Conway Elementary School on September 29, 1981.[17] The purpose of this meeting was to review the results of the studies on the dual diagonal runway system alternative and to receive final input from the public on proposed land planning and development controls. During the period between the second and third public meetings, a second citizen group was formed. The Residents Against Diagonal Airport Runways (RADAR) were, as the name implies, opposed to the dual diagonal runway system supported by ROAR and generally supported the long term runway proposal for a third parallel runway as identified in the Master Plan. The RADAR group was composed of citizens who were experiencing aircraft noise only to a limited degree and who felt that the dual diagonal runway system would place the large majority of the noise burden on them.[18]

The third public meeting was attended by about four hundred persons including representatives of both ROAR and RADAR. There was general agreement that since there was strong support for each of the alternatives, that both long term alternatives should be included in the final ANCLUC report.[19] In terms of land use controls, few comments were received. The residents felt that any land use controls that were established should not be made retroactive on existing development.[20]

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[17] Summary of Minutes of Public Meeting for ANCLUC, September 29, 1981.

[18] Ibid.

[19] Ibid.

[20] Creiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, p. 25.

The remainder of the discussion at the third meeting involved the implementation program for the ANCLUC recommendations. The public wanted the ANCLUC report to describe the responsibilities of each of the participants and the establishment of a procedure to document when the recommendations were not being complied with. It was also recommended that a procedure be established for penalizing or fining those who violated the established noise abatement procedures.[21]

Public input was received in a number of other ways besides the formal public meetings. Orange County, during its review of the preliminary land planning and development controls, held a number of workshops for the general public which were well attended. Additional citizen input in the form of documented noise complaints was of valuable assistance during the course of the study.

Analysis of the Citizen Participation Program

The FAA guidelines emphasized the need to involve a representative cross section of the noise impacted community in the ANCLUC planning process. The appointment of four representatives with no experience in formulating and implementing a major citizen participation program made it difficult to understand how the GOAA expected to get active involvement of a representative cross section of the community. It appeared to the author that the OIA ANCLUC placed too great a

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[21]Summary of Minutes of the Public Meeting for ANCLUC Study, September 29, 1981.

responsibility for the formation and execution of a major citizen participation program affecting over fifty thousand people on four inexperienced local residents. Furthermore, the GOAA may have made a major error by trying to interact only with the representatives of the affected community rather than working with the community. It was the author's observation that the Public Involvement Committee was being used to insulate the GOAA and other program participants from direct contact with the affected residents.

In appointing the specific members to the Public Involvement Subcommittee, the GOAA seems to have had a hidden agenda. It appointed representatives who had been strong opponents to previous airport development projects in an effort to neutralize their efforts and divert their attention.[22] The GOAA had hoped that these opponents would be too busy trying to establish and conduct the citizen participation program to analyze, object to, or oppose it.[23] The GOAA also used these appointments to add legitimacy to the program. It actually was able to create situations where these past opponents were forced to defend the legitimacy of the study because they were involved in it. The GOAA was successful to some extent in that a great deal of the Public Involvement Subcommittee's time was spent discussing past accomplishments that the opponent/committee members helped develop rather than spending that

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[22]Interview with Rick Alberts, Greater Orlando Aviation Authority Airport Consultant, Greiner Environmental Sciences, Inc., May 1981.

[23]Ibid.

time reviewing the progress made in the ANCLUC study and having input into the process.[24]

The FAA and OIA ANCLUC programs both emphasized that the citizen participation program was to be an educational process. To conduct a citizen participation program aimed at educating the public is a fast and sure way to ensure the failure of a program.[25] Education is one of the things that should happen as a result of an effective citizen participation program. However, when the objective is to educate, the impression is given that the organizers know what is good for the community and they are going to start to educate the community. Few if any citizen groups would agree or accept such an approach.[26]

That was precisely the situation that ROAR members described when they stated that they often felt that solutions were being imposed on them.[27] The public felt that they were not being asked to examine the whole range of options and alternatives, but only to examine and approve the recommended alternative. It should not have surprised the GOAA that residents did not support this approach and demanded that all alternatives be included for consideration and that the consideration

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[24]Interview with Mayor (Belle Isle) Earl Diemund, Public Involvement Subcommittee and Aviation Noise Abatement Council, March 1979.

[25]Hans Bleiker and Marvin Manheim, Citizens Participation Handbook (Massachusetts Institute of Technology: Institute for Participatory Planning, 1979), Ch. III, p. 12.

[26]Ibid.

[27]Interview with James Erwin, Vice President, Residents Opposed to Airport Roar (ROAR), May 1981.

of the alternative be documented. This demand was ignored and finally openly opposed by the GOAA. It appeared to the author that if all the alternatives and options were presented to the residents in an honest manner, they could have come to the same conclusions as the GOAA and the Operations Subcommittee. Instead of giving the residents that opportunity, the GOAA took the attitude that they were the experts and had good reasons to believe that ROAR's ideas were naive and had little practical merit.[28] The GOAA's unwillingness to consider and document the various alternatives could only be interpreted by the residents and other study participants as an indication that the reasons for rejecting those alternatives were not legitimate and defensible.[29]

The OIS ANCLUC participants appeared to ignore a warning in the FAA guidelines cautioning against underestimating the ability of the residents. It appeared that the program participants did underestimate the ability of the residents to comprehend the technical aspects of the study, the expertise the residents developed and, most importantly, their perseverance. Many of the participants expressed the opinion that only they, the professionals, understood the ANCLUC program and that the residents did not. In the instances where the residents did not have the experience, qualifications, talent, knowledge, or expertise, they went out to secure that expertise even if it cost them relatively large

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[28]GOAA comments at the Operations Subcommittee Meeting, January 1980.

[29]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, January 1981.

sums of money.[30] It appeared to the author that the GOAA and the ATA were both susceptible to this oversight. They often expressed the opinion that they knew what alternatives were legitimate and feasible, and the residents did not. They expressed the opinion that they understood the consequences and impacts of the various alternatives, and the residents did not.[31] It appears that the GOAA and the ATA did not understand the residents and as a result may have committed perhaps the most serious error of a citizen participation program defining the issues and options more narrowly than the public perceived them. The resentment and opposition of the residents to being told what was best for them and being told what they could or could not consider nearly destroyed the effectiveness of the entire ANCLUC program.

The residents and members of ROAR were of the opinion that the GOAA and ATA were not providing all of the information and documentation that was relevant to the study.[32] This was contrary to the FAA definition of citizen participation which was "an open process in which the rights of the citizen to be informed, to influence and receive an adequate response . . . ."[33] It was the author's observation that as a result of

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[30]Ibid.

[31]Summary of Minutes, Operations Subcommittee Meeting, February 2, 1979, and February 8, 1979.

[32]Letter from Mayor Earl Diemund to James E. Sheppard, Chief, Miami District Office of FAA, April 9, 1979.

[33]FAA, Citizen Participation in Airport Planning.

those actions ROAR chose to no longer work through the ANCLUC committee structure and developed its own sources of data and information.

The FAA guidelines for citizen participation programs required and recognized the need for early involvement by the public.[34] It was also recommended that the citizens be allowed and encouraged to work and interact with the various committees of the ANCLUC program. The OIA ANCLUC specifically excluded the public and their representatives from the important Technical Coordinating Committee and the Operations Subcommittee. In addition the OIA program was not designed to encourage or allow early involvement of the public in the study. The first public meeting was not held until six months after approval of a scope of work. The FAA recognized but OIA chose to ignore the fact that the public has potentially valuable input into those prior activities and should have been allowed to participate in them.

Most citizen participation programs recognize the need to have the public involved early in the process before irreversible decisions are made. Citizen involvement has its greatest effect during the formative stages of planning while the maximum number of alternative actions are available. Early involvement by the public decreases the likelihood that adverse public reaction will follow. FAA guidelines reflected their experience with the results of the frustration of citizens that is generated when the public becomes aware that important decisions have been made before they had been invited to participate.[35] That citizen

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[34] Ibid.

[35] Telephone interview with John W. Reynolds, Environmental Planner, Office of Airport Planning and Programming, FAA, October 1980.

frustration often translates into distrust of the professionals and opposition to the project. The residents who attended the public hearing expressed such frustration.

The purpose of the first public meeting was to familiarize the public with the ANCLUC program and to gain an insight into their concerns and their ideas on how to solve the noise problem. Dozens of citizens spoke at the meeting in an effort to identify some of the high noise locations, the operations causing their problems, and suggested solutions. The GOAA consultant responded to each of those speakers with comments such as, "That solution is not feasible," "We have already looked at that," and "We have examined that alternative and . . . ."[36] It appears that the residents interpreted these responses to mean that the program and many key decisions were further along than they were led to believe. At the beginning of the meeting, residents were told that their input and the questionnaires would be used to identify problem areas so that the subcommittee could then develop appropriate operational solutions. The GOAA consultant seemed to be implying that those alternatives had already been examined and decisions had been made. This concern of the residents was reinforced when the consultant explained that the operations data had been collected prior to initiation of the study and that the decision had been made to construct a third parallel

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[36]Summary of Minutes, Public Meeting, December 12, 1978, pp. 1-12.

runway. Several residents quickly expressed their opinions that the study appeared to be a fraud and one resident made an impassioned plea to all the residents to unite in one group. Additional problems surfaced at that first meeting that ultimately influenced the effectiveness of the participation process.

Several residents who were quite knowledgeable in airport/aircraft operations corrected the GOAA consultant who had misrepresented several items and contradicted himself several times in response to specific questions by the residents. It was the author's observation that the consultant lost one of the essential assets in a citizen participation program--his credibility.

Orange County, as an active participant and cosponsor in the study, was perceived by residents as being on the side of the airport's interests rather than on the side of the interests of the residents.[37]

At the second public meeting, the residents were organized and extremely well prepared. Since they had not been involved in what they perceived as major decisions in the ANCLUC study, they chose to reject the ANCLUC study.[38] They rejected and ignored the study's design, structure, and approach and offered their own solution to the noise problem instead--construction of a dual diagonal runway system.

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[37]Interview with Mayor (Belle Isle) Earl Diemund, Public Involvement Subcommittee and Aviation Noise Abatement Council, March 1979.

[38]Jim Erwin, Summary of Minutes, Public Meeting, March 14, 1979.

Realizing that they were losing control of the meeting and possibly the whole ANCLUC study, the GOAA was reluctant to change its prior position or decisions. Rather than taking the time to analyze the proposal before reacting, the GOAA publicly opposed consideration of the dual diagonal runway system at the meeting saying that such a system was not feasible. The residents had anticipated and prepared for this response. They introduced the OIA approved Master Plan which clearly demonstrated that the dual diagonal runways were feasible and in fact was identified in the Master Plan as the best alternative from a noise abatement standpoint. The dual diagonal runway system was not considered the preferred alternative even though it met all of the FAA guidelines because it was more expensive than the proposed third parallel runway.[39]

During the next twelve months the GOAA, ATA, and FAA Regional Office staff seemed to do everything in their power to oppose inclusion of the dual diagonal runway system in ANCLUC. The program participants publicly denounced the ROAR proposal as not being feasible. ROAR quickly countered that argument with the data and analysis provided in the OIA Master Plan that conclusively showed that a dual diagonal runway system was feasible.[40]

Opponents argued that consideration of dual diagonal runways was beyond the scope of ANCLUC. The GOAA was even successful in obtaining a letter from the FAA Regional Office in Miami that confirmed this

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[39]Landrum and Brown, Orlando International Airport Master Plan, 1977.

[40]Ibid.

opinion.[41] ROAR went to the FAA headquarters in Washington, D.C., to obtain a letter indicating FAA official policy on the construction of new runways in ANCLUC. FAA's policy position to ROAR was that new runway construction was an appropriate alternative for consideration in ANCLUC and might even be a required alternative in ANCLUC studies.

GOAA's next effort at preventing inclusion of dual diagonal runways was to have the FAA Regional Office analyze the air traffic forecasts for OIA to determine if the additional capacity provided by the dual diagonal system was needed. The FAA Regional Office issued a letter that concluded the dual diagonals could not be justified due to a lack of sufficient air traffic to support the increased capacity that would be provided by a dual diagonal runway system.[42] ROAR researched the issue and was able to prove that FAA analysis was based on outdated traffic forecasts that showed 1990 traffic estimates lower than the traffic volumes then being experienced by OIA. When confronted with ROAR's information, FAA staff rescinded their previous letter to the GOAA[43] and blamed the GOAA for not providing updated information. The FAA staff did have more recent information on which to base a decision. That information was provided by GOAA to justify the new terminal complex construction grant.

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[41]Memorandum from Manuel Rodriguez, FAA Staff, to John Meachum, Greater Orlando Aviation Authority, April 9, 1979.

[42]Ibid., June 1979. Subject: Capacity Justification for Dual Diagonal.

[43]Ibid., June 21, 1979 (Revised). Subject: Rescind Memo of June 1979.

GOAA offered a compromise solution and performed a preliminary analysis for a single diagonal and submitted that analysis to FAA, Miami. FAA rejected that analysis because the single diagonal runway would actually reduce capacity[44] at the airport and result in air traffic conflicts. ROAR countered those arguments by showing that they were aware of the problems associated with the construction of a single diagonal runway and that was why they were recommending a dual diagonal system. A dual diagonal system had already been shown to be acceptable to the FAA in the OIA Master Plan.

The GOAA's last argument against the dual diagonal system was based on the environmental constraints and limitations of the proposed site of the dual diagonal runways. ROAR had State and County environmental agencies analyze the site to confirm the GOAA contention. The findings of those agencies were that there were no environmental problems with locating the dual diagonal runways at the proposed site.[45]

During the twelve months that the GOAA opposed the inclusion of the dual diagonal runways into ANCLUC, ROAR was developing support for that proposal rather than just countering the GOAA's efforts. ROAR was aware that they could fight and win, even in court, if their input was not adequately considered in the ANCLUC program.[46] However, rather than

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[44] Ibid., August 1979. Subject: Analysis of Single Diagonal Runway System.

[45] Florida Department of Environmental Regulation, Orlando, "Preliminary Analysis of Dual Diagonal Runway System on Wetlands," November 1979.

[46] James Erwin, "Newsletter No. 3," Residents Opposed to Airport Roar (ROAR), June 4, 1979.

stay on the defensive, ROAR developed a strong power base of support as well as significant political support for their proposal. It developed the factual information adequate to convince several congressmen, senators, and city and county commissioners who publicly offered their support of ROAR's proposal. With the weight of factual information, public support, and political support, it was inevitable that the GOAA would have to include the dual diagonal system in the ANCLUC study.

The twelve months of staff effort and expense that the GOAA had allocated to opposing the dual diagonal system appears to have been wasted. Had that staff time and effort been put into studying the proposal rather than opposing it, the OIA ANCLUC could have been completed on time and with more public support of the final plan.

The author's observation was that the GOAA's opposition to the dual diagonal runways had lasting repercussions. The reaction of the citizens to the GOAA opposition was that they became suspicious and distrustful of everything in the ANCLUC study. The residents went back through the study and scrutinized every detail and assumption and questioned every recommendation as well as the data it was based on. They required written proof and documentation for everything. ROAR, through the course of its inquiries, discovered a major error by the professionals involved in the study. ROAR discovered that the professionals had not been monitoring and incorporating changing conditions during the course of the study that could affect significantly the

outcome of the study. Changing conditions included CAB deregulation with the resulting increase in air traffic, the extension of the FAR Part 36 deadlines that would result in noisier aircraft, new forecasting and modeling techniques, and a rash of aircraft accidents across the country which heightened the residents' fears of accidents. All of these conditions should have been incorporated into the ANCLUC study. The professionals did not reflect those changes in their analysis and it was the author's observation that they suffered a loss of credibility with the residents.

It appeared that the various consultants were not as objective and critical of their own work as they could have been. They had a difficult time accepting constructive criticism from the residents and often would defend their work with a less than adequate response.[47] The residents, who were well prepared and knowledgeable about an issue before discussing it, would point out numerous errors in the consultant's response, causing the consultant further embarrassment and loss of credibility. The professionals were not willing to admit that the residents were raising legitimate questions or that they were suggesting feasible solutions. It appeared that the professionals did not want to accept the recommendations of the residents because they felt that the residents were infringing upon their area of expertise and influence.[48]

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[47] Summary of Minutes, Public Meetings, December 12, 1978, and March 14, 1979.

[48] Interview with George Hoffman, Orange County Airport Consultant, Howard, Needles, Tammen, and Bergendoff, October 1980.

At the third public hearing, the implementation, enforcement, and monitoring of the ANCLUC recommendations became an issue due to the apparent lack of trust and credibility of the GOAA and ATA. At that meeting, the residents came to the realization that much of what they had fought for and accomplished was dependent on voluntary compliance by GOAA and ATA for implementation. With the past record of GOAA and ATA, the hope for significant implementation of the study's recommendations was doubtful.

It was the author's observation that ROAR also seemed capable of significant misrepresentations, misquotations, exaggeration, and deceit in their mailouts and presentations when they thought it would serve their purposes. Much of the information which it misrepresented was information supplied by or attributed to the Orange County Planning Department. When the County staff would confront ROAR representatives concerning the accuracy of their information or misquotations, ROAR would apologize and assure the staff that it would not happen again.[49] However, the errors continued. Orange County staff offered to review all of ROAR's information prior to distribution but ROAR chose not to accept the offer. This misrepresentation seriously hurt the credibility of the County staff with other participants in the study.[50] When the GOAA was discovered making similar errors, they were forced to admit

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[49]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, January 1981.

[50]Interview with Rick Alberts, GOAA Airport Consultant, Greiner Environmental Sciences, Inc., May 1981.

publicly their errors and to correct all documents and reports containing the error. ROAR, however, would make no effort to correct their errors.

It appeared that when it would serve their purpose, ROAR publicly criticized and accused the Planning Department of not representing their interests. Yet at the same time ROAR was relying on the Planning Department for most of its data, technical assistance, and access to the political decision makers. Privately, ROAR would express gratitude and appreciation for the efforts of the staff on their behalf. Still, ROAR chose to misrepresent and falsely criticize those efforts. The County Planning staff could not help but feel frustrated over the situation, especially since ROAR was doing the exact same thing that they were accusing the GOAA of doing.[51]

In order to be successful, the citizen participation program had to make clear to all involved that all of the undesirable noise effects of the airport could not be eliminated. The constraints to solving the noise problem had to be clearly articulated so that everyone in the study could understand them. Had that been accomplished, most interests may have been able to come to grips with the difficult decisions that had to be made.[52] It was the author's observation that due to the inability to establish open and honest communication with the residents, the constraints to solving the noise problem were never understood by

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[51]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, January 1981.

[52]FAA, Noise Control Plans, p. 3.

all the participants. The GOAA, in an effort to obtain the cooperation and support of the residents led them to believe that all of their noise problems could be solved in the ANCLUC program. The residents came to expect unrealistic levels of relief and were disappointed when it was not accomplished. It was the author's observation that the residents may have withheld their support of the ANCLUC plan, in large measure, because the overall technical and economic constraints were not made clear to them.

It is important in all citizen participation programs to actively solicit input from all groups that potentially could be affected. The OIA program did not accomplish this as was shown by the late formation and involvement of the RADAR group. This group did not get involved until the end of the study when it was made clear finally that they could be affected by aircraft noise. Extensive efforts were required to overcome the problems this created. The GOAA consultant had an extremely difficult time informing the new participants about the planning process they were joining, how and why it began, and what had been accomplished to date.[53] This problem was further compounded by the fact that many of the other citizen group leaders that were involved in the early stages of the planning process were eventually replaced by others.

The FAA and OIA programs created additional problems as a result of their reliance on public hearings and meetings. The major emphasis of the OIA citizen participation program was on the three public meetings.

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[53]Interview with Rick Alberts, GOAA Airport Consultant, Greiner Environmental Sciences, Inc., May 1981.

The participants in the program did not realize until late in the process that the informal informational/working meetings were much more effective and productive than the formal public meetings.[54] The public meetings only demonstrated that many people were interested enough to come to a meeting about the airport. Those meetings were merely demonstrations for or against something; success or failure being measured by the turnout. The setting of the public meetings encouraged confrontation. Working sessions, however, were designed to accomplish a task, encourage negotiation, and resolve differences.

The OIA ANCLUC was also open to the charge that there was not enough continuity in the citizen participation program. The citizen groups and the Public Involvement Subcommittee had little or no involvement or contact with the other program committees. Months would elapse with no interaction; then one of the committees would make a recommendation or issue a report to which the other committees and residents were supposed to react. There were also numerous complaints insufficient public notice of meetings. All public meetings were advertised with a quarter-page advertisement in the local papers a week before the meeting. The various committee meetings were advertised in the legal notice section of the newspaper. Since many people missed those notices, other methods of notification should have been considered. Examination of the approved scope of work indicated that charges of insufficient public notice may have been justified. In

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[54] Ibid.

the approved scope of work, the GOAA committed to producing and distributing a monthly newsletter and progress report, including a schedule of all future meetings. No newsletter was ever published.

CHAPTER VI

LAND USE COMPATIBILITY PLAN

FAA Approach to Land Use Planning

Overview

The lack of adequate land use planning and control for compatibility in the past has resulted in aircraft noise problems at airports across the country. At the time of this study, many of the necessary tools for achieving compatible land use around airports existed; however, they required difficult political decisions which local governments were not always willing to make. The marginal success of past land use planning efforts was a result of a variety of factors, including the multijurisdictional scope of the problem which required multijurisdictional solutions; inability to overcome the antagonism between airports and the noise impacted jurisdictions; lack of documentation as a justification for determining and excluding noise sensitive land uses; the extreme pressure for residential development close to the airport where infrastructure and employment opportunities were readily available; and fear of eliminating needed residential tax base when there was not enough tax revenue producing compatible development to take its place.[1]

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[1] FAA, Airport Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 96-193, Ch. 3, p. 16.

Those factors, coupled with the federal government's policy not to interfere in local land use prerogatives, the absence of state or regional controls, and the inability of airport proprietors to affect land use changes, set the stage for the attempt to achieve greater compatibility through the ANCLUC process.

The FAA program requirements for ANCLUC recognized the importance of the Land Use Element of the Compatibility Plan. The FAA required that the affected jurisdiction(s) with the authority to control land use must be involved in the study. Preferably the involvement would be through a cosponsorship of the grant request with the airport sponsor.[2] In conjunction with an ANCLUC grant or any other type of airport development grant, FAA required a Land Use Compatibility Assurance. The Land Use Compatibility Assurance was documentation provided by the airport proprietor to FAA assuring that appropriate actions had been or would be taken to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes that would be compatible with normal airport operations.[3]

The ANCLUC planning process relied on a two-tiered approach to reducing noise impact of the airport on the surrounding environment. The first approach was through an assessment of noise abatement procedures also known as the operational controls. The second approach

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[2]FAA, Aviation Noise Abatement Policy, p. 10.

[3]Federal Aviation Administration, Land Use Planning, U.S. Department of Transportation, Catalog No. 60024, April 1977, pp. 290-308.

involved extensive use of land use controls. The ANCLUC planning process was unique in its innovative approach of joining the land use and operational controls to maximize the overall airport-community compatibility.

The operational alternatives available for consideration in an ANCLUC study generally involved less expense, less community disruption, and often yielded quick noise relief. The land use control alternatives did not generally provide immediate noise relief, were not easily agreed upon, were more difficult to implement, and were more expensive and disruptive. However, the protection of off-airport land use for establishment and maintenance of compatibility represents most of the total potential for sustained overall aircraft noise-land use compatibility.[4] Most large hub airports exist near areas that are 85 to 90 percent developed. This severely limits the ability of operational changes to yield significant benefits in noise compatibility. In the absence of land use controls, substantial noise reductions can be obtained only by decreasing the number of aircraft operations by an unreasonable magnitude. With all other factors remaining the same, it would require a 50 percent reduction in aircraft operations to yield a 3Ldn decrease in the cumulative noise exposure around an airport.[5] The FAA forecast was that large aircraft operations would increase, not decrease;in addition, the effect of CAB deregulation of the air carriers

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[4] Ibid.

[5] FAA, Airport Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 96-193, Ch. 5, p. 4.

would be to bring more traffic into the busier and already noisier airports. Therefore, the importance of land use controls could not be overestimated.

The ANCLUC Land Use Planning Process

The ANCLUC Land Use Planning Process was devised by the FAA to be a flexible planning process that could be tailored to the local circumstances and the degree of urbanization around the airport. The FAA ANCLUC planning process was based on a comprehensive planning process model that was consistent with traditional planning practices. A general outline of the various steps within the process follows:

1. Identification of Community Goals, Objectives, Values, and Needs.
2. Development of Detailed Work Program.
3. Data Collection/Problem Definition.
    a. Identification of Aviation Needs.
    b. Identification of Noise Zones.
4. Determination of Study Area.
5. Determination of Land Use-Noise Exposure Criteria.
6. Identification of Existing and Unconstrained Future Land Use Pattern.
7. Development of Alternative Compatibility Schemes.
    a. Approach to Alternative Development.
    b. Planning Inputs.
    c. Implementation Tools and Strategies.
8. Selection of Preferred Alternative.

9. Development of Preferred Alternative into Compatibility Plan.
10. Plan Adoption.
11. Implementation.
12. Monitoring Periodic Review.[6]

Two of the elements of the study--the Land Use Noise Exposure Criteria and the Implementation Tools and Strategies--require additional discussion in the following sections.

Land Use Guidance System

The ANCLUC program, as designed by the FAA, incorporated an innovative compatibility guidance system that was both easily understandable and legally defensible.[7] The Land Use Guidance Zone (LUG) System was a uniform noise evaluation technique which directly related to land use compatibility planning. It was a single system for determining the impacts of noise upon individuals resulting from the operation of an airport. The LUG System utilized many of the common noise estimating methodologies as input and translated these into a series of noise quality zones and categories of land use that were compatible to the existing and forecast noise impacts of the airport. The technique could be used for any type of noise source and was used in similar fashion to generate land use categories that would be compatible with highway, rail, or other noise sources. A significant characteristic of the LUG System was that community goals, objectives, values,

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[6] FAA, Airport-Land Use Compatibility Planning, Ch. 2, pp. 15-24.

[7] Ibid., pp. 10-15.

and needs were used to modify and refine the outputs so as to closely comply with the individual character of the affected community. The system incorporated two charts--the Airport Noise Interpolation (LUG Chart I) and Land Use Noise Sensitivity Criteria (LUG Chart II).

Airport Noise Interpolation--LUG Chart I. The LUG Zones A, B, C, and D, as shown in Figure 14, represent four levels of airport noise impact ranging from minimal noise impact for LUG(A) to severe noise impact for LUG(D). The LUG Chart I was used to interpolate noise input from the common airport noise estimating methodologies into LUG Zones. The common methodologies included the Day-Night Average Sound Level (Ldn), Noise Exposure Forecast (NEF), Composite Noise Rating (CNR), and the Community Noise Equivalent Level (CNEL)--all of which are detailed in Appendix A. The chart also includes the Department of Housing and Urban Development (HUD) Noise Assessment Guidelines which indicated the acceptability for site exposure to noise and were used for screening mortgage guarantees and other HUD assistance. They are shown for information and comparability purposes. The suggested noise controls were generalized descriptions of the actions typically desirable. The controls recommended for a specific airport situation should be modified to address the individual situation.

Land Use Noise Sensitivity Criteria--LUG Chart II. The ANCLUC program recognized that different uses of land had different sensitivities to noise. Schools, residences, churches, and hospitals were very sensitive to noise, while factories, warehousing, and farming

LAND USE GUIDANCE CHART I: AIRPORT NOISE INTERPOLATION

LAND USE GUIDANCE ZONES (LUG)	NOISE EXPOSURE CLASS	INPUTS: AIRCRAFT NOISE ESTIMATING METHODOLOGIES				HUD NOISE ASSESSMENT GUIDELINES	SUGGESTED NOISE CONTROLS
		L_{dn} DAY-NIGHT AVG. SOUND LEVEL	NEF NOISE EXPOSURE FORECAST	CNR COMPOSITE NOISE RATING	CNEL COMMUNITY NOISE EQUIVALENT LEVEL		
A	MINIMAL EXPOSURE	0 TO 55	0 TO 20	0 TO 90	0 TO 55	"CLEARLY ACCEPTABLE"	NORMALLY REQUIRES NO SPECIAL CONSIDERATIONS
B	MODERATE EXPOSURE	55 TO 65	20 TO 30	90 TO 100	55 TO 65	"NORMALLY ACCEPTABLE"	LAND USE CONTROLS SHOULD BE CONSIDERED
C	SIGNIFICANT EXPOSURE	65 TO 75	30 TO 40	100 TO 115	65 TO 75	"NORMALLY UNACCEPTABLE"	NOISE EASEMENTS, LAND USE, AND OTHER COMPATIBILITY CONTROLS RECOMMENDED
D	SEVERE EXPOSURE	75 & HIGHER	40 & HIGHER	115 & HIGHER	75 & HIGHER	"CLEARLY UNACCEPTABLE"	CONTAINMENT WITHIN AIRPORT BOUNDARY OR USE OF POSITIVE COMPATIBILITY CONTROLS RECOMMENDED

Figure 14. Airport noise interpolation--Land Use Guidance (LUG) Chart I.

NOTES FOR LAND USE GUIDANCE CHART I

LUG - Land Use Guidance Zone
LUG Zones are inputs to the compatibility planning process and are not intended for use in making direct comparisons of the various noise estimating methodologies.

L_{dn} - Day-Night Average Sound Level (see Appendix

NEF - Noise Exposure Forecast (see Appendix

CNEL - Community Noise Equivalent Level (see Appendix

CNR - Composite Noise Rating (see Appendix
Note: Caution is suggested in applying CNR methodology to general aviation airports since in such use it tends to exaggerate indications of noise impacts.

The DOT/FAA Integrated Noise Model (INM) will produce contours for Ldn, NEF, and CNEL, as well as additional measures (see Appendix

HUD Noise Assessment Guidelines - Acceptability guidelines for site exposure to aircraft noise. The Department of Housing and Urban Development (HUD) promulgated a policy (Circular 1390.2, July 1971) and published Noise Assessment Guidelines (TE/NA-171, August 1971) for establishing noise levels and acceptability guidelines for site exposure to noise to be used for screening mortgaging guarantees and other HUD assistance. These acceptability categories are interpolated from Table I of TE/NA-171 and are shown for illustrative purposes to assist planners in relating HUD screening guidelines to the compatibility planning process. Although the guidelines control HUD assistance, they do not necessarily inhibit the actions of other financial institutions.

Suggested Noise Controls - These suggestions are generalized; see 3 for developing specific controls.

Figure 14 (continued)

were relatively insensitive to noise. Uses such as offices, shopping centers, recreation uses, and hotels had intermediate levels of noise sensitivity. The FAA developed a table of suggested relationships of aircraft noise to categories of land use, which is the LUG Chart II, Land Use Noise Sensitivity Interpolation (Figure 15). The term "suggested" is important since it was intended that these relationships be used as a starting point. They should be modified or refined for each study through citizen participation and consideration of community goals and objectives. The selected value might be higher or lower than the suggested value. However, the community should realize that there are increased costs associated with each increase in compatibility quality.[8] The FAA policy was that all land within the LUG(D) should be either under positive control of the airport or used only for those land uses which had little sensitivity to aircraft noise. This was consistent with the goal of the Aviation Noise Abatement Policy, which was to confine to the greatest extent possible severe aircraft noise exposure levels to the areas included within the airport boundary or over which the airport had a legal interest to preclude development of noise sensitive areas therein, and to reduce substantially the number and extent of noise sensitive areas in the vicinity of the airport subject to significant noise exposure.[9]

Land within the LUG Zone A could be used for almost any land use. Land within LUG Zones B and C could be used for a variety of land uses

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[8] Ibid., Ch. 2, p. 11.

[9] FAA, Aviation Noise Abatement Policy, pp. 1-11.

LAND USE GUIDANCE CHART II: LAND USE NOISE SENSITIVITY INTERPOLATION

LAND USE		LUG ZONE[1]		LAND USE		LUG ZONE[1]		LAND USE		LUG ZONE[1]	
SLUCM NO.	NAME	SUG-GESTED	STUDY	SLUCM NO.	NAME	SUG-GESTED	STUDY	SLUCM NO.	NAME	SUG-GESTED	STUDY
10	Residential.	A-B		30	Manufacturing (continued).[2]			60	Services.[4]		
11	Household units.			31	Rubber and miscellaneous plastic products—manufacturing.	C-D		61	Finance, insurance, and real estate services.	B	
11,11	Single units—detached.	A		32	Stone, clay, and glass products—manufacturing.	C-D		62	Personal services.	B	
11,12	Single units—semiattached.	A						63	Business services.	B	
11,13	Single units—attached row.	B		33	Primary metal industries.	D		64	Repair services.	C	
				34	Fabricated metal products—manufacturing.	D		65	Professional services.	B-C	
11,21	Two units—side-by-side.	A						66	Contract construction services.	C	
11,22	Two units—one above the other.	A		35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks—manufacturing.	B		67	Governmental services.	B	
								68	Educational services.	A-B	
11,31	Apartments—walk up.	B						69	Miscellaneous services.	A-C	
11,32	Apartments—elevator.	B-C		39	Miscellaneous manufacturing	C-D					
								70	Cultural, entertainment, and recreational.		
12	Group quarters.	A-B									
13	Residential hotels.	B		40	Transportation, communication, and utilities.			71	Cultural activities and nature exhibitions.	A	
14	Mobile home parks or courts.	A									
15	Transient lodgings.	C						72	Public assembly.	A	
19	Other residential.	A-C		41	Railroad, rapid rail transit, and street railway transportation.	D		73	Amusements.	C	
								74	Recreational activities.[5]	B-C	
20	Manufacturing.[2]	C-D		42	Motor vehicle transportation.	D		75	Resorts and group camps.	A	
				43	Aircraft transportation.	D		76	Parks.	A-C	
				44	Marine craft transportation.	D					
21	Food and kindred products—manufacturing.	C-D		45	Highway and street right-of-way.	D		79	Other cultural, entertainment, and recreational.[6]	A-B	
				46	Automobile parking.	D					
22	Textile mill products—manufacturing.	C-D		47	Communication.	A-D					
23	Apparel and other finished products made from fabrics, leather, and similar materials—manufacturing.	C-D		48	Utilities.	D					
				49	Other transportation, communication, and utilities.	A-D					
24	Lumber and wood products (except furniture)—manufacturing.	C-D						80	Resource production and extraction.		
								81	Agriculture.	C-D	
25	Furniture and fixtures—manufacturing.	C-D		50	Trade.[4]			82	Agricultural related activities.	C-D	
								83	Forestry activities and related services.	D	
26	Paper and allied products—manufacturing.	C-D		51	Wholesale trade.	C-D		84	Fishing activities and related services.	D	
				52	Retail trade—building materials, hardware, and farm equipment.	C		85	Mining activities and related services.	D	
27	Printing, publishing, and allied industries.	C-D		53	Retail trade—general merchandise.	C		89	Other resource production and extraction.	C-D	
				54	Retail trade—food.	C					
28	Chemicals and allied products—manufacturing.	C-D		55	Retail trade—automotive, marine craft, aircraft, and accessories.	C		90	Undeveloped land and water areas.		
								91	Undeveloped and unused land area (excluding noncommercial forest development).	D	
29	Petroleum refining and related industries.[3]	C-D		56	Retail trade—apparel and accessories.	C					
				57	Retail trade—furniture, home furnishings, and equipment.	C					
								92	Noncommercial forest development.	D	
				59	Retail trade—eating and drinking. Other retail trade.	C-D		93	Water areas.	A-D	
								94	Vacant floor area.	A-D	
								95	Under construction.	A-D	
								99	Other undeveloped land and water areas.	A-D	

1. REFER TO LAND USE GUIDANCE CHART I
2. ZONE "C" SUGGESTED MAXIMUM EXCEPT WHERE EXCEEDED BY SELF GENERATED NOISE.
3. ZONE "D" FOR NOISE PURPOSES; OBSERVE NORMAL HAZARD PRECAUTIONS
4. IF ACTIVITY IS NOT IN SUBSTANTIAL, AIR-CONDITIONED BUILDING, GO TO NEXT HIGHER ZONE.
5. REQUIREMENTS LIKELY TO VARY—INDIVIDUAL APPRAISAL RECOMMENDED.

SLUCM: STANDARD LAND USE CODING MANUAL

Figure 15. Land use noise sensitivity interpolation--Land Use Guidance (LUG) Chart II.

of intermediate sensitivity to aircraft noise and was usually the area where tradeoffs in uses required the most examination. Uses located within soundproofed structures normally could be placed in more intensive LUG Zones. The land use categories in Chart II were developed by the Federal Highway Administration and HUD for their Standard Land Use Coding Manual.[10]

Land Use and Development Controls

Land use and development controls can be used to protect the noise impact areas designated by the plan from encroachment by noise sensitive uses. The number and type of controls available to local governments to correct existing incompatibilities or to prevent additional incompatibilities were quite extensive. The appropriateness of each of the controls was the prerogative of the local jurisdiction and needed to be evaluated in conjunction with the operational controls adopted by the airport proprietor.

Comprehensive plan. The overall framework for the compatibility planning efforts should be the local comprehensive plan. The adopted comprehensive plan was the local government's policy guide for decision making in matters concerning the physical development of the community. The techniques and strategies for ensuring compatibility must work together to implement the comprehensive plan. The comprehensive plan

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[10] U.S., Department of Housing and Urban Development, Standard Land Use Coding Manual: A Standard System for Identifying and Coding Land Use Activities, 1965.

provided the framework to ensure that each individual element related to all of the other functional elements and did not work at cross purposes. The major problem in utilizing the comprehensive plan for compatibility purposes was that they were typically long range, with insufficient emphasis placed on short term problems and solutions. The comprehensive plan was often too general to address compatibility issues and had to rely on the zoning ordinance and subdivision regulations, which were more specific, to effectuate the general proposals of the plan.[11]

Zoning. Zoning has been the traditional safeguard for ensuring land use compatibility but it has not always been effective and is often only a temporary method of controlling land use. The major disadvantages have been that zoning is often subject to political and economic pressures, it is not retroactive, and it has little effect on existing development. It would not be advisable to use zoning in an ANCLUC program to create large areas of nonconforming uses. Zoning jurisdictions are also limited and the noise impacts associated with an airport often span more than one jurisdiction. Traditional zoning use districts create unusual problems for noise compatibility planning. Zoning categories that normally would be considered compatible from a noise sensitivity standpoint, such as agricultural districts, usually permit incompatible uses such as churches and schools. The ANCLUC program recognizes that land use compatibility around airports is not as simple

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[11] William Goodman, ed., Principles and Practices of Urban Planning (Washington, D.C.: International City Managers Association, 1968), pp. 349-371.

as merely selecting a compatible zoning district. Each land use must be examined on its own merits to determine if it is detrimental to airport operations or if airport operations will be detrimental to the land use. To accomplish this analysis, the ANCLUC program relied on the previously described Land Use Guidance (LUG) system in conjunction with the traditional zoning district approach. Innovative zoning techniques such as cluster zoning, development districts, and planned developments were also being incorporated into the ANCLUC program.

Zoning, in order to be effective, must be applied fairly and consistently and must be based on a comprehensive plan. Simply zoning a parcel for commercial or industrial use because it is located in a noise zone is often not sufficient. Charges that such a designation is arbitrary, capricious, or unreasonable are likely and such actions are vulnerable to judicial review. There must be demonstrated a reasonable present or future need for that zoning. When used properly, zoning can result in increased value and productivity of land within high noise impact areas.[12]

Easements. Ownership of property consists of the possession of a series of rights. An easement is a right of another to part of the total benefits of ownership of real property. The rights which go with ownership may be bought and sold separately except for those rights retained by the state, the general public, or neighboring property. These rights are acquired in the form of easements, with the cost of

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[12]FAA, Airport-Land Use Compatibility Planning, Ch. 3, pp. 25-26.

the easements, with the cost of the easement determined by the value of those rights to the landowner. If the easement will not significantly impair the owner's use or sale of the land, the cost should be low, but if it does impair the use or sale, the cost of the easement would be much higher.

Easements can be either positive or negative. A positive easement grants the right to do something with the property, such as constructing an access across the property. A negative easement prevents the owner from using the property for certain uses. For airport noise compatibility, both types of easements should be acquired to ensure adequate control. A positive easement can be obtained to allow the airport to make noise over the land and a negative easement could be used to prevent the creation of an unprotected noise sensitive use upon the property.

Easements may be used as an effective and permanent control and, in some instances, they may be better than zoning.[13] Easements are permanent, with title held by the purchaser until they are sold or released. They work equally well inside or outside of zoning jurisdictions. They are directly enforceable by the holder through the civil courts and may often be acquired for a fraction of the cost of the land's value. An additional benefit is that the land is still free to be developed with noise compatible uses. The easements may be obtained by purchase, condemnation, or dedication either voluntarily or in conjunction with the issuance of a development permit.

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[13] Ibid., pp. 26-28.

Land purchase. The purchase of noise impacted land in fee simple is the most positive form of land use control and is the most expensive. When combined with resale for compatible development or retention and use for compatible public purpose, the net cost may be reduced significantly. Acquisition can be accomplished through negotiation with the property owner, by deed or gift, or through condemnation.

There are often locations or circumstances within the noise impact areas which leave little choice other than direct acquisition of full or partial interest in the impacted land by either the airport proprietor, the state, or local levels of government. The Airport and Airways Development Act of 1976 provided for federal participation in the purchase of interest in land adjacent to the airport for noise compatibility purposes. Under the FAA guidelines, lands within the two highest noise zones were eligible for funding. The overall goal of the Aviation Noise Abatement Policy was to confine severe noise exposure levels (40NEF, 75Ldn) to areas within the airport boundary and the ANAP encouraged land acquisition to accomplish this goal.[14]

At the time of this writing, land acquisition was running $32,000 per acre or $20,500 per person relocated.[15] Due to the tremendous expense, it limited applicability. Its major benefit was that it not only reduced existing incompatible uses but would also guarantee the prevention of new incompatible uses. Various types of acquisition

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[14] FAA, Aviation Noise Abatement Policy, pp. 5-8.

[15] FAA, Airport Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 96-193, Ch. 5, p. 5.

programs were available including sale-leaseback arrangements or purchase assurances where the residents do not desire to relocate and where condemnation is unlikely or politically unacceptable.

Land acquisition programs, both with and without federal funding, have been undertaken by a number of airport proprietors. It is not feasible to attempt to solve all airport noise compatibility problems with massive federally supported land acquisition efforts due to the tremendous financial cost, population disruption, and removal of land from the tax base. For an ANCLUC plan to concentrate attention almost solely on extensive land acquisition as the measure to solve the airport noise problem is not a realistic approach to the solution of the problem.[16]

Land banking. Land banking is an approach that involves the acquisition of extensive undeveloped land within noise zones with subsequent resale of parcels and tracts in a way that controls the type, rate, and pattern of development. Land banking is a modified version of the land acquisition programs in that it is done by a governmental agency and is on a much larger scale. As applied to the airport situation, the governmental agency or airport proprietor would purchase the land within the noise impact areas. The agencies would then release the lands for sale gradually, for compatible use and in sufficient amounts to prevent artificially increasing land prices. This type of land banking provides for more orderly and compatible development.

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[16] Ibid., Ch. 3, p. 28.

Public land banking schemes, though uncommon in the United States, have been successfully implemented in Australia, Canada, Denmark, England, Germany, the Netherlands, Israel, Norway, and Sweden.[17]

As with zoning, the economic effects of land banking depend on how the program is administered. By withholding land from the market, land prices are often increased. The escalation in land prices is particularly severe during the initial acquisition of the land. This has been a major deterrent to establishing land banking programs. After initial acquisition, land prices are determined essentially by the amount of land released for development.

Capital improvements programs. Locating and programming of public works projects can exert strong influences over land use trends and demands. The capital improvements program must be designed and implemented to encourage development patterns consistent and compatible with the airport noise impacts and discourage incompatible developments. Public works projects such as road construction and widening, construction of schools, parks and recreation facilities, water and sewer extensions, and flood control projects must be closely coordinated to ensure that incompatible development will not be encouraged. Used as an implementation tool of the ANCLUC plan, constructive use of public works related capital improvements can greatly assist in changing land

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[17] FAA, Land Use Planning, pp. 126-128.

use. Changing the timetable for implementing these improvements or altering their routes can redirect incompatible development away from the airport.[18]

Building codes. The building codes adopted by the local government can establish requirements for specific noise attenuating standards in construction in noise impact areas. Building code requirements for soundproofing in conjunction with noise easements offer an affordable substitute for land acquisition. Soundproofing is an action which involves the modification of existing structures or requirements for new structures in an attempt to reduce the maximum noise levels inside structures located in noise impacted areas.

Soundproofing involves various techniques for reducing exterior to interior sound transmission of a building by identifying those structural elements that provide sound transmission paths and applying appropriate modification to improve noise attenuation.

Techniques for achieving soundproofing include minimal efforts of sealing and weatherstripping of windows, doors, vents, and external openings, replacement of hollow core doors with solid ones, and elimination of direct exterior-interior transmission paths. Additional measures include full-time air conditioning, acoustically treated ceiling panels, double glazed windows, elimination of windows, acoustical entryways, attic treatment, wall paneling, treated crawl spaces, and other sound sealing applications.

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[18]Goodman, pp. 388-397.

The effects of soundproofing vary as a function of the degree/cost of the modifications and the condition, age, state of repair, and type of construction of the structure. The building's location and noise exposure level must also be quantified to identify the appropriate level of noise reduction. An additional benefit of sound attenuation is increased energy efficiency and conservation within the structure.[19]

Truth in sales/truth in lending ordinances. Truth in sales/truth in lending ordinances are locally adopted disclosure statements that can inform potential homebuyers and renters of impacts of aircraft noise in an area. This type of ordinance requires developers and realtors to show homebuyers or renters the relationship of the property to the airport, aircraft flight patterns, and airport noise contours. The buyer/renter signs a notice that they are aware of the information. This technique has been effective in warning the homebuyer/renter of the noise nuisance and takes away the economic incentive for developing incompatible uses in noise impact areas. Current residents of noise impact areas often oppose disclosure statements because they fear diminished property values.[20]

Transfer of development rights. In the transfer of development rights (TDR) concept, some of the property's development rights are transferred to another location where they may be used to intensify

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[19]Alan MAGAN, Quiet Communities, Minimizing the Effects of Noise through Land Use Controls (New Brunswick, N.J.: National Association of Counties Research, Inc., March 1979), pp. 1-17.

[20]FAA, Airport-Land Use Compatibility Planning, Ch. 3, pp. 23-31.

allowable development. Under a TDR program, lands within an airport's high noise impact area could be kept in open space or agricultural uses and their development rights for residential uses transferred to locations outside the noise impact area. Land owners could be compensated for the transferred rights by their sale at the new locations or the rights could be purchased by the airport. The TDR program must be fully coordinated with the community's comprehensive plan and zoning. A major handicap to establishment of a TDR program has been the lack of a viable market for the transferred densities.[21]

The Orlando International Airport Land Use Element

The approved workprogram for the OIA ANCLUC identified the work efforts and responsibilities of the various agencies in the development of the Land Use Element. Primary responsibility for all land planning activities was vested in the Orange County Planning Department and the County's consultant from the firm of Howard, Needles, Tammen, and Bergdoff. Orange County staff was to coordinate their efforts with the planning departments of Osceola County and the cities of Belle Isle, Edgewood, and Orlando. The major work products that were anticipated included a Land Use Guidance (LUG) Chart and Noise Sensitivity Criteria, a comprehensive land use plan for the short and long term operational alternatives, and a land use control program that would ensure compatibility.[22] The land use control program was to examine the

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[21] FAA, Land Use Planning, pp. 122-126.

[22] Greiner Environmental Sciences, Inc., Orlando International Airport, ANCLUC Work Program, pp. 5-6.

following implementation techniques and strategies:

1. Modification of capital improvements programs.
2. Zoning changes.
3. Use of restrictive easements.
4. Land acquisition.
5. Building code modifications.[23]

The major land use planning efforts could not begin until the Operational Alternatives were completed. The author's observation was that the two year delay in completing the Operational Alternatives adversely affected the continuity of the land planning efforts. In order to proceed as rapidly as possible, the program was designed around five major work efforts:

1. Identification and examination of the existing land use situation including an analysis of the existing land use controls in use around the airport.
2. Identification of the existing and future noise impact areas for which land use plans must be developed.
3. Development of criteria for assessing the compatibility of land uses and activities within the various noise zones.
4. Identification of existing and potential land use compatibility problems.

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[23] Ibid.

5. Development of future land use plans for areas influenced by airport operations, with the land use control measures to implement the development pattern.[24]

Early in the ANCLUC study it was evident that strong development pressure would continue during the course of the study in the noise impact areas. In an effort to prevent further incompatible development while the study was being conducted, the Orange County Board of Commissioners adopted an interim land use policy restricting new development in an unincorporated portion of the county until the ANCLUC study was completed. The text and notice of the development moratorium are reproduced in Figures 16 and 17.

The existing land use and zoning are shown in Figures 2 and 3 (pp. 20 and 21). The Planning Department analysis indicated that the existing incompatible development was located to the north and northeast of the airport and was predominately low density, high priced single family residences, several schools, and numerous churches. While there was significantly less development of an incompatible nature to the northeast, this area had been experiencing intensive development pressure. Identification of large vacant tracts to the north and northeast as well as to the east and south were of prime importance. The development of those vacant tracts would determine the long term success or failure of the land use compatibility efforts.

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[24]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report, pp. 23-24.

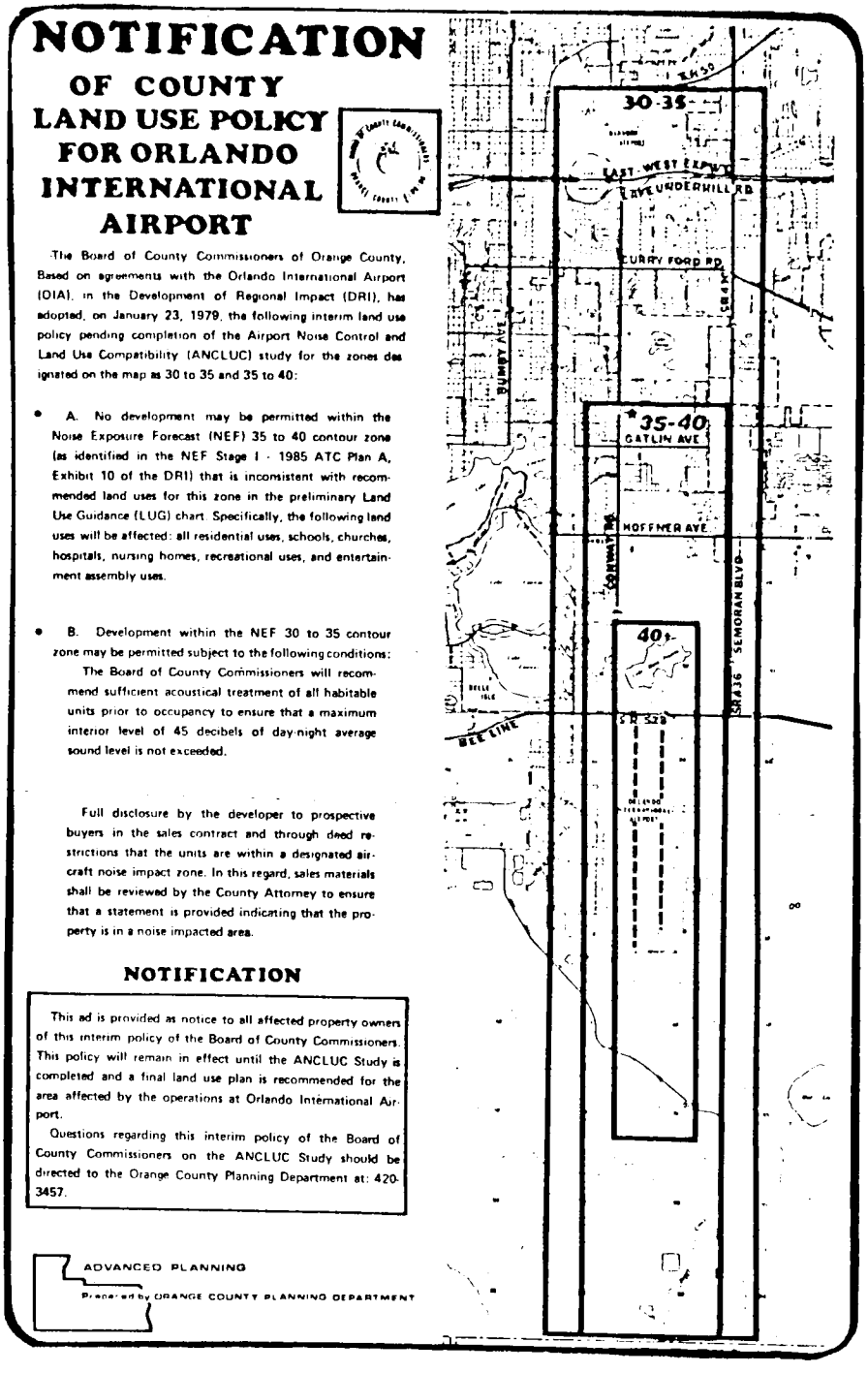

Figure 16. Notification of land use moratorium.

Legal Notice

Orange County Interim Land Use Policy
for Orlando International Airport

"The Board of County Commissioners of Orange County, based on agreements with the Orlando International Airport (OIA), in the Development of Regional Impact (DRI), has adopted, on January 23, 1979, the following interim land use policy pending completion of the Airport Noise Control and Land Use Compatibility (ANCLUC) study for the zones designated on the map as 30 to 35 and 35 to 40:

No development may be permitted within the Noise Exposure Forecast (NEF) 35 to 40 contour zone (as identified in the NEF Stage 1 - 1985 ATC Plan A, Exhibit 10 of the DRI) that is inconsistent with recommended land uses for this zone in the preliminary Land Use Guidance (LUG) chart. Specifically, the following land uses will be affected: all residential uses, schools, churches, hospitals, nursing homes, recreational uses, and entertainment assembly uses.

Development within the NEF 30 to 35 contour zone may be permitted subject to the following conditions:

The Board of County Commissioners will recommend sufficient acoustical treatment of all habitable units prior to occupancy to ensure that a maximum interior level of 45 decibels of day-night average sound level is not exceeded.

Full disclosures by the developer to prospective buyers in the sales contract and through deed restrictions that the units are within a designated aircraft noise impact zone. In this regard, sales materials shall be reviewed by the County Attorney to ensure that a statement is provided indicating that the property is in a noise impacted area.

No development in the NEF 40+ zone, except permitted industrial uses, shall be allowed."

Figure 17. Legal notice of interim land use policy.

Comprehensive Land Use Plan

The second step in the process was to examine the Orange County Future Land Use Plan to determine if potentially incompatible development patterns were being encouraged. The Orange County Growth Management Policy (GMP) was adopted by ordinance on June 15, 1980, pursuant to the requirements of the Local Government Comprehensive Planning Act of 1975 (LGCPA).[25] The LGCPA, unlike typical state enabling legislation, required that all county and municipal governments adopt a comprehensive land use plan by ordinance and that all development activity and permits be consistent with that land use plan. The participants in the ANCLUC study recognized that the stringent consistency requirements of the LGCPA offered tremendous potential for the implementation of the ANCLUC recommendations.

During the development and adoption of the County's Growth Management Policy, the existence and special needs of the airport were recognized and incorporated in the future land use plan. Numerous policies in the Future Land Use, Development Framework, Housing, Transportation, and Conservation Elements of the Growth Management Policy referenced the ongoing ANCLUC study and the need to incorporate ANCLUC recommendations into those elements. The Future Land Use Policy Guide Map was to be amended to reflect the need for land use compatibility with the airport. Comparison of the Future Land Use Policy Guide Map to the short and long term noise zones resulted in the identification of few compatibility problem areas.

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[25] Local Government Comprehensive Planning Act, 163.3161 Florida Statutes, 1975.

Zoning Ordinances

Orange County had in its adopted Zoning Resolution[26] approximately twenty district classifications which regulated land uses. The establishment of these districts in 1963 and subsequent amendments preceded the development of the adopted Growth Management Policy (GMP). During the later stages of the ANCLUC study, the County was conducting a program of administrative rezonings to bring the districts into closer conformance with the GMP.

The districts in the Orange County Zoning Resolution identified permitted uses and many of the districts were cumulative in permitting uses; that is, each more intensive district allowed all of the permitted uses of less intensive districts in the same zoning category except that commercial districts only allowed residential uses by Special Exceptions.

The Zoning Resolution of Orange County regulated certain uses in each of the districts through Special Exceptions. These specified uses in each district might be permitted provided that they were subject to review and hearing in which factors such as the character of the neighborhood or effect on surrounding land values were considered. Of note for purposes of regulating airport noise-sensitive uses was the fact that the location of schools, churches, sanitariums, hospitals, and nursing homes was regulated in zoning districts through the use of Special Exceptions. Modification of the Zoning Ordinance was determined to be necessary to accommodate the ANCLUC recommendations.

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[26]Orange County, Florida, Comprehensive Zoning Resolution, Chapter 63-1716, Laws of Florida, Special Acts, 1963.

In addition to the traditional type of zoning ordinance adopted by Orange County, there was in effect a special jointly adopted Orlando-Orange County Airport Zoning Ordinance. This ordinance, adopted in 1973 under the provisions of Chapter 333, Florida Statutes, restricted the height and lighting of all tall structures and excluded certain land uses within accident potential zones at the ends of the runways.

Building Codes

Orange County, Osceola County, Orlando, and Belle Isle issued building permits based on the Southern Standard Building Code. The 1979 edition of the code did not address noise attenuation. Modification of the code was determined to be necessary to incorporate ANCLUC recommendations.

Capital Improvements Program

Orange County, as part of the adopted Growth Management Policy, identified their proposed Capital Improvements Program (CIP) in five year increments for the period 1980 to 2000. Major water, wastewater, and road improvements were scheduled with the noise impact area that could encourage and support incompatible development. Staff recommended that revisions to the CIP be considered.

Avigation Easements, Deed Restrictions, and Land Acquisition

Deed restrictions and avigation easements were not being utilized at OIA prior to ANCLUC. A land acquisition program for noise compatibility had not been considered prior to ANCLUC.

Land Use Guidance System

After completing the review of the existing land use, the existing and future incompatibilities, and the existing land use controls, the planning department staff initiated the development of the Land Use Guidance System and Land Use-Noise Criteria. The development of the Land Use Guidance System was the FAA recommended method for estimating the effects of aircraft noise on the general public. The process involved developing an inventory of the types of land use, evaluating the compatibility of the land use activity with different levels of aircraft noise, and rating the land uses against the aircraft noise levels on the basis of the derived land use compatibility criteria and the community's goals, objectives, and values. There was no single set of land use compatibility criteria which was applicable to all circumstances. Differences occurred due to variations in climate, lifestyle, quality and type of construction, and local attitudes toward aviation. All of these factors were considered and documented in the development of the LUG criteria for the OIA ANCLUC.[27]

The Airport Noise Interpolation-LUG Chart I is shown in Table 1 and is identical to the FAA recommended chart. The chart identifies four noise zones of varying intensity with general statements of policy with respect to development potential within those zones. The staff recommendation which was accepted by the Policy Committee was that there were no circumstances or justifications for modifying the FAA

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[27]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report, pp. 77-119.

Table 1

Airport Noise Zones--Land Use Guidance (LUG) Chart I

Noise zone (Land Use Guidance zone)	Noise exposure level	Day-night average Sound level Ldn[a]	Residential noise assessment guidelines[b]	Suggested noise controls[c]
4	High exposure	75 and higher	Not acceptable	Containment within airport boundary or use of positive compatibility controls recommended
3	Moderate to high exposure	70-75	Normally unacceptable	Use of land use and other compatibility controls. Require interior noise attenuation for residential and noise sensitive uses (e.g., schools)
2	Moderate exposure	65-70	Conditionally acceptable	
1	Minor	65 and lower	Acceptable	Land use controls should be considered to reduce noise sensitive uses in the noisier parts of zones outside of Ldn 65

[a]Day-Night Average Sound Level (Ldn)--A composite aircraft noise calculation methodology which yields contour of noise impact areas expressed in Day-Night Average Sound Level values.

[b]Amendment by Orange County of U.S. Department of Housing and Urban Development (HUD) Noise Assessment Guidelines for use in screening mortgage guarantees and of other HUD assistance programs.

[c]The "Suggested Noise Controls" are a generalized description of typically desirable action as noted by the Federal Aviation Administration, but do not consider Orange County specifically.

recommended criteria. The Land Use Guidance Chart II, shown in Figure 18, identifies the wide variety of land uses that occurred in the vicinity of Orlando International Airport and assigned each use a noise sensitivity rating. The OIA ANCLUC rating varied considerably from the FAA recommended rating due to local conditions and community goals and objectives. Modifications and qualifications of the basic land development policies were recorded as notes to the chart. These qualifications took into consideration such variables as specialized land use situations and local building construction techniques, including energy and noise attenuating construction.

The OIA ANCLUC Land Use Guidance System incorporated an innovative system that identified the noise level reduction that would be necessary to allow a particular land use in higher noise zones, as well as the measures necessary to achieve that level of noise reduction. The Land Use and Noise Level Reduction for Structures is shown in Table 2. The actual noise level reduction techniques are found in Appendix D.

Following is a summary description of land use categories for new development which would be permitted in each noise zone based on the LUG Charts, Noise Level Reduction techniques, and Land Use Control programs that were developed by the County staff.[28]

Noise Zone 4 (Ldn 75+)

No new residential uses (including mobile homes) were allowed. Transient lodging (hotels, motels) were permissible with a 30 db(A)

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[28] Ibid.

LAND USE GUIDANCE CHART II

LAND USE CATEGORY	Noise Zone (NEF) +40 (Ldn) +75	35-40 70-75	30-35 65-70	-30 -65
	4	3	2	1
1. RESIDENTIAL				
	2	1,2	1,3,5	4
2. INDUSTRIAL & MANUFACTURING				
	6,7	7	7	
3. TRANSPORTATION				
	8	8	8	
4. TRADE				
	6			
5. SERVICES				
• Financial, Insurance, Real Estate, Business Services & Government Offices				
			10	
• Repair & Contract Construction Services				
	9	21		
• Medical & Health Services				
			10	
• Military Installations				
	11	11	11	
• Educational Services				
			10,12,14	14
• Religious Activities				
			10	14
6. CULTURAL ENTERTAINMENT and RECREATION				
• Cultural Activities, Entertainment, Assembly, Public Assembly (Indoor), Outdoor Amusement, Resorts & Group Camps				
		15	16	22
• Playgrounds & Community Parks				
	17			
• Sports Assembly (Indoor), Sports Activities, Water Based Activities				
	18			
• Nature Exhibits				
	19	19		
7. RESOURCE PRODUCTION and EXTRACTION				
	20			
8. UNDEVELOPED LANDS & WATER AREAS				

- LEGEND FOR DEVELOPMENT POLICY -

Acceptable | Conditionally Acceptable | Normally Unacceptable | Unacceptable

3 Numbers refer to Footnotes appended to LUG Chart.

Figure 18. Land Use Guidance Chart II.

Footnotes on Land Use Guidance Chart

1. Duplexes, multi-family, and group quarter uses are generally compatible with aircraft noise given a noise level reduction (NLR) of the order of 25 dB(A) *achieved through design and construction of the building. Note: Outdoor environment in this zone is basically unsuitable for outdoor residential activities. The absence of viable alternatives should be determined and an evaluation performed prior to approval to substantiate that a demonstrated community need for these uses would not be met if development were prohibited in this zone. * dB(A) reduction assumes closed windows.

2. Transient lodging is conditionally acceptable given a 20 dB(A) NLR.

3. Single family residences are unacceptable in zones 3 and 4. Single family residences are normally unacceptable in zone 2 (Ldn 65-70), but development will be considered on a case-by-case basis utilizing the following minimum criteria:

   (a) compatibility of uses other than single family with the surrounding area.
   (b) services available for single family development.
   (c) determination of the noise impact.

   However, in no case will single family be permitted in zone 2 (Ldn 65-70) without full disclosure and other restrictions, such as acoustical treatment measures.

4. Single family residences, duplexes and mobile homes are acceptable except in areas subject to bothersome noise not included in the calculation of noise contours (such as thrust reversal), to occasional loud noise incidents, or to extensive overflights.

5. Mobile homes are especially susceptible to aircraft noise. They may be excluded from this zone unless meeting criteria for interior noise attenuation which are more stringent than those described for conventional single family homes.

6. Uses are conditionally acceptable in Noise Zone 4 given suitable degrees of sound attenuation in sales and office showroom areas (20 dB(A)).

7. Professional and scientific uses are conditionally acceptable provided that the conditions of footnote 6 are met and that activities are not liable to disruption from vibration due to aircraft overflight.

8. Communication uses are conditionally acceptable except for facilities which would be disrupted by aircraft noise (radio and television stations), transmission facilities (either electrical interference or tower interference - with air navigation).

9. Repair services and contract construction services are conditionally acceptable in Zone 4 given suitable degrees of sound attenuation of sales and office showroom areas (25 dB(A)).

10. All service uses are conditionally acceptable in Noise Zone 2, given NLR's of 20 dB(A) in buildings with these activities.

Figure 18 (continued)

11. The activities of military installations are compatible but should be subject to the same kind of noise acceptability criteria as comparable civilian activity.

12. Educational services are conditionally acceptable provided that laboratories, classrooms and areas of technical construction are centrally air-conditioned. This is a current practice in new school construction in the Orlando area.

13. Educational services, religious activities and medical and health services are unacceptable in Ldn 70-75.

14. Educational services and religious activities are conditionally acceptable in Zones 1 and 2 except in areas subject to bothersome noise not included in noise contours, to occasional loud noise incidents, and extensive overflights.

15. Cultural entertainment and recreational uses in Zone 3 are normally unacceptable, except for sports activities, water based activities, and playgrounds and parks. Indoor activities should have NLR's of 25 dB(A).

16. Cultural entertainment and recreational uses in Zone 2 are normally unacceptable, except for sports activities, water based activities, and playgrounds and parks, and should have NLR's of 20 dB(A).

17. Playgrounds may be acceptable and quiet in Noise Zone 3. Parks which are "open space" oriented are generally considered unacceptable, but the decision should be made on a case-by-case basis.

18. Water based activities such as boating are conditionally acceptable in Zone 4, but quiet activities calling for verbal communication should preferably be excluded. No restriction on sports activities.

19. Current indications are that aircraft noise does not significantly disturb animals, though this is not fully established. The more critical factor may be that of the intensity of public use. If public attendance is high and concentrated (as in a zoo), this will affect the compatibility of the use; if it is sparse, as with nature trails, it may not be a factor. Decisions must be made on a case-by-case basis.

20. There is some evidence that livestock is affected by aircraft noise, although it appears that these effects are limited to certain types of farming activity (e.g., milk and egg production), and usually this is not a factor in determining compatibility.

21. Repair services and contract construction service uses are conditionally acceptable in Zone 3 with a 20 dB(A) NLR in sales, office and showroom areas.

22. Cultural entertainment and recreational uses in Zone 1 are acceptable, but open buildings (e.g. amphitheaters) are particularly sensitive to land noise incidents and extensive overflights. The flight paths of aircraft in Zone 1 should be used to help determine the best location for these activities.

SOURCE: Orlando International Airport Land Use Guidance Chart, June, 1979

Figure 18 (continued)

Table 2

Recommended Land Uses and Noise Level Reduction for Structures

Activities and land uses	Land use noise zones		
	Low level (Ldn 60-65)	Moderate level (Ldn 65-75)	High level (Ldn 75)
	Zone 1	Zone 2	Zone 3
Residential--single family, mobile home	RW/NLR 20	RW/NLR 25	N
Residential--multifamily, group quarters, residential hotels	RW/NLR 20	RW/NLR 25	N
Transient lodging--hotels, motels	RW/NLR 20	RW/NLR 25	RW/NLR 35
Industrial/manufacturing	R	R[c]	R[b]
Transportation, utilities	R	R	R
Communications (noise sensitive)	R	R	RW/NLR 30
Commercial/wholesale trade	R	R[c]	R[b]
Retail--building materials	R	R	R[a]
Retail--food, general merchandise[d]	R	R	RW/NLR 30
Retail--eating and drinking places	R	R	RW/NLR 30
Offices, personal business, and professional services	R	R	RW/NLR 30
Educational and institutional[f]	RW/NLR 20	RW/NLR 25	N
Cemeteries	R	R[c]	R[a]
Playground, neighborhood parks	R	R	N
Community and regional parks	R	R	N
Spectator sports including arenas	R	R	N
Golf course,[g] riding stables	R	R[c]	R[a]
Auditoriums, concert halls	RW/NLR 25	RW/NLR 35	N
Outdoor amphitheaters, music shells	R	N	N
Agriculture[h] (not including residences)	R	R	R

R = Recommended RW = Recommended With N = Not Recommended

[a]An NLR 35 should be incorporated into the design and construction of portions of these buildings where the public is received, office areas or areas where the ambient noise level is low.

[b]An NLR 30 should be incorporated into the design and construction of portions of these buildings where the public is received, office areas, or where the ambient noise level is low.

[c]An NLR 25 should be incorporated into the design and construction of portions of these buildings where the public is received, office areas, or where the ambient noise is low.

[d]Retail stores, clothing stores, department stores, food and dairy markets, barber shops, beauty shops, new and used car sales.

[e]Professional and financial offices, banks, savings and loan associations, mortgage bankers, insurance offices, real estate offices, architects, engineers, attorneys-at-law, decorators.

[f]School classrooms, libraries, churches, hospitals.

[g]Includes driving ranges, miniature golf courses.

[h]Includes farms, orchards, nurseries, greenhouses.

reduction when not located in the accident potential hazard area and under primary flight corridors.

Property in this zone should be recommended for purchase by the GOAA if possible; alternatively, noise avigation easements should be provided in conjunction with new development.

No community facilities (schools, churches, medical, or libraries) and group assembly uses (recreational, entertainment, and cultural) should be located in this zone.

Preferably, no retail commercial uses should be allowed.

Industrial and agricultural uses were compatible.

Noise Zone 3 (Ldn 70-75)

New residences were not recommended except where the area was not located under a primary aircraft flight corridor that carried more than 5 percent of all aircraft activity and the required levels of NLR were provided. No new single family development (including mobile homes) should occur. Duplexes, multifamily, and group quarters uses were generally acceptable given a noise level reduction of 25 dB(A).

No medical, health, religious, or educational facilities should be permitted regardless of location with respect to primary flight path corridors.

New professional office developments were permissible. There would be a suggested minimum sound attenuation requirement of 25 dB(A) in office areas.

Cultural entertainment and recreational uses were normally unacceptable except for sport activities and water based activities.

Parks and playgrounds were normally acceptable.

Industrial and agricultural uses were compatible.

Noise Zone 2 (Ldn 65-70)

New residential development (except mobile homes) might be allowed in the Ldn 65-70 contour provided that specified NLR were achieved and that nonaircraft noise considerations indicated that this was an appropriate use. Primary flight paths, number of aircraft, and altitude of aircraft data as derived from the ANCLUC study would be used to determine the amount of noise level reduction (NLR) between 20 and 30 dB(A). Mobile homes should not be permitted in this zone.

Professional offices were acceptable given noise level reductions of 20 dB(A) in office areas.

New educational and religious uses were conditionally acceptable provided that central air conditioning and acoustical treatment levels of 20-25 dB(A) were incorporated into the structure. The preference was not to locate these uses under primary flight corridors.

Noise Zone 1 (Ldn 65 or Lower)

All uses were either acceptable or conditionally acceptable and would not require any additional noise attenuating construction that would not already be incorporated in order to comply with the Florida Model Energy Building Code.

Future Land Use Controls

In the course of the study, a series of alternative approaches to land use management in the noise zones, representing different degrees

of County/City intervention in the development market, were examined. The feasibility and the costs and benefits of the following major options were evaluated as the study progressed:

1. Limit residential development and noise sensitive uses, but maintain the land use pattern proposed in the Growth Management Plan.
2. Require compatible uses in noise zones, primarily industrial and commercial, through a more active role in land use control by the counties and municipalities.
3. Major purchases of land and development rights should exclude all new noncompatible uses and should remove current land use conflicts.

The scale of the noise problem, the extent of existing development, and the political and financial realities led to the conclusion that an approach of constraining growth of residential and other noise-sensitive uses, combined with maximizing industrial/commercial development in selected areas, would be the most effective means of achieving the study objectives. Detailed consideration of other concepts was not made.[29]

Recommended Land Use Concept

The conceptual land use plan for the study area is presented in Figure 19. The areas that were or would be subject to aircraft noise under the three airport configurations were included in the plan. Change in aircraft operations that would substantially alter noise contours and

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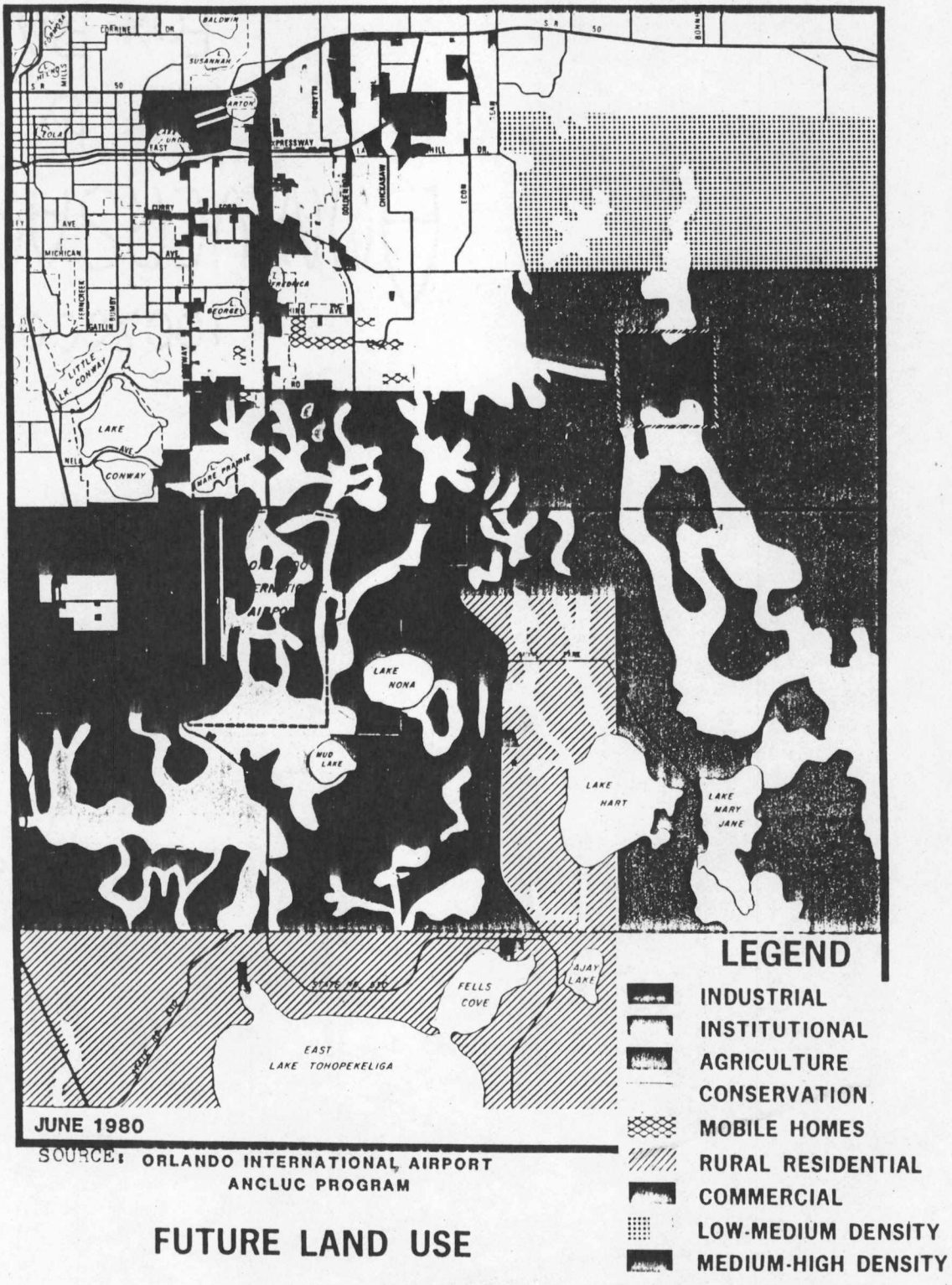
[29] Ibid., p. 10.



FUTURE LAND USE

Figure 19. Future land use.

site selection and development of new runway(s) could result in a relaxation of land use controls and construction standard requirements in areas where they had been required.

The land uses recommended were generally those already proposed in the Future Land Use Policy Guide map of the Growth Management Policy with the following exceptions: (1) the east side of Conway Road south of Hoffner Avenue from low-medium residential to industrial uses, (2) the north and south sides of Hoffner Avenue east of Conway Road from low-medium to professional office uses, and (3) areas designated for residential and other uses identified in Figure 20 located within the Ldn 65 zone would require interior noise attenuation treatment; the uses would stay the same for the three noise zones; hoqwcwe, the extent of interior noise attenuation would vary.

Land Use Control Procedures

The Land Use Control recommendations for the OIA ANCLUC were intended to guide future land use of undeveloped land rather than to regulate retroactively properties that had already been developed.

Several legislative and administrative actions were to be taken by local governments to promote the desired pattern of compatible land use in the airport noise zones. The overall strategy proposed by Orange County was to package the more significant new controls on land use in a new ordinance, to be called an "Airport Noise Zones Ordinance" and to recommend amendment to existing ordinances where this seemed an effective way of implementing the more routine changes. The intent was to utilize existing administrative procedures where possible.

Growth management policy amendments. The Orange County GMP predated the ANCLUC study. Amendments to the goals, objectives, policies, and future land use policy guide map were suggested.

Zoning regulation amendments. The Land Use Element recommended several amendments to the existing ordinances to ensure that noise sensitive uses would be subject to review as special exceptions or conditional uses.

Airport noise zone ordinance. An airport noise zone ordinance was prepared for adoption.[30] The major features of the ordinance included:

1. Establishment of existing and future aircraft noise zones that were to be the basis of restricting land uses and/or requiring specified levels of interior noise attenuation.

2. Establishment of procedures for the periodic updating of the noise zones map.

3. Establishment of guidelines for uses that were permitted in various noise zones and conditions for acceptability in particular noise zones.

4. Establishment of requirements for interior noise attenuation standards for specified uses in each noise zone.

5. Establishment of categories of property subject to the provisions of the ordinance. The approval process for new subdivisions, whether they required a zoning change or otherwise, would subject them to review. Development proposals, other than construction of one

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[30] See Appendix E.

single-family home on a parcel, that required neither subdivision nor zoning approval must also be brought under the jurisdiction of this ordinance.

6. Establishment of administrative procedures and assignment of responsibilities for enforcement and administration. The criteria and standards should be uniform for the three local governments but the administrative responsibilities would clearly differ. The criteria and standards should be defined in a clear manner for ease of administration. It was the intent of the ordinance that it stimulate negotiation of the most desirable mix of activities, encourage development of site plans compatible with aircraft noise, and provide the authority for requiring interior noise attenuation.

Intergovernmental agreements on land use controls. It was recommended that an intergovernmental agreement among Orange County, Osceola County, and the City of Orlando be adopted for uniform enforcement of an Airport Noise Zone Ordinance. Enforcement of the provisions of the ordinance was to rest with the appropriate local government having jurisdiction.

School board policy on school location. Orange and Osceola Counties should enlist the support of their school boards in recognizing the extent of current and future noise zones and adopting a policy of locating schools outside of noise zones and away from daytime aircraft flight tracks.

Avigation easement. Dedication of avigation easements to give the GOAA the right to fly over land in the vicinity of the airport was recommended. The local subdivision regulations would be amended to require this dedication. This ordinance would apply only to new developments. A sample of avigation easement is found in Appendix F.

Disclosure ordinance. The Land Use Element recommended the adoption of ordinances which would require that the sale or lease of any structure or land within the airport noise zones include a notice of the noise zone in which it was located. A sample disclosure form is shown in Appendix G. The purpose of the measure was to ensure that transactions did not occur in ignorance of the noise environment in which the property lay. This disclosure statement would apply only to new development and would not be retroactive to property which had already been developed.

Analysis of Land Use Element

The FAA and OIA ANCLUC programs both recognized the importance of the land use planning process to the overall success of the program. To encourage success, the FAA guidelines allowed maximum flexibility in the design of the land use planning process. The OIA ANCLUC used that flexibility to devise a land use planning process and a land use plan that reflected the opportunities and constraints of the area.

The land use planning process was similar to most comprehensive traditional planning processes. The author's observation was that the OIA program had sufficient staff and resources to conduct the program

as it was designed, and sufficient implementation strategies and controls were available to address the objectives of the study.

The planning effort that resulted was very thorough in its identification of the noise problem areas and the existing and potential compatibility problems. The analysis of the existing land use controls uncovered deficiencies and problems in the regulations that contributed to the compatibility problem. The analysis also identified opportunities in the regulations that, with modification, could prevent future problems.[31]

The land use planning efforts in ANCLUC offered greater potential benefits in Florida than in other states due to the state enabling legislation. The Local Government Comprehensive Planning Act mandated land use planning prior to the initiation of ANCLUC. As a result, local government agencies had developed strong land use planning programs and experience on which ANCLUC could rely. This tradition of land use planning offered numerous benefits to the ANCLUC program. Those prior planning efforts provided the ANCLUC planning program with a detailed data base to draw on. The data base had only to be updated, which would not require the tremendous staff effort that would be needed to generate the same data base. The previous planning efforts provided a foundation and insight into the community's goals, objectives, and values. The County's adopted Growth Management Policy provided a future land use plan, land use controls, implementation strategies, and a capital

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[31] Interview with James Sellen, Director, Orange County Planning Department, January 1981.

improvements program that ANCLUC could work with rather than having ANCLUC spend the time and resources to develop. Most importantly, the County's previous planning efforts had already laid the groundwork for developing airport-land use compatibility. Policies in the GMP and the future land use map reflected the needs and constraints of the airport. The GMP also emphasized that the final recommendations of ANCLUC would have to be incorporated into the plan as amendments.

When compared to enabling legislation in other states, the LGCPA offered additional benefits to the ANCLUC program in that it required local comprehensive plans to be adopted by ordinance. The local comprehensive plan then has the full force and effect of law. Requiring that local plans be adopted by ordinance and coupled with the LGCPA strong consistency requirements encourages that the land use plan and land use controls would not "sit on a shelf gathering dust" but would be used as a guide in land development decisions.

The Orange County Planning staff involved in the OIA ANCLUC recognized early in the study that additional development pressure within the study area could result in more incompatible development before the ANCLUC study could be completed. They recommended a building moratorium within the study area to prevent this. The Board of County Commissioners accepted that staff recommendation and adopted a building moratorium in spite of strong opposition from the development interests. It appears that these actions may have prevented the introduction of additional incompatible development.

The Noise Level Reduction (NLR) system developed by the planners in the OIA program appeared to be an innovative approach for modifying the

FAA Land Use Guidance (LUG) system. The NLR system was a mechanism to allow more flexibility in approving particular land uses in the various noise zones while retaining the intended compatibility controls. In the FAA system, particular land uses were allowed or prohibited in each of the noise zones based on their sensitivity to noise. Using the NLR system, particular land uses may be developed in a higher noise zone from which that use would normally be excluded from, if prescribed noise level reduction through soundproofing could be accomplished. Specific methods to achieve the noise level reduction were provided or the developer could submit certification from a registered architect that their proposal would meet or exceed the prescribed level.

The author's observation was that the planning staff developed a unique land use control program which was not documented in any other ANCLUC study. The cornerstone of that system was a comprehensive Airport Noise Zone Ordinance that would ensure that the identified noise zones would be legally defined and defensible in court if necessary. The ordinance established procedures for updating and revising the zones, and established the permitted and prohibited uses within each noise zone.

It was the author's observation that the planning process and land use element of the OIA ANCLUC was well documented. Extensive efforts were made to ensure that the process was well documented, including the alternatives that were not recommended, in response to the problems associated with the documentation of the operational alternatives.

A strong point of the planning process that was utilized was that it built a great deal of flexibility into its recommendations. The

planning process recognized the uncertainty of the future runway configurations, so land use recommendations and controls were developed to address both alternatives. Then as the situation became more certain and a decision was made as to the future runway configuration, then the controls in areas where they were no longer required would be removed.

The planning process that was utilized was not without its share of problems. In response to the problems with the residents in other parts of the study, the professional planners took exceptional efforts to work with the residents, to get the residents involved in the land use planning program, and to ensure that they understood the entire process. The planners did not want the situation to deteriorate in a manner similar to the Operational Alternatives Element.[32] The residents had direct input into the data collection, assumptions, alternative development and analysis, and in development of the land use control strategies. However, the residents had no direct input into the portion of the planning process that they were best able to assist in--the development of the community's goals and objectives that were used to guide the planning process. The planners involved in the study developed the goals and objectives themselves, with no direct input from the residents, due to time and resource constraints.[33] The fact that the goals and objectives of the community were based only on the perceptions of the professionals raised serious doubts as to their

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[32]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, May 1981.

[33]Ibid.

appropriateness and legitimacy. The importance of the goals and objectives cannot be understated, especially when one considers that they were used to modify the Land Use Guidance system and Noise Sensitivity Criteria. If the OIA ANCLUC goals and objectives did not represent the goals and objectives of the community, then the modifications that were made to the noise sensitivity criteria could be inappropriate.

Throughout the Land Use Element, it was emphasized that "the land use control recommendations were intended to guide future land use and the development of vacant land rather than to retroactively regulate properties that are presently developed."[34] The planners made that recommendation, which was accepted by the Board of County Commissioners, because the residents, particularly the members of ROAR, opposed applying any new regulations to existing development. ROAR members were particularly vocal in their opposition to noise disclosure statements for existing development, fearing they would adversely affect their property values.[35] The planners were of the opinion that the disclosure forms should be required of both existing and new development. However, rather than oppose ROAR, they changed their recommendation.[36] It appeared that the planners might have violated their professional

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[34]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report.

[35]Summary of Minutes, Public Meeting, September 29, 1980, pp. 1-14.

[36]Interview with Timothy Wilson, Airport Planner, Orange County Planning Department, May 1981.

responsibility and in effect made a major program decision that they did not have the authority to make. It can be argued that they should have presented their first recommendation, allowed ROAR to present its objections, and then let the Board of County Commissioners make the final decision, as is their right, on whether the requirements would apply to existing development.

The planning process identified existing incompatible development but did not make any recommendations to resolve these existing problems. Little or no consideration was given to resolving the existing compatibility problem through soundproofing of existing facilities or land acquisition and resident relocation. Both programs had been very successful in resolving existing compatibility problems in other areas.[37] A soundproofing program of even a limited nature would have been appropriate and beneficial at the school facilities and churches that were located in high noise zone areas.

The land use recommendations were disappointing as they did not recommend any positive program or efforts to encourage compatible development. The entire land use control program was based on regulations and restrictions that would prevent incompatible development. Programs could have been developed that would encourage and support compatible development. More attention could have been placed on establishing special development districts around the airport, developing tax incentives, or encouraging and supporting compatible development through revisions in the CIP.

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[37] FAA, Airport-Land Use Compatibility Planning, Ch. 3, p. 31.

The planning program appeared conservative in its consideration of innovative techniques such as land banking or transfer of development rights. The conclusion was made that:

> an approach of constraining growth of residential and other noise sensitive uses, combined with maximizing industrial/ commercial development in selected areas, would be the most effective means of achieving the study objectives. Detailed consideration of other radical concepts was not made.[38]

There was no recognition by the professionals that the potential benefits of a transfer of development rights, land banking, or other "radical concept" were appropriate in the airport compatibility program. The fact that the ANCLUC study was two years behind schedule and considerably over budget could have caused the staff's reluctance to spend the time and resources examining all of these alternatives. However, to discount those techniques because they were "radical" demonstrated a lack of comprehension and foresight. The FAA ANCLUC guidelines could address those techniques. The FAA had not provided sufficient policy direction and technical assistance in the land use portions of the ANCLUC study. As a result, each individual ANCLUC study essentially had to reinvent the wheel and spend unnecessary time, resources, and money evaluating alternatives as though they were never studied before.

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[38] Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report, p. 103.

CHAPTER VII

IMPLEMENTATION

The FAA Approach to Plan Implementation

The Airport Noise Control-Land Use Compatibility Program was established as a direct result of the Aviation Noise Abatement Policy (ANAP). Both the program and the policy emphasized the responsibilities of all the participants, industry, governments, and private citizens, to participate in the noise compatibility planning efforts and to implement its recommendations. ANCLUC and the ANAP recognized that in order to achieve significant and measurable progress in reducing aircraft noise, each part would have to assume certain responsibilities and act on the basis of complete cooperation and coordination.[1]

The Aviation Noise Abatement Policy set out the legal and proper responsibilities of the FAA, the airport proprietors, air carriers, aeronautical manufacturers, state and local governments, and private citizens. Adoption and implementation of the program's recommendations were obvious and critical aspects of the process which would lead to achieving compatibility. To develop an airport noise control-land use compatibility plan without adopting or implementing it could only be described as a meaningless exercise.

It was clearly the intent of the Aviation Noise Abatement Policy that the ANCLUC planning process would be used by the participants

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[1] FAA, Airport-Land Use Compatibility Planning, Ch. 1, p. 3.

within the limits of their authority to adopt and implement measures that would increase airport noise-land use compatibility. However, the actual adoption and implementation of an ANCLUC plan was not mandated by any law or regulation. The actual adoption and implementation of the recommendations of the studies were beyond the scope and funding of the federal ANCLUC program.

The FAA approach recognized the essential need for implementation; however, the program chose not to require mandatory implementation.

The FAA ANCLUC guidelines provided for numerous implementation strategies and justifications. The guidelines recommended that an airport/community noise abatement working group be established to monitor the success of implementation of all of the operational recommendations.

The FAA guidelines recommended that the adoption of the land use element not be considered the end of implementation. The FAA envisioned that the land use element would be an ongoing process of continual adjustment to fine tune the land use controls to meet the changing requirements of the airport and the community, while striving to maintain and improve overall compatibility.

The FAA provided and recommended the use of contractual agreements among the program participants to ensure adoption and implementation if the participants felt such an approach was appropriate.

The OIA Approach to Implementation

The responsibilities for implementing the recommendations of the ANCLUC program were to be a cooperative and voluntary, all of the

participants in the program. The GOAA and ATA refused to contractually define the responsibilities and duties of each of the participants, preferring instead to list those duties and responsibilities in the final report and allowing voluntary compliance. A brief discussion of the responsibilities of each of the participants follows.

The Federal Aviation Administration (FAA) had the authority and responsibility to control aircraft noise by the regulation of source emissions, by flight operational procedures, and by management of the air traffic control system and navigable airspace in ways that minimized noise impact on residential areas, consistent with the highest standards of safety. The federal government also provided financial and technical assistance to airport proprietors for noise reduction planning and abatement activities and, working with the private sector, conducted continuing research into noise abatement technology.

The Greater Orlando Aviation Authority (GOAA) was primarily responsible for planning and implementing actions designed to reduce the effect of noise on residents of the surrounding area. Such actions included optimal improvements in airport design, noise abatement ground procedures, land acquisition, and restrictions on airport use that did not unjustly discriminate against any user, impede the federal interest in safety and management of the air navigation system, or unreasonably interfere with interstate or foreign commerce.

The Federal Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) had the responsibility to review technically matters likely to impact the human or natural environment

(EPA) and to allow or deny federal funding support for housing or other urban forms of development (HUD).

The State of Florida Department of Transportation (DOT) provided financial and technical assistance to airport proprietors for noise reduction planning and abatement activities. The State Department of Environmental Regulation provided technical assistance on environmental matters.

Orange County and other Local Governments and Planning Agencies were to provide for environmental guidance, land use planning and development, and zoning and housing regulation that would limit the uses of land near airports to purposes compatible with airport operations.

The Air Carriers were responsible for retirement, replacement, or retrofitting of older jets that did not meet federal noise level standards, and for scheduling and flying airplanes in a way that minimized the impact of noise on people.

General Aviation Interests were responsible for the flying of airplanes in a way that minimized the impact of noise on people and would need to adjust to the limitations which would result from the proposed Terminal Control Area.

The Public was to participate in implementation in three ways. First, those who would travel or ship goods through Orlando International generally would bear the cost of the quiet engine program. The airlines and air freight companies would pass on the costs, at least in part, to those who utilized their service through ticket and waybill price increases. Second, for those residents affected by aircraft noise, their responsibility would be to continue to provide information

on aviation related noise problems experienced in their communities and continue to support federal, state, and local legislation which would reduce noise exposure. And third, prospective residents of areas impacted by noise should include the potential effects noise exposure might have prior to making final property acquisition decisions.[2]

Airport Operational Recommendation

Consistent with the FAA guidelines, the GOAA had established an Airport Noise Advisory Council prior to ANCLUC to oversee the implementation of the operational changes and review, over the long term, the effectiveness of those ANCLUC recommendations.

The operational controls established within the ANCLUC program were voluntary measures which would be implemented by the airlines, general aviation, and the FAA tower. Voluntary agreements of this type were typical at airports throughout the country and had been implemented successfully.[3] A procedure was also established to identify and investigate violations.

Land Use Control Measures

The implementation of the recommendations contained in the ANCLUC report required that each of the political entities establish the necessary ordinances, policies, and land use plan changes within their

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[2]Greiner Environmental Sciences, Inc., Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report.

[3]FAA, Air Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 91-193, pp. 2-7.

governmental framework. Orange County completed the adoption and amendment procedures in June 1981. The City of Orlando initiated a program similar to Orange County's in May 1982. At the time of this study, Osceola County, Edgewood, and Belle Isle had not taken any action.

The actions which Orange County had completed included amendments to adopted Growth Management Policy, amendments to the Future Land Use Policy Guide Map, Zoning Regulation amendments, adoption of the Airport Noise Zones Ordinance, adoption of an Avigation Easement Ordinance, amendments to the Building Codes, adoption of the Disclosure Ordinance, and revision of the Land Use Review procedures.

Analysis of Plan Implementation

The FAA had been unwilling to require that implementation of the ANCLUC program be mandatory. Its justification for this position had been that the federal government could not and should not interfere with local jurisdictional control of land use. That argument might not be sufficient justification in light of the FAA Land Use Compatibility Assurance requirements in conjunction with airport development grants. The Land Use Compatibility Assurance was a mandatory, contractual agreement involving the FAA, the airport proprietor, and the local jurisdiction which documented that appropriate actions had been or would be taken to restrict the use of land adjacent to the airport to activities and purposes compatible with normal airport operations.[4]

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[4] FAA, Land Use Planning.

Requiring mandatory implementation of the Land Use recommendations resulting from an ANCLUC study would be no more interference in local jurisdictional control of land use than the Land Use Compatibility Assurance. One possible explanation was that mandatory implementation of the operational and land use recommendations would require a much greater federal commitment, which was not forthcoming.[5]

There was an obvious lack of federal funding for implementation programs. The resource commitments had not kept pace with the program commitments outlined in the Aviation Noise Abatement Policy and the ANCLUC program guidelines. The ANCLUC planning process differed from the traditional planning approach in that the adoption and implementation of the ANCLUC recommendations were beyond the scope and funding of the program. The airport proprietor's contractual obligation to the FAA ended when the ANCLUC plan report was submitted to the FAA. The grant contractual agreements required the FAA to review the ANCLUC plans to determine that all work items had been completed in order to approve final grant payments. Essentially, the FAA was taking the position that implementation was not part of the overall planning process and could not be funded through that process.

The operational controls recommended in ANCLUC were voluntary measures which were to be implemented by the airlines, the airport proprietor, and the FAA tower. Voluntary implementation had worked in other areas; however, the GOAA's previous record indicated that the

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[5]Interview with John W. Reynolds, Environmental Planner, Office of Airport Planning and Programming, FAA, May 1980.

operational recommendations were not likely to be followed. The ANAC committee had documented that their efforts to have the easternmost runway designated as the Preferential Runway (also recommended by ANCLUC) was not implemented after two years, even though the GOAA agreed with it. Howard Cone, FAA Tower Chief, would not implement those procedures until he was instructed to by the GOAA and not by the ANAC committee. Even though GOAA "supported" the operational change, it would not instruct the tower to implement the procedure.[6] Procedures as inexpensive as installing signs on the taxiways to allow intersection takeoffs were delayed for two years because GOAA did not want to encourage the voluntary operational change they had agreed to previously.[7] The operational procedure which was creating the most noise controversy was the takeoffs to the north over the Conway Lakes. Those operations were to have been rerouted before ANCLUC was begun. Three years later they were still not stopped. With a past performance record such as this, the residents and other program participants placed little faith in voluntary implementation.

The GOAA and ATA were not willing to commit to mandatory implementation because they had developed operational changes that they knew were unenforceable.[8] The operational recommendations depended on narrowly defined flight tracks when, in reality, aircraft would vary

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[6]Minutes of the Aviation Noise Abatement Council, February 23, 1979, pp. 1-5.

[7]Ibid., p. 5.

[8]Summary of Minutes, Operations Subcommittee Meeting, February 20, 1979.

several miles on either side of the flight track. The airline pilots had indicated that they would not follow the instrument landing procedures or displaced threshold on runways (see Chapter VI for additional discussion).[9] It was quite obvious that the only operational recommendations that were likely to be implemented were those that would be funded by the FAA. If GOAA or the airlines were required to implement or fund the project, it was not likely to be accomplished.

The major recommendations that were the responsibility of the FAA were scheduled to be implemented between 1985-1987. Those improvements included establishing the Terminal Control Area, relocating the radar facilities from Herndon to OIA, and constructing a third parallel or dual diagonal runway system.

The implementation responsibilities of Orange County were voluntarily adopted and implemented. At the time of this study, the land use controls and procedures had been in effect for a year and were functioning as anticipated. However, the implementation of only the land use element of the ANCLUC study would not resolve the airport noise-land use compatibility problems in the Orlando International Airport area.

Plan implementation in the traditional planning process identified what was to be implemented, how it was to be funded, who had what responsibilities, and an implementation schedule to accomplish the various tasks. The FAA and OIA approach to implementation appeared to be less complete and detailed. Those programs only identified who was

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[9] Ibid.

responsible for each of the recommendations. The scheduling and financing were not addressed. The ANCLUC programs could be modified to require that those elements of the implementation program be addressed.

CHAPTER VIII

CONCLUSION

The Airport Noise Control-Land Use Compatibility Program has been recognized by the planning profession, aviation interests, and citizen groups as the state of the art in airport noise-land use compatibility planning as a result of its innovative approach of joining aircraft operational planning with land use planning. The ANCLUC program was developed to be a comprehensive approach to a multifaceted and extremely complex problem. The ANCLUC program had the financial resources, technical expertise, and citizen interest and involvement normally necessary to be successful. The range of alternatives and mitigating measures available to reduce the noise problem and ensure land use compatibility were so extensive that successful results were anticipated at OIA. The program included the range of participants with the necessary authority and obligations to facilitate implementation of the agreed upon noise abatement plan. However, the conclusion of the author, based on observation of the program, data generated through interviews of the key participants, and analysis of data generated during the course of the study, is that the ANCLUC program at Orlando International Airport was a failure.

This study of the OIA ANCLUC identified the major factors which resulted in the failure of the ANCLUC program. The failure of the OIA program was a result of a combination of factors including deficiencies in the FAA ANCLUC program and problems in the design and actual

execution of the OIA ANCLUC. These factors and problems included:

1. The FAA ANCLUC program's failure to address the safety aspects and concerns associated with airport activity.

2. The lack of commitment to noise abatement by the Greater Orlando Aviation Authority and the Air Transport Association which represented the airlines.

3. The adversary approach and lack of cooperation by the various program participants.

4. The program participants defined the issues and alternatives more narrowly than the residents perceived them.

5. The problems in the Operational Alternatives Element including:

   a. Questionable data and assumptions.

   b. Questionable modeling techniques and procedures.

   c. Operations Subcommittee's unwillingness to consider the full range of alternatives.

6. The failure of the Citizens' Participation program to establish effective communication and public input due to:

   a. Poor program design.

   b. Staff support and funding that were not sufficient.

   c. Questionable methods and techniques which were employed.

7. The failure of the land use element to address the existing compatibility problems.

8. The failure of the implementation program to address:

   a. Funding.

   b. Scheduling.

   c. Mandatory versus voluntary compliance.

9. Lack of sufficient FAA participation in ANCLUC in technical, procedural, and policy advice and direction.

The FAA ANCLUC program's disregard of safety considerations in the overall design and the FAA's institutional bias against safety evaluations in ANCLUC, as identified in Chapter III, were two of the major factors contributing to the failure of the OIA ANCLUC program. ANCLUC addressed only the noise hazards associated with aircraft operation. It is recommended that the FAA ANCLUC program be redesigned to ensure that the public is properly protected from both noise and safety problems associated with aircraft operation.

Should the FAA overcome this institutional bias and correct this major program deficiency, the ANCLUC program could be modified easily to incorporate safety considerations in a manner similar to the Air Installation Compatible Use Zone (AICUZ) program used by the military.[1] The AICUZ and ANCLUC programs were similar in their delineation of land use districts and guidelines of compatibility for land areas affected by aircraft operations. The AICUZ program differed and surpassed the ANCLUC program by identifying and analyzing accident potential areas as well as noise exposure areas. The AICUZ study evaluated adjacent land areas to determine if and how certain land uses might obstruct airspace, present other hazards to aircraft operations, or jeopardize the health, safety, or welfare of adjacent residents. The AICUZ process projected, mapped, and defined noise and accident potential zones while the ANCLUC program only identified noise zones. The Accident Potential Zones

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[1] Eatman and Martin, pp. 1-13.

(APZs) and Noise Zones (NZs) were overlaid on base maps to create Compatible Use Districts which were the basic planning units of the AICUZ program. By combining the APZ and NZ land use guidelines, the Compatible Use District became a composite input into the local planning process.[2]

The FAA's evaluation of ANCLUC programs across the country identified several key factors that were common to all of the successful ANCLUC programs: (1) an airport proprietor's commitment to the noise compatibility planning effort, (2) recognition in the workscope of the needs of all the participants, and (3) comprehensive and cooperative involvement in the planning process by representatives of all affected parties.[3]

Based on the author's observations and the analysis presented in Chapter III, it was evident that the OIA ANCLUC lacked several of the necessary ingredients found in successful ANCLUC studies. The analysis of the research data resulted in the conclusion that the lack of the airport proprietor's commitment to the noise compatibility planning effort, the lack of cooperative involvement by the participants, and identified deficiencies in the OIA work program were major factors in the failure of the OIA ANCLUC.

Interviews with representatives of the GOAA and ATA documented in Chapter III indicated that the airport proprietor was not committed to

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[2] Ibid.

[3] FAA, Air Noise Compatibility Planning and Programs under P.L. 91-258 and P.L. 91-193, p. 2.

noise abatement planning and was of the opinion that Orlando International Airport did not have a noise problem. The GOAA commitment to ANCLUC was to ensure federal funding of the new terminal complex. The lack of commitment to noise abatement planning was reflected in many of the actions taken by GOAA throughout the study.

The GOAA, the Air Transport Association, citizen groups, and Orange County--all major participants in the study--came into the program with an uncooperative, antagonistic, and adversary approach. It was the author's observation that this uncooperative adversary approach exhibited by the various participants significantly reduced the chances for program success and actually was a major factor contributing to the failure of the program.

The Operational Alternatives element of the ANCLUC program had the potential for alleviating noise impacts in areas adjacent to airports. It appeared that the Operations Recommendations element of the Orlando International Airport ANCLUC did not realize that potential. Questions concerning the validity and appropriateness of the data and assumptions used in this element were documented in Chapter IV. The inherent limitations of the Integrated Noise Model, identified programming errors and omissions, as well as the failure to properly calibrate the model, detracted from the credibility of the noise contour modeling efforts.

In addition to the technical problems in the operational element, it appeared that the more serious issue was the unwillingness of the GOAA and Operation Subcommittee to consider the full range of available operational alternatives. The unwillingness to even consider many of

the alternatives was a further indication of the GOAA's lack of commitment to the noise abatement program.

The Operational Recommendations did not appear to adequately resolve the major noise problems that they were designed to address. The most annoying noise problem resulted from aircraft taking off north of the airport on a northwesterly heading over the heavily populated residential areas adjacent to the Conway Lakes.[4] Rather than completely eliminating those flights or rerouting them, the Operations Subcommittee recommended that those aircraft go slightly further to the north before making that turn over the residential areas. When the inadequacy of the recommendations was combined with the GOAA's past performance in not enforcing noise abatement procedures, it appeared that little noise attenuation would actually result from the recommendations of the Operations Element of the ANCLUC study.

The purpose of the Citizen Participation program of the OIA ANCLUC was to develop constructive and effective interaction with the residents in order to gain public acceptance and support of the final plan. Chapter IV documents the process that was conducted at OIA. The author's observations and interpretation of the results of that process led to the conclusion that it was a poorly designed and executed program that did not follow FAA guidelines and objectives and did not even follow generally accepted planning principles. The likelihood of program success was greatly reduced due to the reliance on four

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[4]Eighty-two percent of the respondents on the questionnaire distributed at the Public Meeting, December 12, 1978, identified that flight operation as the worst from a noise concern.

inexperienced lay residents to formulate and execute the program without sufficient resources or guidance.

The Citizen Participation program appeared to have been designed to accomplish questionable objectives such as educating the public and utilized questionable techniques such as appointing airport opponents to the Public Involvement Subcommittee in an effort to diffuse that opposition. Contrary to the FAA guidelines, the residents were brought into the process much too late after the work program and data collection had been completed and major decisions had been made. It appeared to the author that sufficient efforts were not made to solicit input from all affected groups. That conclusion was evidenced by the formation of the RADAR group late in the process. The OIA program also placed too much emphasis on formal public meetings rather than on informal work sessions where meaningful input could be developed.

Examination of the work program indicated that the ANCLUC study was designed to be completed in the shortest possible time that it would take to do the technical data collection, analysis, and recommendations. Several public meetings were scheduled at various times to inform the public of the progress which was being made and to get the reaction of the residents to those recommendations. The OIA ANCLUC program could have been designed to allow resident input before the recommendations were made and not after the fact, which would have been consistent with FAA program guidelines. The OIA program design discouraged citizen input and specifically excluded direct citizen involvement with the Operations and Technical Coordinating Committees. It was the author's conclusion that the OIA ANCLUC Citizen Participation program was merely

an effort to legitimize a process aimed at fulfilling federal program requirements.

The OIA ANCLUC Citizen Participation program was not able to foster communication and positive interaction and, as a result, the failure of that element contributed to the failure of the overall program. Despite all the issues, problems, and concerns raised in the Citizen Participation program, it was the author's conclusion that one of the major problems was that the GOAA and the other program participants tried to define the issues and options in the ANCLUC program more narrowly than the residents perceived them. As a result, the residents expressed the feeling that decisions and solutions were being forced on them and they reacted negatively to this type of approach. The program participants conversely reacted to the negative reactions of the residents by opposing their suggestions and refusing to consider legitimate solutions they proposed.

The land use planning element of the OIA ANCLUC program adequately addressed and resolved the future land use compatibility issues. The planning process that was employed was comprehensive and based on sound planning practices and principles. However, few planning programs are conducted that do not experience some problems in addition to their accomplishments. The major problem of the OIA ANCLUC land use planning program was that it failed to address the existing compatibility problems. It appeared to the author that the land use planning program addressed only half of the airport noise-land use compatibility issue. To ensure better results, the land use planning element of the OIA

ANCLUC program should have been expanded to address the existing compatibility problem, consistent with FAA guidelines.

It was also the author's observation that the Orange County planners were too easily influenced and politicized by the residents, in particular the members of ROAR. The professionals were so sensitive to the concerns of ROAR that they were willing to reverse one of their major recommendations--a recommendation that they felt was professionally justified. The staff should have been able to make that difficult and unpopular recommendation that the new land use controls be applied to existing and new development and not just to new development, which was ROAR's position.

Based on the OIA ANCLUC program, the FAA should consider incorporating a Noise Level Reduction System into the FAA Land Use Guidance System. The Noise Level Reduction Approach developed in the OIA program added a great deal of flexibility to the system. The FAA should also establish a program to evaluate the effectiveness of ANCLUC programs that have their land use plans adopted by ordinance rather than by resolution. In areas such as Orlando, where the noise problem was very controversial and development approvals were extremely politicized, having a strong plan adopted by ordinance was one way to ensure fair and consistent implementation of plan recommendations.

The OIA ANCLUC program was successful in bringing together all of the affected and responsible parties to participate in the noise planning process. It was the author's observation that the OIA ANCLUC was less successful in ensuring that all parties accept their appropriate responsibilities during the planning process to adopt and

implement recommendations. The plan implementation element did not even identify the schedule and funding responsibilities of the various implementation activities.

Adoption and implementation of the noise compatibility plan was not mandated by law or regulation. Until it would be so mandated, the level of implementation and program success would have to be determined by the level of commitment of all of the participants. It has been documented in this study of the OIA ANCLUC that the commitment of the participants was significantly less than anticipated in the FAA guidelines. Results indicated that even the federal commitment in terms of staff, resources, and funding had not kept pace with the program commitments outlined in the Aviation Noise Abatement Policy and the Airport Noise Control-Land Use Compatibility Program. GOAA's past record of implementing noise abatement procedures was disappointing. After the ANCLUC study, the only effort taken by the GOAA to implement the ANCLUC program was to apply for funding for a new runway. Contrary to the ANCLUC program recommendations, that application was for the single parallel runway and would not include consideration of the dual diagonal system.

This study analyzed the FAA ANCLUC program which was said to be the state of the art in airport noise-land use compatibility planning. However, during the study many factors and problems were uncovered which could be used to improve the program, particularly in the problem areas identified. This study also indicates that a state-of-the-art planning process without the proper commitment by the participants and the support of the residents is not likely to be a success. This study may be applicable to other ANCLUC programs and there is the hope that by

examining the failures of the Orlando International Airport ANCLUC study, others will not recreate them and the overall ANCLUC program will improve.

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APPENDIXES

APPENDIX A

AIRCRAFT NOISE ESTIMATING METHODOLOGIES

1. INTRODUCTION. This appendix is intended to provide a general familiarization with several noise methodologies in common use in the United States. A brief description of the methodologies is given, followed by a listing of references which may be consulted to obtain detailed technical information. The descriptions are proceeded by a brief glossary of some terms often encountered in discussing noise.

2. GLOSSARY OF NOISE TERMS.

   a. Decibel (dB). A numerical expression of the relative loudness or level of a sound, i.e., the sound pressure level.

   b. A-Weighted Sound Level (dBA). The human ear is more sensitive to sound energy at high frequencies than at low frequencies. Also, the ear's sensitivity to sounds of different frequencies changes with the level of the sound. The A-weighted sound level is the actual measured sound level weighted to match the sensitivities of the human ear. This may also be written dB(A).

   c. Noise Metric. Noise metrics are the different measures by which a given noise may be expressed, for example, Noise Exposure Forecast or Day-Night Average Sound Level.

3. FAA INTEGRATED NOISE MODEL VERSION I (INM-1).

   a. Overview. The INM-1 was developed by DOT/FAA to provide a conceptually simple and flexible method for characterizing aircraft noise near airports. For acceptable definitions of aircraft operations, the INM-1 is capable of computing noise exposure for five different noise measures.

      (1) Measures. Noise measures (metrics) available from the model are Noise Exposure Forecast (NEF), Day-Night Average Sound Level (L_{dn}), Equivalent Sound Level (L_{eq}), Community Noise Equivalent Level (CNEL), and Time of Exposure Above (TA) a number of user specified A-weighted sound levels in decibels, dBA (TA_{85}, TA_{95}, etc.). All of these measures can be displayed in the form of contours of equal noise exposure to a desired map scale. The users will normally choose a single measure of greatest interest for contour plotting, although plots in more than one metric can be readily obtained. The INM-1 also automatically provides numerical listings of the calculated noise values at all intersecting points on a grid which encompasses the airport and its environs. This printed output includes computations of the four noise measures based on accumulated acoustical energy, and time-above-A-weighted sound levels for six selected noise thresholds, from 65 decibels to 115 decibels. The time of exposure calculations are further broken down into three daily periods: a 24-hour day, evening hours (7 p.m.-10 p.m.), and night hours (10 p.m.-7 a.m.).

      (2) Inputs. The input of certain characteristics of the airport and its operation is a necessary step in the calculations. The user must define runway user and flight tracts and must allocate the traffic by specific aircraft types.

      (3) Outputs. The program output consists of a printout of the input data, plotted noise contours, and computed noise levels at grid points. Options are provided to plot contours of any of the four cumulative energy metrics or contours of equal exposure in minutes over specified A-weighted sound levels. A very convenient option is specification of the contour plot scale so it matches the scale of a desired map. The runways are drawn on the contour map

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Source: FAA, Airport Noise Control and Land Use Compatibility Planning under the Planning Grant Program, pp. 1-7.

to provide visual orientation and reference when the contours are used as overlays on maps of the same scale. Calculations at each grid point are printed in tabular form.

b. References. The Basic User's Guide for the DOT/FAA integrated Noise Model Version I, Report Number FAA-EQ-78-01, January 1978, and the DOT/FAA Integrated Noise Model (Brochure), Report Number FAA-EQ-78-02, January 1978 (available through the National Technical Information Service, Springfield, Virginia 22151).

4. DAY-NIGHT AVERAGE SOUND LEVEL L_{dn}.

a. Description. L_{dn} was developed in 1973-1974 for the Environmental Protection Agency. It is receiving wide use for estimating noise impacts at both civil and military airports and is based upon an Equivalent Sound Level (L_{eq}). The L_{dn} is weighted to account for the quieter background noise levels from 10:00 p.m. to 7:00 a.m., with a 10 dB penalty applied. It is a measurable quantity and can be measured directly at existing airports using portable monitoring equipment. Also, L_{dn} may be used for quantifying other noise sources, such as auto traffic, and for comparing them to airport-generated noise. Contour values usually range from less than 55 L_{dn} for lightly impacted areas to more than 75 L_{dn} for heavily impacted areas. The contours are drafted upon a map of the airport and its environs as shown in Illustration 2-1. Although contours are typically computer-produced, they can be produced by "desk-calculation" methods (see reference (2)(a) below).

TYPICAL DAY-NIGHT AVERAGE SOUND LEVEL (L_{dn}) CONTOURS

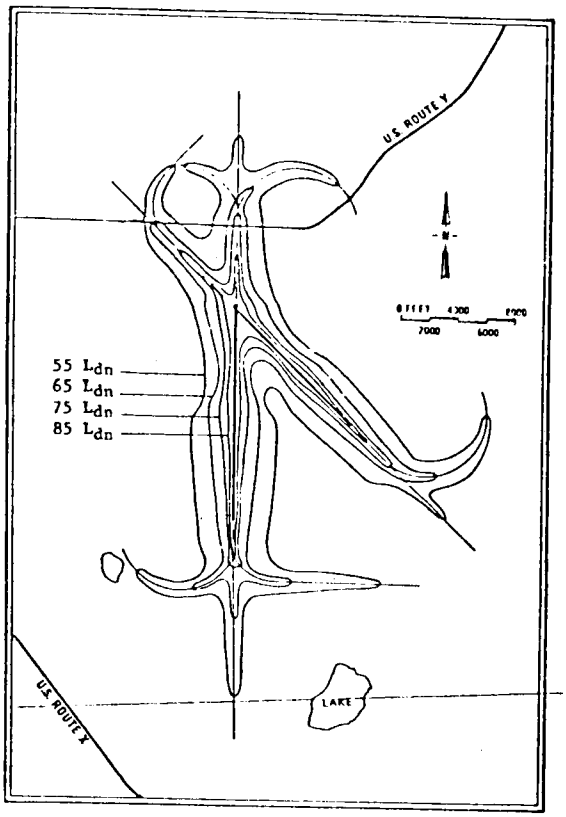


ILLUSTRATION 2-1

b. References.

(1) General Information. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety; Environmental Protection Agency; Report No. 550/9-74-004; March 1974 (document for sale by U.S. Government Printing Office, Stock No. 055-000-0012-1, $2.10).

(2) Technical Information.

(a) Calculation of Day-Night Levels (L_{dn}) Resulting from Civil Aircraft Operations; Environmental Protection Agency; Report No. 550/9-77-450; January 1977 (available from Environmental Protection Agency (AW-471), Washington, D.C. 20460).

(b) Developing Noise Exposure Contours for General Aviation Airports; D. E. Bishop and A. P. Hays; Bolt, Beranek, and Newman, Inc.; Report No. FAA-AS-75-1; December 1975 (available through National Technical Information Service, Springfield, Virginia 22151, No. ADA 023429, $7.75).

5. NOISE EXPOSURE FORECAST (NEF).

a. Description. The NEF was developed in 1967 as a refinement of the composite noise rating (CNR) methodology (see paragraph 9). It takes into account the factors considered by the CNR plus the additional exposure factors of the duration of aircraft flyovers and of discrete (pure) tones such as turbine "whine". The NEF is a complex procedure, usually requiring the use of a computer for noise contour development. NEF for general aviation with some jet operations can, however, be obtained from reference (1) below. Contours derived via this method usually range from less than 20 NEF for lightly impacted areas to more than 40 NEF for heavily impacted areas. The NEF is a calculated noise exposure value and cannot be directly measured.

b. References.

(1) General Information. Developing Noise Exposure Contours for General Aviation Airports; D. E. Bishop and A. P. Hays; Bolt, Beranek, and Newman, Inc.; Report No. FAA-AS-75-1; December 1975 (available through the National Technical Information Service, Springfield, Virginia 22151, No. ADA 023429, $7.75).

(2) Technical Information.

(a) Noise Exposure Forecast: Evolution, Evaluation, Extensions, and Land Use Interpretations; W. J. Galloway and D. E. Bishop; Bolt, Beranek, and Newman, Inc.; Report No. FAA-NO-70-9; August 1970 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD 771-131, $5.25).

(b) Procedures for Developing Noise Exposure Forecast Areas for Aircraft Flight Operations; D. E. Bishop and R. D. Horonjeff; Bolt, Beranek and Newman, Inc.; Report No. DS-67-10; August 1967 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD 660-706, $5.25).

6. COMMUNITY NOISE EQUIVALENT LEVEL (CNEL).

a. Description. The CNEL was developed for the State of California. It is quite similar to the L_{dn}, except that it introduces an intermediate weighting for the early evening hours between 7:00 p.m. and 10:00 p.m. in addition to the weighting for the nighttime hours (10:00 p.m. to 7:00 a.m.). Contour values usually range from less than 55 CNEL for lightly impacted areas to more than 75 CNEL for heavily impacted areas. CNEL, like L_{dn}, is a measurable quantity and can be measured directly. The contours are typically computer-produced.

b. References.

(1) The Adopted Noise Regulations for California Airports, TITLE 4, Register 70, No. 48-11-28-70, Subchapter 6, Noise Standards (distributed by Documents Section, State of California, P.O. Box 20191, Sacramento, California 95820).

(2) Community Noise; Environmental Protection Agency; Report No. PB-207-124; December 1971 (document for sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Stock Number EP 1.2:N69/6, $2.25).

7. EQUIVALENT SOUND LEVEL (L_{eq}).

a. Description. The L_{eq} is formulated similarly to Ldn and CNEL, except that it includes no time of day corrections. L_{eq} is an energy summation of the aggregate noise environment as measured in A-weighted sound level. Contour values usually range from less than 50 L_{eq} for lightly impacted areas to more than 70 for heavily impacted areas.

b. References. Computation of Noise Exposure Values - Integrated Noise Model, Wyle Research Report WCR-77-1, January 1977; Evaluation and Sensitivity Analysis of Airport Noise Characterization Methodologies, MITRE MTR-6994, August 1975.

8. TIME ABOVE A THRESHOLD OF A-WEIGHTED SOUND LEVEL (TA).

a. Description. Time Above a Threshold of A-weighted Sound Level (TA) is a noise measure recently developed by the FAA. TA indicates the amount of time that a threshold sound level is exceeded at a given point. TA, which uses no time of day weighting, can be directly measured and provides an objective description of the noise climate around airports. However, no criteria have been developed for either excessive or appropriate exposure. TA is available for noise thresholds ranging from 65 to 115 dBA.

b. References. Computation of Noise Exposure Values - Integrated Noise Model, Wyle Research Report WCR-77-1, January 1977.

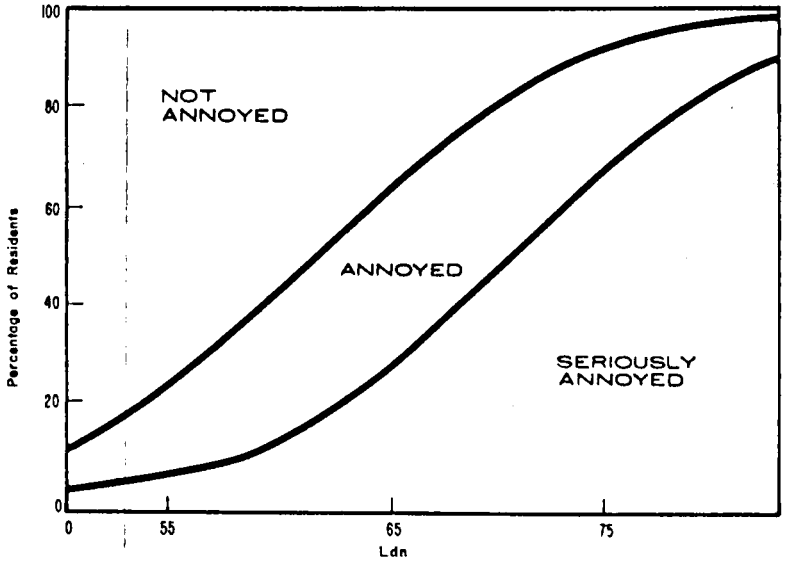
9. COMPOSITE NOISE RATING (CNR).

a. Description. The composite noise rating (CNR) is a summary measure of the aircraft generated noise environment in the vicinity of airports over a 24-hour period. The CNR methodology was developed in 1952 and is the oldest of the methodologies in use. The CNR is a calculated noise exposure value and cannot be directly measured. CNR contours cannot be produced via the INM. They are calculated from aircraft noise expressed in terms of the maximum perceived (i.e., identified by the human ear) noise level (PNL) and the number of operations in day and nighttime periods. They are based upon statistical analyses correlating given individual reactions to measured aircraft noise levels, and numerical corrections are applied to the aircraft noise contours to reflect public response to noise under varying conditions. Night operations are weighted to account for the quieter overall noise levels and the resting activity of the majority of the population during the late evening and early morning hours (10:00 p.m. to 7:00 a.m.). Nighttime aircraft operations need to be only a fraction of the number of daytime operations to generate the same perceived noise level; similarly, nighttime operations have a much greater effect upon perceived noisiness than daytime operations. Contours developed via the methodology are drafted upon a map of the airport and its environs. The contour values usually range from less than 90 CNR for minimally impacted areas to more than 115 CNR for heavily impacted areas. Caution is suggested in applying CNR methodology to general aviation airports since in such use it tends to exaggerate indications of noise impact.

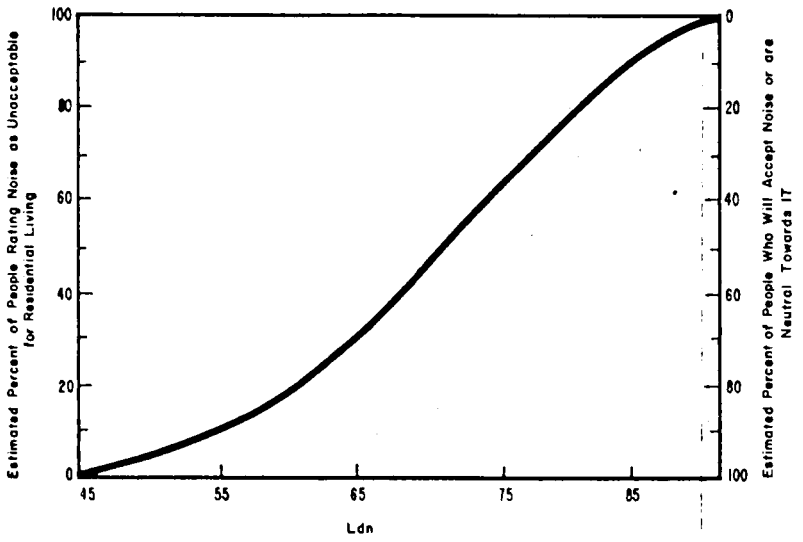
b. Reference.

(1) General Information. Developing Noise Exposure Contours for General Aviation Airports; D. E. Bishop and A. P. Hays; Bolt, Beranek, and Newman, Inc.; Report No. FAA-AS-75-1; December 1975 (available through the National Technical Information Service, Springfield, Virginia 22151, No. ADA 023429, $7.75).

(2) Technical Information. Land Use Planning Relating to Aircraft Noise; W. J. Galloway and A. C. Pietrasanta; Bolt, Beranek, and Newman, Inc.; Technical Report No. 821; October 1964 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD 615-015, $5.25).



ANNOYANCE CAUSED BY AIRCRAFT NOISE
IN RESIDENTIAL COMMUNITIES
NEAR MAJOR AIRPORTS



ATTITUDES TOWARD AIRCRAFT
NOISE IN A RESIDENTIAL COMMUNITY

APPENDIX B

ORLANDO JETPORT AT MCCOY

AIRCRAFT APPROACH AND DEPARTURE COMPLAINT FORM

HOW RECEIVED: TELEPHONE_____ DATE_____

PERSONAL_____

LETTER_____ TIME_____

COMPLAINANT'S NAME_____

ADDRESS_____

TELEPHONE NO._____

OTHER WITNESSES_____

(NAMES & ADDRESSES)_____

NATURE OF COMPLAINT: (INFORMATION FROM COMPLAINANT)

DATE_____ TIME OF INCIDENT_____ A/C DESCRIPTION_____

RUNWAY USED_____ INBOUND_____ OUTBOUND_____

AIRCRAFT IDENTIFICATION NUMBER (IF OBSERVED)_____

COMPLAINANT'S DESCRIPTION OF INCIDENT_____

_____

_____

CORROBORATING DATA:

PROBABLE RUNWAY USE LOG ENTRY(S) CORRESPONDING TO INCIDENT REPORTED:

FLT. NO. OR A/C NO.	TIME	INBOUND OR OUTBOUND	RUNWAY USED

WIND DIRECTION_____ VELOCITY_____ CEILING_____ VISIBILITY_____

REMARKS:_____

_____

_____

_____

APPENDIX C

Date _____

AIRCRAFT NOISE QUESTIONNAIRE

NAME: _____

ADDRESS: _____

_____

PHONE: _____

Community in which you live:

[ ] Belle Isle
[ ] Conway East
[ ] Conway Estates
[ ] Conway Woods
[ ] Edgewood
[ ] Orange County
[ ] Orlando
[ ] Osceola County
[ ] Shenandoah Park
[ ] Taft
[ ] Other _____

1. How long have you lived at this address? _____

   a. Do you own your home? [ ]
   b. Do you rent? [ ]

2. Do you have a problem with aircraft noise? Yes [ ] No [ ]

   If you do:
   a. Have you called to complain? Yes [ ] No [ ]
   b. Whom did you call? _____
   c. If you didn't call, why? _____

3. Generally, is your noise problem:

   a. Seldom [ ] Occasional [ ] Frequent [ ]
   b. Mild [ ] Moderate [ ] Severe [ ]
   c. Day [ ] Evening [ ] Night [ ]
   d. General Aviation [ ] Commercial Airlines [ ] Military [ ]
   e. Don't have a noise problem [ ]

4. Is your noise problem worse as a result of: (answer only one)

   Takeoffs to the: North [ ] South [ ]
   Landings from the: North [ ] South [ ]
   Other (please explain) _____
   Don't have a noise problem [ ]

5. Would you support some restrictions on property rights through building codes and other land use controls as a means of protecting residential development from adverse noise impacts?

   a. Would you support building codes that would alleviate noise problems but could potentially raise the cost of a house from $3,000-$5,000?

      Yes [ ] No [ ]

   b. Would you support rezoning of land in high noise impact areas from residential uses to more compatible uses such as commercial, agricultural and industrial?

      Yes [ ] No [ ]

   c. Would you support withholding of certain public facilities such as sewer and water lines to prevent incompatible development in high noise impact areas?

      Yes [ ] No [ ]

6. Would you favor the expenditures of County funds to purchase private property or easements to prevent adverse noise impacts?

   Yes [ ] No [ ]

7. Should Orange County's land use policy encourage high intensity uses such as industrial/commercial uses in high noise areas?

   Yes [ ] No [ ]

8. Should Orange County's land use policy discourage most residential development, schools, churches and other places of assembly in high noise areas?

   Yes [ ] No [ ]

9. Would you support programs such as transfer of development rights from high noise impact areas to other areas as a means of compensation to affected land owners?

   Yes [ ] No [ ]

10. What is your main concern (or concerns) regarding aircraft operations?

    _____

    _____

    _____

    _____

11. What do you think could be done to alleviate your concerns?

    _____

    _____

    _____

    _____

12. Do you wish to have your representative on the Public Involvement Sub-Committee call you to personally discuss your concerns?

    Yes [ ] No [ ]

13. Additional comments. (Use reverse side, if necessary.)

    _____

    _____

    _____

    _____

    _____

Please return the questionnaire at this meeting or mail to:

ANCLUC Public Involvement Sub-Committee
Post Office Box 19127
Orlando, Florida 32814

– REMEMBER –

Noise Complaint Number
855-3400

APPENDIX D

RECOMMENDED BUILDING REQUIREMENTS:

A. SECTION 1 - RECOMMENDED BUILDING REQUIREMENTS FOR A MINIMUM NOISE LEVEL REDUCTION OF 25 db

1-1 Compliance

Compliance with the following standards shall be deemed to meet the requirements of the compatible use districts in which an NLR 25 is specified.

1-2 General

a. Brick veneer, masonry blocks or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.

b. At the penetration of exterior walls by pipes, ducts, or conduits the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.

c. Window and/or through-the-wall ventilation units shall not be used.

d. Through-the-wall/door mail boxes shall not be used.

1-3 Exterior Walls

a. Exterior walls other than as described in this section shall have a laboratory sound transmission class rating of at least STC-39.

b. Masonry walls having a surface weight of at least 25 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.

c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer.

(1) Interior surface of the exterior walls shall be of gypsum board or plaster at least ½" thick, installed on the studs.

(2) Continuous composition board, plywood or gypsum board sheathing at least ½" thick shall cover the exterior side of the wall studs behind wood or metal siding. Asphaltic or wood shake shingles are acceptable in lieu of siding.

(3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.

(4) Insulation material at least 2" thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

1-4 Windows

a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28.

b. Glass shall be at least 3/16" thick.

c. All operable windows shall be weather stripped and airtight when closed so as to conform to an air infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.

Source: FAA, Airport Noise Control and Land Use Compatibility Planning under the Planning Grant Program, pp. F1-F19.

d. Glass of fixed-sash windows shall be sealed in an airtight manner with a nonhardening sealant, or a soft elastomer gasket or glazing tape.

e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-00153.

f. The total area of glass in both windows and doors in sleeping spaces shall not exceed 20% of the floor area.

1-5 Doors

a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28.

b. All exterior side-hinged doors shall be solid-core wood or insulated hollow metal at least 1-3/4" thick and shall be fully weather stripped.

c. Exterior sliding doors shall be weather stripped with an efficient airtight gasket system with performance as specified in Section 1-4C. The glass in the sliding doors shall be at least 3/16" thick.

d. Glass in doors shall be sealed in an airtight nonhardening sealant, or in a soft elastomer gasket or glazing tape.

e. The perimeter of door frames shall be sealed airtight to the exterior wall construction as described in Section 1-4E.

1-6 Roofs

a. Combined roof and ceiling construction other than described in this section and Section 1-7 shall have a laboratory sound transmission class rating of at least STC-39.

b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.

c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weight of at least 25 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.

d. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-28.

1-7 Ceilings

a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 1-6B above. Ceilings shall be substantially airtight, with a minimum number of penetrations.

b. Glass fiber or mineral wool insulation at least 2" thick shall be provided above the ceiling between joists.

1-8 Floors

a. Openings to any crawl spaces below the floor of the lowest occupied rooms shall not exceed 2% of the floor area of the occupied rooms.

1-9 Ventilation

a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior.

b. Gravity vent openings in attic shall not exceed code minimum in number and size.

c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1" thick coated glass fiber, and shall be at least 5 ft. long with one 90° bend.

d. All vent ducts connecting the interior space to the outdoors, excepting domestic range exhaust ducts, shall contain at least a 5 ft. length of internal sound absorbing duct lining. Each duct shall be provided with a bend in the duct such that there is no direct line of sight through the duct from the venting cross section to the room opening cross section.

e. Duct lining shall be coated glass fiber duct liner at least 1" thick.

f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.

g. Fireplaces shall be provided with well-fitted dampers.

B. SECTION 2 - RECOMMENDED BUILDING REQUIREMENTS FOR A MINIMUM NOISE LEVEL REDUCTION OF 30 db

2-1 Compliance

Compliance with the following standards shall be deemed to meet the requirements of the Compatible Use Districts in which an NLR 30 is specified.

2-2 General

a. Brick veneer, masonry blocks or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.

b. At the penetration of exterior walls by pipes, ducts or conduits, the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.

c. Window and/or through-the-wall ventilation units shall not be used.

d. Operational vented fireplaces shall not be used.

e. All sleeping spaces shall be provided with either a sound-absorbing ceiling or a carpeted floor.

f. Through-the-wall/door mailboxes shall not be used.

2-3 Exterior Walls

a. Exterior walls other than as described below shall have a laboratory sound transmission class rating of at least STC-44.

b. Masonry walls having a surface weight of at least 40 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.

c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer.

(1) Interior surface of the exterior walls shall be of gypsum board or plaster at least 1/2" thick, installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.

(2) Continuous composition board, plywood or gypsum board sheathing shall cover the exterior side of the wall studs behind wood, or metal siding. The sheathing and facing shall weigh at least 4 pounds per square foot.

(3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.

(4) Insulation material at least 2" thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

2-4 Windows

a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33.

b. Glass of double-glazed windows shall be at least 1/8" thick. Panes of glass shall be separated by a minimum 3" air space.

c. Double-glazed windows shall employ fixed sash or efficiently weather stripped operable sash. The sash shall be rigid and weather stripped with material that is compressed air tight when the window is closed so as to conform to an infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-282-65-T.

d. Glass of fixed-sash windows shall be sealed in an airtight manner with a nonhardening sealant, or a soft elastomer gasket or glazing tape.

e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-00153.

f. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.

2-5 Doors

a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33.

b. Double door construction is required for all door openings to the exterior. Openings fitted with side-hinged doors shall have one solid-core wood or insulated hollow metal core door at least 1-3/4" thick separated by an airspace of at least 4" from another door, which can be a storm door. Both doors shall be tightly fitted and weather stripped.

c. The glass of double-glazed sliding doors shall be separated by a minimum 4" airspace. Each sliding frame shall be provided with an efficiently airtight weather stripping material as specified in Section 2-4C.

d. Glass of all doors shall be at least 3/16" thick. Glass of double sliding doors shall not be equal in thickness.

e. The perimeter of door frames shall be sealed airtight to the exterior wall construction as indicated in Section 3-4E.

f. Glass of doors shall be set and sealed in an airtight nonhardening sealant, or a soft elastomer gasket or glazing tape.

2-6 Roofs

a. Combined roof and ceiling construction other than described in this section and Section 2-7 shall have a laboratory sound transmission class rating of at least STC-44.

b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.

c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weight of at least 40 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.

d. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-33.

2-7 Ceilings

a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 2-6.B above. Ceilings shall be substantially airtight, with a minimum number of penetrations.

b. Glass fiber or mineral wool insulation at least 2" thick shall be provided above the ceiling between joists.

2-8 Floors

The floor of the lowest occupied rooms shall be slab on fill, below grade or over a fully enclosed basement. All door and window openings in the fully enclosed basement shall be tightly fitted.

2-9 Ventilation

a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior.

b. Gravity vent openings in attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least 3 ft in length containing internal sound absorbing duct lining. Each duct shall have a lined 90° bend in the duct such that there is no direct line of sight from the exterior through the duct into the attic.

c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1" thick coated glass fiber, and shall be at least 5 ft long with one 90° bend.

d. All vent ducts connecting the interior space to the outdoors, excepting domestic range exhaust ducts, shall contain at least a 10 ft length of internal sound absorbing duct lining. Each duct shall be provided with a lined 90° bend in the duct such that there is no direct line of sight through the duct from the venting cross section to the room opening cross section.

e. Duct lining shall be coated glass fiber duct liner at least 1" thick.

f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.

g. Building heating units with flues or combustion air vents shall be located in a closet or room closed off from the occupied space by doors.

h. Doors between occupied space and mechanical equipment areas shall be solid core wood or 20 gauge steel hollow metal at least 1-3/4" thick and shall be fully weather stripped.

C. SECTION 3 - RECOMMENDED BUILDING REQUIREMENTS FOR A MINIMUM NOISE LEVEL REDUCTION OF 35 db

3-1 Compliance

Compliance with the following standards shall be deemed to meet the requirements of the Compatible Use Districts in which an NLR 35 is specified.

3-2 General

a. Brick veneer, masonry blocks or stucco exterior walls shall be constructed airtight. All joints shall be grouted caulked airtight.

b. At the penetration of exterior walls by pipes, ducts or conduits, the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.

c. Window and/or through-the-wall ventilation units shall not be used.

d. Operational vented fireplaces shall not be used.

e. All sleeping spaces shall be provided with either a sound absorbing ceiling or a carpeted floor.

f. Through-the-wall/door mailboxes shall not be used.

g. No glass or plastic skylight shall be used.

3-3 Exterior Walls

a. Exterior walls other than as described below shall have a laboratory sound transmission class rating of at least STC-49.

b. Masonry walls having a surface weight of at least 75 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.

c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer.

(1) Interior surface of the exterior walls shall be of gypsum board or plaster at least 1/2" thick, installed on studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer. If the exterior is stucco or siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.

(2) Continuous composition board, plywood or gypsum board sheathing shall cover the exterior side of the wall studs behind wood, or metal siding. The sheathing and facing shall weigh at least 4 pounds per square foot.

(3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.

(4) Insulation material at least 3-1/2" thick shall be installed continuously through the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

3-4 Windows

a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-38.

b. Double-glazed windows shall employ fixed sash. Glass of double-glazed windows shall be at least 1/8" thick. Panes of glass shall be separated by a minimum 3" air space and shall not be equal in thickness.

c. Glass of windows shall be sealed in an airtight manner with a nonhardening sealant, or a soft elastomer gasket or glazing tape.

d. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-00153.

e. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.

3-5 Doors

a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-38.

b. Double door construction is required for all door openings to the exterior. The door shall be side-hinged and shall be solid-core wood or insulated hollow metal, at least 1-3/4" thick, separated by a vestibule at least 3 ft in length. Both doors shall be tightly fitted and weather stripped.

c. The perimeter of door frames shall be sealed airtight to the exterior wall construction as specified in Section III-4.d.

3-6 Roofs

a. Combined roof and ceiling construction other than described in this section and Section 3-7 shall have a laboratory sound transmission class rating of at least STC-49.

b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.

c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weight of at least 75 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.

3-7 Ceilings

a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 3-6. Ceilings shall be substantially airtight, with a minimum number of penetrations. The ceiling panels shall be mounted on resilient clips or channels. A nonhardening sealant shall be used to seal gaps between the ceiling and walls around the ceiling perimeter.

b. Glass fiber or mineral wool insulation at least 3-1/2" thick shall be provided above the ceiling between joists.

3-8 Floors

The floors of the lowest occupied rooms shall be slab on fill or below grade.

3-9 Ventilation

a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without need to open any windows, doors, or other openings to the exterior.

b. Gravity vent openings in attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least 3 ft in length containing internal sound absorbing duct lining. Each duct shall have a lined 90° bend in the duct such that there is no direct line of sight from the exterior through the duct into the attic.

c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1" thick coated glass fiber, and shall be at least 10 ft long with one 90° bend.

d. All vent ducts connecting the interior space to the outdoors, excepting domestic range exhaust ducts, shall contain at least a 10 ft length of internal sound absorbing duct lining. Each duct shall be provided with a lined 90° bend in the duct such that there is no direct line of sight through the duct from the venting cross section to the room opening cross section.

e. Duct lining shall be coated glass fiber duct liner at least 1" thick.

f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.

g. Building heating units with flues or combustion air vents shall be located in a closet or room closed off from the occupied space by doors.

h. Doors between occupied space and mechanical equipment areas shall be solid core wood or 20 gauge steel hollow metal at least 1-3/4" thick and shall be fully weather stripped.

APPENDIX E

A BILL TO BE ENTITLED AN ORDINANCE RELATING TO THE REGULATION OF LAND USES WITHIN NOISE IMPACTED AREAS SURROUNDING THE ORLANDO INTERNATIONAL AIRPORT; ADOPTING LAND USE REGULATIONS FOR NOISE IMPACTED AREAS; PROVIDING DEFINITIONS; ESTABLISHING NOISE ZONES; PROVIDING SOUND LEVEL REQUIREMENTS FOR STRUCTURES AND BUILDINGS; PROVIDING SOUND LEVEL REDUCTION DESIGN REQUIREMENTS; PROVIDING FOR VERIFICATION OF SOUND LEVEL REDUCTION; PROVIDING A METHOD FOR APPEALS AND VARIANCES FROM THE PROVISIONS OF THIS ORDINANCE; PROVIDING PENALTIES; PROVIDING FOR SEVERABILITY; PROVIDING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF ORANGE COUNTY:

Section 1. Authority. This ordinance is adopted pursuant to the authority granted in §163.3177(6)(j) and §125.01, Fla. Stat. 1979.

Section 2. Purpose and Intent. This ordinance is enacted to protect the health, safety and welfare of the citizens of Orange County and more particularly, those citizens living or working near the Orlando International Airport, whose property may be impacted by noise resulting from the operations of the airport.

Section 3. Definitions. For the purposes of this ordinance, the following terms, phrases, and words shall have the meanings given herein unless otherwise indicated:

A. Airport: Orlando International Airport.

B. Avigation Easement: The assignment to an airport proprietor of a right to a portion of the total benefits of the ownership of real property. Such rights may be granted to the airport proprietor or may be purchased by him.

C. Building Official: The director or manager of the Orange County Building Department or his authorized representative.

D. Ldn: Day/night average sound level, which is the twenty-four hour average sound level in decibels obtained after the addition of ten decibels to the night-time sound level measured from 10:00 P.M. to 7:00 A.M.

E. Noise Reduction (NR): Reduction in decibels of sound pressure levels between two designated locations or rooms for a stated frequency or band.

Source: Greiner Environmental Sciences, Inc. Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report (Orlando: Greiner Environmental Sciences, Inc., February 1981), pp. 130-142.

F. Noise Zones: Those zones established by this ordinance for the imposition of land use and construction restrictions and/or regulations.

G. Person: Any individual, firm, partnership, corporation, company, association or political body, including a trustee, receiver, assignee, administrator, executive, guardian, or other authorized representative.

H. Overflight Areas: Those areas which lie directly below and five hundred (500) feet on either side of the center line of runways 18L/18R and 36L/36R and extend three thousand (3,000) feet from the ends of each runway.

I. Qualified Acoustical Consultant: A person who, by reason of his/her training and experience in the science and technology of acoustics and his/her knowledge of construction methods and materials, is deemed by the Building Official as qualified to pass judgment on acoustical designs, materials, and methods of construction for reduction of sound levels.

J. Sound Absorption: The capacity of materials and furnishings in a room to absorb sound. For the purposes of this ordinance, the sound absorption is equal to .05 times the room volume in cubic feet divided by the measured reverberation time, in seconds, determined with an octave band of noise centered at five hundred (500) Hertz.

K. Sound Level: In decibels, the quantity measured by an instrument satisfying the requirements of the American Standard Specification for Type I Sound Level Meter. The sound level shall be the frequency weighted sound pressure level obtained with the frequency weighting "A" and the standardized dynamic characteristic "SLOW".

L. Sound Level Reduction (SLR): The difference in decibels between the sound level outside a building and the sound level inside a designated room of the building which is caused by exterior noise.

M. Site Specific Analysis (SSA): Process by which a proposed land use in a designated aircraft noise impacted area is examined for compliance with the Orange County Growth Management Policy, the Land Use Guide Chart (Table 1) and the Airport Noise Zone Map (Appendix A).

Section 4. Establishment of Noise Zones.

A. Noise Zones. There are hereby created and established three (3) Airport Noise Zones: Zone A, Zone B, and Zone C. Such zones are shown on the Airport Noise Zone Map (attached hereto as Appendix A, and by this reference incorporated herein) and more specifically described in subsection D of this Section.

Noise zones established herein are based on a projection of future noise environments arising from aircraft flight operations at the Orlando International Airport through the year 1995, as such environments were defined by the April, 1981, Orange County Airport Noise Control and Land Use Control Study, as amended.

B. Definition of Noise Zones.

1. Zone A shall include that area commencing at the outermost boundary line of the Airport, extending outward to a boundary line indicated on the Airport Noise Zone Map as "B" and as more specifically described in subsection D. The outer boundary line of Noise Zone A approximates a noise level of 75 Ldn.

2. Zone B shall include that area commencing at the boundary line indicated on the Airport Noise Zone Map as the outer boundary line of Noise Zone A, extending outward to the boundary line indicated on the Airport Noise Zone Map as "C" and as more specifically described in subsection D of this Section. The outer boundary line of Noise Zone B approximates a noise level of 70 Ldn.

3. Zone C shall include that area commencing at the boundary line indicated on the Airport Noise Zone Map as the outer boundary line of Noise Zone B and extending outward to the furthermost boundary line indicated on the Airport Noise Zone Map and as more specifically described in subsection D. The outer boundary line of Noise Zone C approximates a noise level of 65 Ldn.

C. Legal Description of Noise Zone Boundaries. Noise Zone Boundaries are described as follows:

1. Zone A. A legal description of Noise Zone A is contained in Appendix B, attached hereto and by this reference incorporated herein.

2. Zone B. A legal description of Noise Zone B, is contained in Appendix C, attached hereto and by this reference incorporated herein.

3. Zone C. A legal description of Noise Zone C, is contained in Appendix D, attached hereto and by this reference incorporated herein.

D. Determination of Boundaries. In determining the boundary lines described in subsection C above, the following rules were applied. If any changes in the boundary lines are necessary following adoption of this ordinance, these same rules shall be used to determine the location of new boundary lines.

1. Where a noise contour line follows a street or alley, the centerline of such street or alley shall be the noise zone boundary.

2. Where a noise contour line enters or crosses a platted lot, the property line of such lot shall be the noise zone boundary. If the noise contour line divides the lot into equal parts the more restrictive noise zone requirement shall apply to the entire lot. If a lot is divided into unequal parts, the Noise Zone Boundaries of the largest part shall apply to the entire lot.

3. Where a noise contour line divides a parcel of property which is not platted and is less than ten (10) acres in area into equal parts, the more restrictive noise zone requirements shall apply to the entire parcel of property. If the parcel is divided into unequal parts, the noise zone requirements for the largest part shall apply to the entire parcel of property.

4. Where a noise contour line divides unplatted property, ten (10) acres or more in area, location of the boundary line shall follow the actual noise contour.

Section 5. Land Use Restrictions.

A. Permitted Activity. Specific land uses may be permitted in Noise Zones A, B and C, as provided in the Land Use Guidance Chart (Table 1) provided that the property is zoned for the intended use. No residential development shall be permitted within Noise Zone A. An activity or land use not specifically referenced in the Land Use Guidance Chart may be permitted or restricted in a Noise Zone based on its similarity to the noise tolerance of activities and land uses which are permitted in that noise zone pursuant to the Land Use Guidance Chart.

B. Non-Conforming Uses. The provisions of this Section shall not be construed to alter, modify, or otherwise prohibit the continuance of any non-conforming use existing as of the effective date of this ordinance, provided that any said non-conforming use shall not be extended, enlarged or changed, unless such extension, enlargement or change makes such use conform with the provisions of this ordinance.

Section 6. Sound Level Reduction Requirements.

A. Minimum Requirements. Except as otherwise provided in this ordinance, the construction, alteration, moving, repair or use of any building or structure within Noise Zones A, B, and C, except work located primarily in a public right-of-way, public utility towers and poles, and/or mechanical equipment not specifically regulated by this ordinance, shall meet the Site Specific Analysis and Sound Level Reduction requirements shown in the Land Use Guidance Chart (Table 1),

provided that nothing herein shall require any change in the construction or alteration of any building or structure where construction or alteration had commenced prior to the effective date of this ordinance.

B. Application to Existing Buildings.

1. General Application. Any additions, alterations, or repairs to existing buildings or structures shall comply with the provisions of this subsection.

2. Substantial Alterations. If any additions, alterations or repairs to any existing building or structure affect or include over fifty (50) percent of the area of the existing building or structure, the entire building or structure shall be made to conform to the provisions of this ordinance.

3. Roof Repairs. If fifty (50) percent or more of the roof covering of any building or structure is to be replaced, the roof covering shall conform to the provisions of this ordinance.

C. Moved Buildings. Any building or structure moved or relocated into or within a Noise Zone shall comply with the provisions of this ordinance.

Section 7. Sound Level Reduction Design Requirements.

A. General Requirements. The sound level reduction (SLR) requirements shown in Table 1 may be achieved by any suitable combination of building design, building materials and/or construction details which meets the approval of the Building Official. The Building Official may approve any method of construction provided for in the recommended Material and Construction List (Appendix E, attached hereto and by this reference incorporated herein) to meet the requirements of this ordinance. If a variation from the recommended Material and Construction List is requested, the Building Official may require sufficient evidence or proof be submitted by a qualified acoustical consultant to substantiate any claims made as to the performance of substituted materials or methods.

The SLR requirements contained in Table 1 shall apply to any room which is intended for occupancy and has one or more exterior wall and/or ceiling when such room is furnished in accordance with its intended final usage.

B. Compliance. No building or structure for which an SLR of twenty-five (25), thirty (30) or thirty-five (35) is required pursuant to subsection A, may be constructed, altered, moved or repaired, unless and until a building permit therefore, has been issued by the Orange County Building Department. No permit shall be issued unless the plans and specifications for the building are:

1. Approved by the Building Official as meeting the Sound Level Reduction Requirements of this ordinance, or,

2. Are certified by a qualified acoustical consultant as meeting the Sound Level Reduction requirements of this ordinance.

C. SLR Design Information. Making calculations for the purpose of determining how the requirements of Section 6 of this ordinance is to be met, the Building Official, owner or qualified acoustical consultant may use the assumed outside spectrum shown in Figure 1 attached hereto and by this reference incorporated herein. Such calculations shall take into account the area of exposed room surfaces and sound transmission loss characteristics of exposed room surfaces and the amount of sound absorption in the room. For rooms in residential structures, it can be assumed that the ratio of the sound absorption in each room to the room floor area is as follows:

Octave Frequency Band, Hz	Sound Absorption Floor Area
63	0.30
125	0.50
250	0.75
500 and higher	1.0

In the calculations, allowance shall be made for a decrement of at least 2 decibels for sound leaks and flanking sound transmission paths.

Section 8. Verification of Sound Level Reduction.

A. Requiring Verification. Prior to granting a certificate of occupancy, the Building Official may require field testing to verify that the sound level reduction requirements of this ordinance have been met. Such verification may be required whenever it appears that the material and construction methods used vary from those contained in the Recommended Material and Construction List and/or have not been given prior approval by the Building Official. The Building Official may accept, in lieu of field testing, a certification of design criteria, by a qualified acoustical consultant, verifying the sound level reduction of the building. Such tests or certifications shall be done solely at the owner's expense.

B. Verification Testing Procedure. For the purpose of verifying compliance with the sound level reduction requirements in a completed building, aircraft noise prevailing outside the building may be used as a sound source. Using

the noise signal generated by an individual aircraft operation (fly-over event), outside and inside noise levels may be measured simultaneously.

Sound level reductions shall be determined for at least four (4) fly-over events for each room tested. The resulting SLR value assigned to the room shall be the average of the individual fly-over event's SLR values.

For rooms intended for human occupancy in residential structures, inside noise levels shall be measured with a single microphone, five feet above the floor, either near the center of the room, or inside the room eight feet from the exterior wall most directly exposed to the aircraft noise, whichever distance from the most direct exposed wall is less.

The outside noise level shall be measured in an unobstructed location near the center of the wall most directly exposed to the aircraft noise source, approximately five feet above the level of the floor of the room being tested and eight feet from the wall.

For structures in which several rooms are to be evaluated, tests need only be conducted for those rooms whose exterior walls are most directly exposed to the noise source. If noise level reduction requirements are met for these rooms, the tests need not be repeated for rooms of similar construction which are not as directly exposed to fly-over events.

For structures where a number of rooms receive nearly equal exposure to aircraft noise, tests need only be conducted in two of the near identical rooms.

For residential structures, it shall generally be sufficient to conduct tests in two rooms. One of the rooms to be tested shall be the bedroom most directly exposed to aircraft noise. The other room to be tested shall be either the living room, dining room, or family room, whichever is most directly exposed to the aircraft noise.

For purposes of this subsection, the Building Official shall have sole authority in determining the number of rooms and the particular rooms to be tested.

When the sound level reduction is measured in an unfurnished or partially furnished room, an adjusted sound level reduction shall be computed by adding ten times the logarithm to the base ten of the ratio of the floor area of the room to the sound absorption in the unfurnished or partially furnished room, but in any event, such correction shall not exceed two (2) decibels. The adjusted noise level reduction value shall be used in determining compliance with the SLR requirements.

If the noise level reduction is measured in a furnished room, no adjustment in the noise level reduction may be made.

The noise levels measured outside and inside the room being tested may be observed directly by simultaneously reading the maximum noise levels on two sound level meters. Alternatively, the outside and inside fly-over event noise signals may be recorded on magnetic tape with noise level reduction determined by analysis of the recorded signals. In either case, the two measuring systems used for outside and inside noise measurement must satisfy the requirements for a Type II Sound Level Meter according to AMSI S1.4-197 and be operated in a manner designated by AMSI S1.13-197. The two (2) systems shall be calibrated prior to and following the fly-over events so that they indicate the same level within one decibel for the same noise, using suitable calibration procedures as specified by the sound level meter manufacturer.

Section 9. Appeals. Any person may appeal the interpretation or application of any provision of this ordinance by the Building Official as it related to such person's property. Such appeals shall be taken to the Board of Adjustment and Appeals established pursuant to the Building Code adopted by Orange County Ordinance No. 79-23.

Section 10. Variances. Any person may request a variance from the provisions of this ordinance. Such variance request shall be made to the Board of Adjustment and Appeals. A variance shall be granted only where, owing to conditions peculiar to the property, and not the result of the actions of the applicant, literal enforcement of this ordinance will result in unnecessary hardship and would prevent the substantial enjoyment of property rights shared by nearby properties which do conform to this ordinance.

Section 11. Violations and Penalties. Violations of this ordinance shall be punished as provided by general law. Each day a violation continues to exist shall constitute a separate offense. Any violation of this ordinance is hereby declared a public nuisance for which legal action to enjoin may be taken by the County.

Section 12. Severability. If any provision of this ordinance or the application thereof to any person or circumstance is held invalid, the invalidity shall not affect other provisions or applications of the ordinance which can be given effect without the invalid provision or application, and to this end the provisions of this ordinance are declared severable.

Section 13. Effective Date. This ordinance shall take effect pursuant to general law.

TABLE 1

LAND USE GUIDANCE CHART

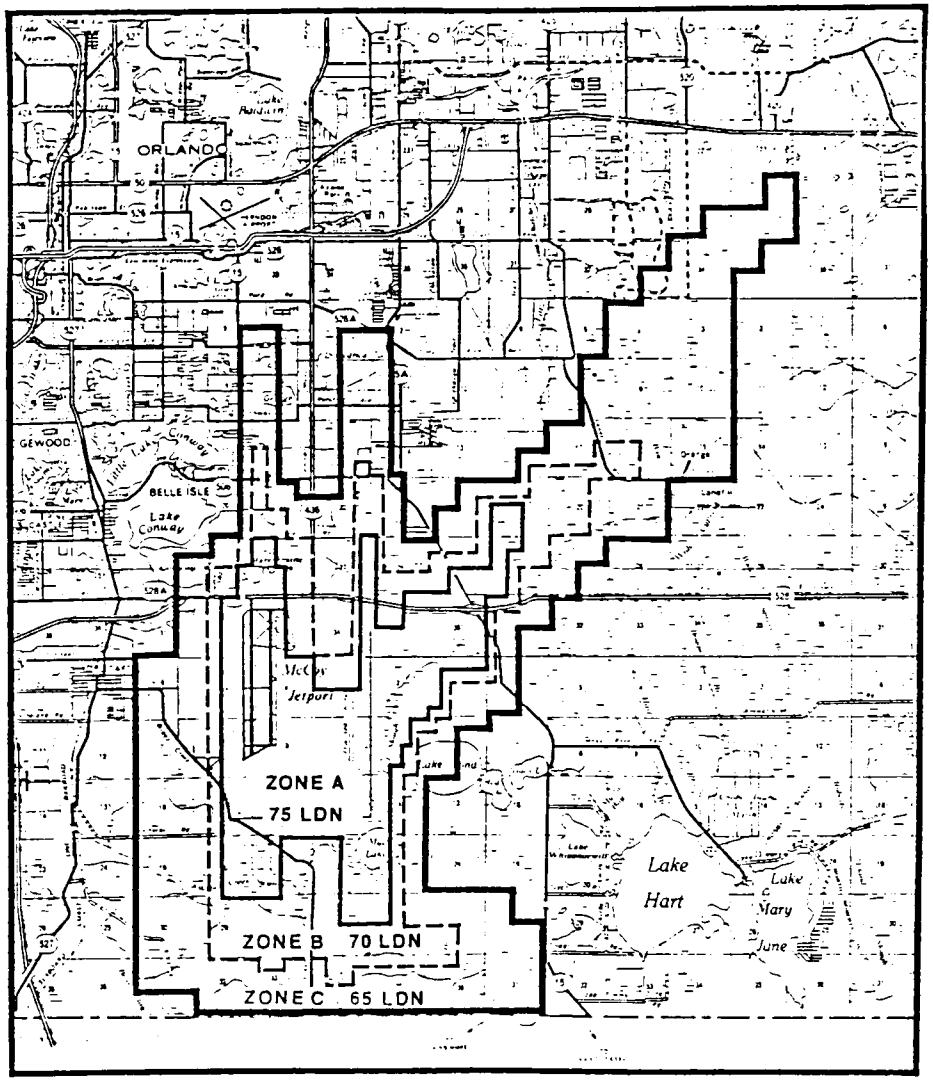
ACTIVITIES AND/OR LAND USES	LAND USE NOISE ZONES			NOISE ZONES LOCATED IN OVERFLIGHT AREAS		
	A	B	C	A	B	C
	75Ldn	70-75 Ldn	65-70 Ldn	75 Ldn	70-75 Ldn	65-70 Ldn
RESIDENTIAL						
Single - Units Detached Town Houses - Attached Duplexes	NA	NA	SLR-25	NA	NA	NA
Mobile Homes	NA	NA	SLR-25	NA	NA	NA
Multi Family	NA	SSA SLR-30	SLR-25	NA	NA	SSA SLR-25
Motels - Residential	NA	SSA SLR-30	SLR-25	NA	SSA SLR-30	SSA SLR-25
Motels - Tourist	NA	SSA SLR-30	SLR-25	NA	SSA SLR-30	SSA SLR-25
MANUFACTURING						
Professional and Scientific	NA	SSA	SSA	NA	NA	SSA
General Manufacturing	NA	SSA	Permitted	NA	SSA	SSA
TRANSPORTATION COMMUNICATIONS & UTILITIES						
Transportation Related Uses	Permitted	Permitted	Permitted	SSA	SSA	Permitted
Communications Facilities	NA	SSA	Permitted	NA	SSA	SSA
Radio-Television	NA	SSA	SSA	NA	NA	NA
COMMERCIAL						
Building Materials, Hardware Automotive	SSA	Permitted	Permitted	SSA	SSA	Permitted
Retail Trade General Merchandise	NA	SSA	Permitted	NA	SSA	SSA
Petroleum Stations	SSA	Permitted	Permitted	NA	NA	NA
Wholesale Trade	SSA	Permitted	Permitted	SSA	SSA	SSA

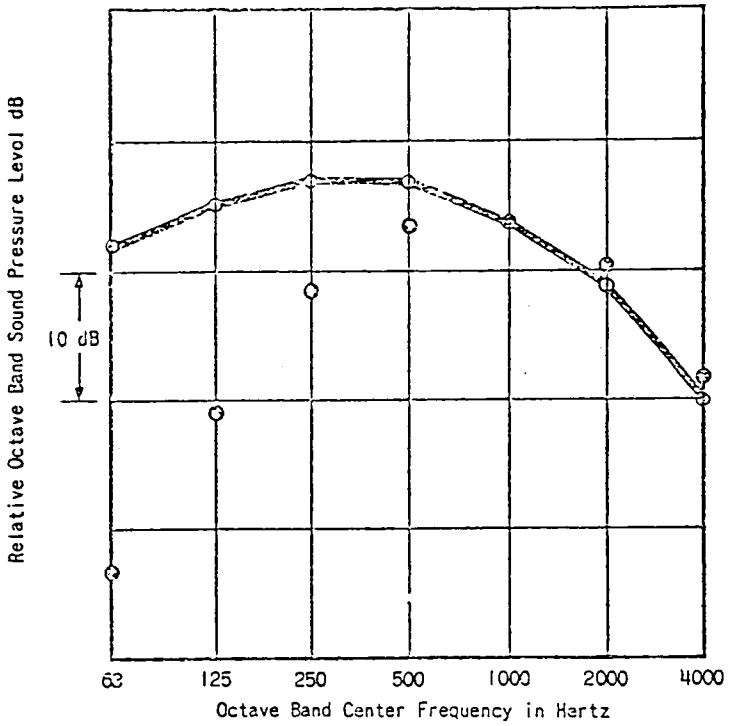
Table 1 (continued)

ACTIVITIES AND/OR LAND USES	LAND USE NOISE ZONES			NOISE ZONES LOCATED IN OVERFLIGHT AREAS		
	A	B	C	A	B	C
	75Ldn	70-75 Ldn	65-70 Ldn	75 Ldn	70-75 Ldn	65-70 Ldn
SERVICES						
Medical and Health In-Patient Care	NA	NA	SSA SLR-30	NA	NA	NA
Medical and Health Out-Patient Care	NA	NA	SSA SLR-30	NA	NA	NA
Educational and Religious Activities	NA	NA	SLR-25	NA	NA	NA
Repair Services Contract Construction	SSA	Permitted	Permitted	NA	SSA	Permitted
CULTURAL ENTERTAINMENT RECREATION						
Entertainment Assembly (Outdoors) (Cultural)	NA	NA	SSA	NA	NA	NA
Entertainment Assembly (Indoors) (Cultural)	NA	NA	SLR-30	NA	NA	SSA SLR-30
Sport Activities	SSA	Permitted	Permitted	SSA	SSA	SSA
Playgrounds and Neighborhood Parks	NA	Permitted	Permitted	NA	SSA	SSA
Community and Regional Parks	SSA	Permitted	Permitted	SSA	SSA	Permitted
RESOURCE PRODUCTION						
Agricultural	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Animal and Poultry Breeding	NA	NA	Permitted	NA	NA	SSA

NA - Not Authorized
SSA - Site Specific Analysis
SLR - Sound Level Reduction

AIRPORT NOISE ZONE MAP





Note: Closed Circles show the corresponding relative A-Weighted octave band sound pressure levels.

FIGURE 1 OCTAVE BAND NOISE SPECTRUM TO BE USED FOR CALCULATION OF NOISE LEVEL REDUCTION

APPENDIX F

AIRPORT APPROACH RIGHT-OF-WAY

AND CLEAR ZONE EASEMENT

THIS INDENTURE, made this _____ day of _____, 19___, by and between _____,

of _____ (Address), _____ (City), _____ (State),

hereinafter called the Grantor, and BROWARD COUNTY, a body corporate and politic of the State of Florida, whose post office address is 201 Southeast Sixth Street, Fort Lauderdale, Florida 33301, hereinafter called the Grantee. (Wherever used herein the terms "Grantor" and "Grantee" shall indicate both singular and plural, as the context requires, and shall include all the parties to this instrument and their heirs, personal representatives, successors, agents, and assigns.)

W I T N E S S E T H :

That the Grantor, for and in consideration of the sum of _____ _____ Dollars ($_____), paid by the Grantee to the Grantor, and of other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby grants, bargains, sells, and conveys unto the Grantee, for its use and benefit as owner and operator of the _____ Airport (hereinafter referred to as "Airport"), a permanent, perpetual, and assignable easement for the free, unrestricted, and unobstructed flight, passage, operation, and navigation of aircraft of any and all kinds, construction, size, and character existing now or in the future, in, over, through, and across the airspace at any altitude or height above a portion of the inclined plane of the Clear Zone Approach Area (defined and described on Exhibit _____ attached hereto), said portion being hereinafter referred to as Parcel _____ and being more particularly described as follows:

Source: Greiner Environmental Sciences, Inc. Orlando International Airport, Airport Noise Control and Land Use Compatibility Plan, Final Report (Orlando: Greiner Environmental Sciences, Inc., February 1981), pp. 122-123.

TO HAVE AND TO HOLD said easement unto the Grantee until the Airport shall cease to be used for airport purposes by Grantee, its successors and assigns.

AND

That the Grantor, for and in further consideration of the sum set forth above and of other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby grants, covenants, and agrees as an appurtenance to the foregoing easement, as follows:

A. That said easement shall include the right in the Grantee, stemming from and incidental to the Grantee's operation of the Airport, to commit such intrusions upon and against the land and airspace below said Parcel as are appurtenant to the flight of aircraft through airspace above such land and the taking off and landing of aircraft from Airport through said Parcel.

B. That said easement shall also include a continuing and perpetual right in the Grantee to enter upon and to pass over the Grantor's underlying property for the purpose of removing and to remove any and all obstructions or encroachments, whether structures or vegetation, natural or manmade, which exist or may in the future exist in Parcel _____, together with the right to cut down at ground level and remove any and all trees or other vegetation which obstruct or encroach upon said Parcel now or in the future. It is understood that said rights shall include a continuing right in the Grantee to prevent the future construction, erection, or planting of any building, object, structure, or tree or other vegetation, upon the Grantor's underlaying property which encroaches upon or might in the future encroach upon said Parcel.

C. That this instrument grants and conveys unto the Grantee the same rights in, over, and above the streets, roads, alleys, and highways, whether improved or unimproved, leading into or through or lying adjacent or contiguous to the Grantor's underlying property, as are granted hereinabove in, over, and above said underlying property, to the extent of the Grantor's right, interest, or estate in such streets, roads, alleys, and highways.

D. That said easement shall also include a continuing obligation of the Grantor to clear and keep clear Parcel _____ of any and all obstructions or encroachments of any kind or character, as well as any and all objects on the surface of the ground, whether natural or manmade, which might in the future encroach upon or obstruct said Parcel. The Grantor specifically covenants that none of the following species of trees or vegetation will be planted, grown, maintained, or cultivated upon the underlying property: Norfolk Island Pine (Aravcaria Excelsa), Australian Pine (Casuarina Equisetifala), Cunningham Pine (Casuarina Cunninghamiana), Coconut Palm (Cocos Nucifera), Carib Royal Palm (Roystonea Oleracea), Cuban Royal Palm (Roystonea Regia), Puerto Rican Royal Palm (Roystonea Borinquena), Roystonea Elata or Floridana, Meialeuca (Melaieuca Leucadendron), and any and all species of the genus Eucalyptus.

E. That said easement shall also include a continuing obligation of the Grantor to prevent the placement of any device or structure and to prevent any conduct or activity upon the underlying property which emits or may cause to be emitted radio or other invisible waves or signals or bright lights which will or might interfere with the safe operation of any aircraft operating in or around the Airport and Clear Zone Approach Area.

It is further understood and agreed by and between the parties hereto that the covenants, rights, privileges and easements granted, made, and conveyed herein shall run with the land, and that for the purposes of this instrument the Grantor's underlying property shall be the servient tenement and the Airport shall be the dominant tenement.

And the Grantor does hereby covenant to and with the Grantee that Grantor is the owner in fee simple of the property over which the above-described easement lies, that it has a legal and valid right to execute this instrument, and that it fully warrants and will defend this easement against the lawful claims of all persons whomsoever.

(INDIVIDUAL)

IN WITNESS WHEREOF, the Grantor(__) ha(__) hereunto set _____ hand(__) and seal(__) on the date hereinabove stated.

WITNESSES:

_____

_____

_____

_____

GRANTOR(__):

_____

_____

_____

_____

ACKNOWLEDGMENT FOR MARRIED PERSONS

STATE OF _____)
) SS
COUNTY OF _____)

Before me, the undersigned authority, this day personally appeared _____ and _____, _____, to me well known and known to me to be the individuals described in and who executed the foregoing instrument, and they severally acknowledged before me that they executed the same.

WITNESS my hand and official seal this _____ day of _____, 19__.

My commission expires:

_____
Notary Public

ACKNOWLEDGMENT FOR SINGLE PERSONS

STATE OF _____)
) SS
COUNTY OF _____)

Before me, the undersigned authority, this day personally appeared _____ , to me well known and known to me to be the person described in and who executed the foregoing instrument, and acknowledged before me that they _____ executed the same.

WITNESS my hand and official seal this _____ day of _____, 19__.

My commission expires:

_____
Notary Public

(CORPORATE)

IN WITNESS WHEREOF, the Grantor has hereunto set its hand and seal on the date hereinabove stated.

(CORPORATE SEAL)

_____
Corporate Name

ATTEST:

By_____
President

_____
Title:

WITNESSES:

_____

_____

ACKNOWLEDGMENT FOR CORPORATIONS

Before me, the undersigned authority, this day personally appeared _____ and _____, _____President and _____, respectively, of _____ _____, a corporation under the laws of the State of _____, to me known to be the persons who executed the foregoing instrument, and severally acknowledged the execution thereof to be their free act and deed as such officers and that they affixed thereto the official seal of said corporation and that they are empowered to do so by and on behalf of said corporation.

WITNESS my hand and official seal this _____ day of _____, 19__.

My commission expires:

_____
Notary Public

APPENDIX G

DISCLOSURE STATEMENT

"HOME OWNER or OCCUPANT"

The tract of land located in Section _____, Range _____ Township _____, in Orange County, Florida, situated at _____ which is being purchased/leased from _____ by _____ lies within the noise zones occurring around Orlando International Airport, identified by County Ordinance _____.

The purchaser/lessee is hereby notified that: This property lies within Noise Zones _____ as depicted on the Orange County Noise Zones Map and is subject to levels of noise generated by aircraft utilizing the Orlando International Airport which may be objectionable.

The undersigned purchaser/lessee of said tract of land certifies that (sh)he (they) has (have) read and do understand the above disclosure statement and do acknowledge the preexistence of the said airport named above, and the right of said airport to operate with the potential for creating objectionable noise.

_____ Seller/Lessor

_____ Buyer/Lessee

Sworn to and Subscribed before me at:

_____ on _____ Date

VITA

Edward John Williams was born in Portland, Oregon, on May 6, 1954. He spent his childhood in the town of Waterford, New York, and attended local schools there until his graduation from Catholic Central High School, Troy, New York, in June 1972. He received a Bachelor of Science degree in biology from Manhattan College in May 1976.

In September 1976 he entered the Graduate School of Planning, The University of Tennessee, Knoxville. He received a Master of Science in Planning degree in August 1982.

The author is married to the former Anne Marie Fogarty of Fair Lawn, New Jersey.