ILLINOIS POLLUTION CONTROL BOARD
April 10, 1986

IN THE MATTER OF:	)	
	)	R77-4
PUBLIC AIRPORT NOISE REGULATIONS PART 904	)	
	)	

PROPOSED RULE. FIRST NOTICE.

PROPOSED OPINION AND ORDER OF THE BOARD (by J. Marlin):

This matter comes before the Illinois Pollution Control Board upon the filing by the Illinois Attorney General on February 16, 1977 of a petition for adoption of airport noise regulations at 35 Ill. Adm. Code Part 904. Each of three successive Illinois Attorney Generals (William Scott, Tyrone Fahner and Neil Hartigan) have sponsored this proposal. Specifically, it is a proposal to regulate noise emissions from public airports that are owned or operated by the State or its political subdivisions. The proposal was published in the Pollution Control Board's Environmental Register (No. 144, pp 5-17, March 21, 1977). Amendments to the proposal were filed on September 19, 1977 (Exhibit 23), June 12, 1978 (Exh. 127) and on November 14, 1979 (Exh. 156). The Illinois Department of Energy and Natural Resources (DENR) (formerly the Illinois Institute of Natural Resources [IINR] and the Illinois Institute for Environmental Quality) [IIEQ] performed an economic impact analysis on the proposal and submitted four volumes of an economic impact study (EcIS) to the Board. Volumes I and II (public airports outside of Chicago) were filed on July 1, 1981 while volumes III and IV (public airports in Chicago) were filed on November 16, 1981.

A total of forty-five hearings were held on the proposal: thirty-nine merit hearings, four economic impact hearings, and two update merit hearings. The last merit hearing was held on September 9, 1980, the last economic impact hearing on March 15, 1983, and the two update merit hearings were held on September 10

This Opinion and the accompanying Order have benefited from considerable input from current Board Members. The Board wishes to acknowledge the efforts of the late Irvin G. Goodman, Vice Chairman of the Board, who attended most of the hearings as the coordinating Board Member. Current Board staff who provided invaluable assistance in drafting the Opinion and Order include Kevin F. Duerinck, who researched the record and proposed initial drafts; Lee Cunningham, who prepared the first legal analysis; Kathleen M. Crowley, who prepared the final legal section; Morton F. Dorothy, who provided scientific and technical input; Lorilyn Chamberlin, who provided editorial assistance, and Beth Guido, who typed the several drafts.

and 18, 1985. Prior to these two update hearings, comments and reply comments were filed by the participants, the last being filed on November 28, 1983. After the two update hearings, the participants again submitted comments, the last being filed on November 12, 1985.

The record in this proceeding consists of 46 transcripts (approximately 7,500 pages), 253 numbered exhibits and approximately 12 lettered exhibits, 4 EcIS volumes, written public comments, and additional filings.

Aside from the two update merit hearings, the Board is aware that over five years have passed since the last merit hearing and three since the last economic impact hearing. This fact does not seriously affect the usefulness of the record before the Board. Although some changes have occurred in the number of flights, fleet mix, and individual companies and witnesses, the basic situation has not changed. The two supplemental hearings held in September 1985 established that people living near airports continue to find the noise objectionable and that airports and airlines maintain their objections to the proposal. Developing an entirely new record would not serve a useful purpose. The Board notes that references to dollar amounts in the record have not been adjusted for any inflation that occurred since the testimony was given.

The two supplemental hearings held in 1985 provided participants the opportunity to raise any significant new issues. Further opportunity to comment will be provided during the 45 day first notice comment period. Participants as well as the public will be able to comment in writing on the Board's First Notice Opinion and Order and may request a hearing.

To avoid any confusion, citations to the hearing transcripts will be as follows: "R" for merit hearing, "E" for economic impact hearing, and "S" for the two supplemental hearing transcripts of September 1985. Where a hearing transcript was not consecutively paginated, any reference to that transcript is by hearing date and page.

The Attorney General's Office (AGO) has proposed to regulate the amount of airport noise emanating from airports owned or operated by the State or its political subdivisions. The AGO's proposed noise standard for receiving Class A Land is 65 Ldn (Ldn is sometimes referred to as DNL). According to the AGO, noise in excess of this level is unacceptable for land devoted to Class A uses.

Pursuant to 35 Ill. Adm. Code 901.101(a), Class A Land uses include among others residential quarters, hotels and motels, medical and other health services, correctional institutions, schools, religious activities, certain cultural activities such as libraries and museums, nature exhibitions such as planetaria

and botanical gardens but not zoos, leisure and ornamental parks, and forest reserves.

The proposal phases the 65 Ldn standard in gradually over seven years. A variance procedure is provided for airports which cannot meet the standard. The variance procedure includes developing a plan for reducing noise at the airports. In addition, the proposal requires airport proprietors to gather information on aircraft operations to be used in noise models to map the area affected by an airport's noise.

The AGO's proposal has been amended several times both formally and in the hearings and comments. There is no single document in the record which contains the text of the rule as proposed by the AGO at the close of the hearings in 1985. The Board has used its discretion to formulate the final wording.

At the first hearing, the AGO moved to incorporate the regulatory record in R72-2, In the Matter of Noise Regulations (R. 7-8) and R74-10; Motor Vehicle Noise, (R. 132). Over objections the motion was granted and the records of both proceedings were entered as Exhibits 2 and 3 respectively (R. 7-8, R. 141). The record in R70-13, the old Airport Noise proceeding, on motion of the City of Chicago was entered as Exhibit 4 (R. 141). The Board on its own motion hereby overrules the hearing officer and strikes Exhibits 2, 3, and 4 from the record. These three voluminous regulatory records have not been considered or cited by any participant. Under the circumstances, the Board sees no merit in keeping this bulk in the record of this proceeding.

Regarding jurisdiction, on May 12, 1977 the Board denied the Air Transport Association's (ATA) and Chicago Association of Commerce and Industry's motions for postponement of the hearings for deferral of briefing and consideration of constitutional and statutory questions (25 PCB 543, May 12, 1977). At the time, hearings were being held by the Federal Aviation Administration (FAA) based on a proposal filed by the United States Environmental Protection Agency (USEPA) (25 PCB 541, May 12, 1977) (25 PCB 545, 546, May 12, 1977). The Board will address the jurisdictional as well as other legal issues in the legal section below.

Airport Noise Index

THE PROBLEM

The airport noise regulation is one of the most complex issues ever to come before the Board. The implications of any decision will affect a large number of competing interests and government agencies at all levels. The voluminous record and the length of this Opinion are a reflection of these realities.

Illinois is home to a number of airports, including O'Hare International which is the busiest in the world. The economic impact of these facilities and related aviation activity in Illinois in 1982 was over 9.1 billion dollars according to the Illinois Department of Transportation (Exh. 252, b). In 1984 O'Hare served 45.7 million passengers and processed over 882,000 tons of cargo with a total of 732,000 aircraft operations. Its closest rival, Atlanta, handled 39 million passengers and 547,000 operations (Exh. 240). Because of its location and many connecting flights, O'Hare has become a pivotal point for the world's passenger and airfreight movements. This facility plays a key role in the economy of Illinois and is essential to the efficient operation of thousands of businesses.

Other publicly-owned airports in the state may lack O'Hare's size, but make a vital contribution to the state's economy. They provide feeder service from cities which would otherwise be without air service and attract industries which depend on their services. The State's airports are expected to increase their operations over the coming decades. Unfortunately, past airport development has caused considerable conflict with local residents and in all probability future developments will have similar problems.

With the advent of commercial jet aircraft it became apparent that much land surrounding airports would be subjected to noise levels which would be unacceptable for a number of uses, including residential development, hospitals and schools. The noise is generated by planes as they land and take off as well as by engine testing and taxiing on the ground. The noise pattern about an airport is irregular in shape, but generally follows the flight paths of the planes. At a major airport such as O'Hare, persons more than 20 miles from the runways may complain about the noise (R. 1009).

The testimony demonstrates that large numbers of people are affected by the airport noise problem. The two Chicago airports, Midway and O'Hare, greatly impact the surrounding areas. Around O'Hare, approximately 45,000 acres of land (exclusive of the airport) were subjected to noise levels in excess of 65 Ldn. At Midway between 1,920 and 20,480 acres are impacted depending upon the level of flight activity. According to the EcIS, about 101,500 dwelling units are impacted by noise at O'Hare and up to 76,000 at Midway. Over 500,000 people are subject to noise levels in excess of 65 Ldn from the two airports. This number

varies as flight operations change (Exh. D). Information supplied by the City of Chicago's Department of Aviation (CCDA) illustrates how the amount of land impacted by noise can change over short time frames. The data show that 1984 aircraft operations exceeded 1982 operations by over 100,000 yet impacted ten fewer square miles. According to the CCDA, about 50,000 fewer people were subjected to 65 Ldn in 1984 then in 1979. These estimates are based on population and housing unit counts "based on residential units constructed before or in 1979." Table 1 summarizes the noise impact data provided by the CCDA (Exh. 240).

As of 1981, downstate Illinois public airports created noise levels in excess of 65 Ldn on 8,614 acres, 962 acres of which have noise sensitive land uses. The 962 acre figure does not include industrial lands, parks, commercial or airport properties (Exh. A, EcIS Vol. I at 6). Dwelling units impacted totalled 2,575. Id.

TABLE 1.

Population, Community Facilities & Square Miles
Within the 65 Ldn and Greater Sound Level*

1979	1982	1983	1984	
Population	312,920	286,320	285,430	259,620
Housing Units	103,740	94,720	94,730	86,400
Schools	102	95	96	93
Hospital/Nursing Homes	15	16	20	14
Parks/Forest Preserves	115	105	102	103
Libraries	10	7	12	9
Square Miles	89	88	80	78

* Population and housing unit counts are based on residential units constructed before or in 1979.

O'Hare Total Aircraft Operations	735,245	604,383	667,963	731,742

Source: Exh. 240, Map.

THE LEGAL COMPLEXITIES OF AIRPORT NOISE REGULATION

In brief summary, the Attorney General has proposed that the Board adopt regulations providing for a "continuum of actions", which he has characterized as a three-tier system:

> At the lowest level of the continuum, State action simply requires the disclosure of noise impact information. At an intermediate level, it requires the use of such information and forecasts to formulate specific noise abatement policies and programs as part of a planning process. At the highest level, it directs state intervention and the use of state authority to require compliance with state prescribed standards, whether through implementation of the policies and programs formulated at the planning level or otherwise. (A.G. Brief, p. 17-18).

The legal questions facing the Board were well and simply framed by Law Professor Sheldon Plager, first witness at the first day of hearing in 1977:

> First of all, is there a role for the State of Illinois acting through its Pollution Control Board and [its] Environmental Protection Agency, in the abatement of this [airport] noise problem? And secondly, if there is such a role, is the proposal by the Attorney General within the scope of that role? (R. 12).

In summary, the Board's conclusions on each of these questions are -- as were those of the witness -- "yes, with qualifications." In reaching these conclusions, the Board has considered the remarks of all hearing participants, but has placed particular reliance on the extensive and thoughtful legal analyses presented by the Attorney General in support of the regulation, and of the Air Transport Association of America (ATA) in opposition thereto.

The ATA argues that any regulation by the Board of airport noise is contrary to both federal and state law. In brief, the ATA first contends that any regulatory action by Illinois is "preempted" by the United States Constitution, federal legislation and regulations implementing that legislation. The ATA then asserts that, even if state regulation of airport noise is not preempted by federal law, that the Board cannot adopt rules without violating the laws and constitution of the State of Illinois.

To place these legal arguments in perspective, the Board will first outline the current state of controls of airport noise, discussing case law as necessary to "tell the story". The Board will then address first the federal law and then the state law issues.

Preemption Overview

A preliminary overview of the general principles of preemption analysis will serve to enhance the discussion of federal legislation and the regulatory reaction of the Federal Aviation Administration (hereinafter "FAA") to this legislation.

Simply stated, the so-called "preemption doctrine" is that the federal government may take legislative or regulatory action which totally or partially precludes the states from legislating or regulating the same subject matter. This doctrine flows from the supremacy and interstate commerce clauses of the federal constitution. U.S. Const. art.1 8, cl. 3; art 6, cl. 2. Due to the nature and effects of aircraft noise, the principal cases in this area rely upon one, the other, or both of these constitutional provisions.

In dealing with supremacy clause issues, the Supreme Court:

> start[s] with the assumption that the historic police powers of the States were not to be superseded by the Federal Act unless that was the clear and manifest purpose of Congress....Such a purpose may be evidenced in several ways. The scheme of federal regulation may be so pervasive as to make reasonable the inference that Congress left no room for the States to supplement it....Or the Act of Congress may touch a field in which the federal interest is so dominant that the federal system will be assumed to preclude enforcement of state laws on the same subject....Likewise, the object sought to be attained by the federal law and the character of obligations imposed by it may reveal the same purpose....Or the state policy may produce a result inconsistent with the objective of the federal statute. Rice v. Santa Fe Elevator Corp., 331 U.S. 218, 230 (1946).

If purported state intent and action runs afoul of Congressional intent and action in any of these particulars, the state action will be invalidated.

As to the commerce clause, the basic principles, as restated by the Supreme Court in Southern Pacific Co. v. Arizona, 325 U. S. 761, 767 (1945), are that:

> [E]ver since Gibbons v. Ogden, 9 Wheat. 1, [1824] the states have not been deemed to have authority to impede substantially the free flow of commerce from state to state or to regulate those phases of the national commerce which, because of the need for national uniformity, demand that their regulation, if any, be prescribed by a single authority.

Generally, the local benefit of a state's exercise of its police power to protect the public health, safety, and welfare is examined in relation to the direct and indirect economic and other effects which it may have on the national commerce. Where the burden on interstate commerce is judged to be excessive in relation to the local benefit a state seeks to achieve, the local action is invalidated. For instance, in Southern Pacific, Arizona's attempt to reduce accidents by requiring that long trains be broken up into shorter ones for travel through the state was held to be impermissible. The safety interest causing interruption in service to dissassemble and reassemble trains was found to be plainly outweighed "by the interest of the nation in an adequate, economical and efficient railway transportation service". 325 U.S. at 783-4

Federal Statutes and FAA Regulations

The primary federal agency having jurisdiction of aircraft and their noise is the Federal Aviation Administration (FAA), created by the Federal Aviation Act (FA Act) of 1958, 49 U.S.C. 1301 et seq. The FAA was created primarily to promote air safety and commerce, functions formerly, since 1938, within the province of the Civil Aeronautics Board (see R. 19-20). Section 1508 of the FA Act provides in part that the "United States of America is declared to possess and exercise exclusive national sovereignty in the airspace of the United States". Sections 1348(a) and (c) give the Administrator of the FAA wide authority to promulgate regulations. The 1958 FA Act did not specifically mention the regulation of noise, but a 1968 amendment, Pub. L. 90-411, added Section 611 (49 USC 1431) which provided that:

> to afford present and future relief and protection to the public from unnecessary aircraft noise and sonic boom, the Administrator shall prescribe and amend such rules...necessary to provide for the control and abatement of aircraft noise and sonic boom.

The FAA's regulatory response to Section 611 was the promulgation of Federal Aviation Regulations (FAR) 14 C.F.R. Part 36 (hereinafter "FAR-36"). In brief, FAR-36 set a limit on noise emissions from domestically manufactured new aircraft for which manufacturers were required to have aircraft certificates. FAR-36 was not applicable to aircraft types approved as of November 18, 1969, and was not applicable to all newly manufactured aircraft until 1973.

In 1972, Section 611 of the FA Act was amended by the Noise Control Act of 1972 (hearinafter "Noise Control Act"). Pub. L. 92-574, codified at 42 U.S.C. 4901-4918. The FAA characterized this action as one taken by a Congress "displaying some dissatisfaction with the FAA's methodical regulatory practice under Section 611" (Exh. 13, p. 30). The amended Section 611 added USEPA to the FAA rulemaking process, although it did not give the USEPA independent authority to promulgate

aircraft/airport noise regulations. Instead, and in brief, the USEPA was authorized and directed to present regulatory proposals to the FAA. The FAA was required only to publish the proposals in the Federal Register and, after considering public comments thereon, to advise the public whether it was adopting any proposals. Section 611 was also amended to require the FAA to consider noise abatement in its issuance of aircraft certificates.

As discussed later in more detail, consideration of the legislative history of the FA Act and the Noise Control Act led the Supreme Court to remark in City of Burbank v. Lockheed, 411 U.S. 624, 639 (1973) that:

> Control of noise is of course deepseated in the police powers of the States. Yet the pervasive control vested in EPA and in FAA under the 1972 [Noise Pollution Control] Act seems to leave us no room for local curfews or other local controls. What the ultimate remedy may be for aircraft noise which plagues many communities and tens of thousands of people is not known.

The Burbank case, which invalidated a city's attempt to impose a curfew on night-time flights into a private airport, is the Supreme Court's first and last word on the subject. However, Burbank is as significant for what it did not address, as what it did address. In footnote 14 to the opinion, the Court first quoted a letter from the Secretary of Transportation concerning his view of the effects of Section 611 on the rights of governments as proprietors of airports. The Court itself then stated that:

> We are concerned here not with an ordinance imposed by the City of Burbank as "proprietor" of the airport, but with the exercise of police power. While the Hollywood-Burbank Airport may be the only major airport which is privately owned, many airports are owned by one municipality yet physically located in another. For example, the principal airport serving Cincinnati is located in Kentucky. Thus, authority that a municipality may have as a landlord is not necessarily congruent with its police power. We do not consider here what limits, if any, apply to a municipality as a proprietor. (411 U.S. at 635.)

Since 1973, FAR-36 and the companion FAR-91 (which sets complaince deadlines for FAR-36) remain the only regulatory limits on noise emissions promulgated by the FAA.* In 1976, the

*As of July 1, 1985, 88% of the United States certificated fleet were in compliance with the noise certification standards of FAR-36; 100% compliance is required by statute on January 1, 1988 (continued)

FAA developed its Noise Abatement Policy (hereinafter "Noise Policy"). The Noise Policy encouraged the airport proprietor to take various voluntary actions, on the basis of the FAA's assessment that it is the proprietor who was "primarily responsible for planning and implementing actions designed to reduce the effect of noise on residents of the surrounding area." (Noise Policy, Exh. 13, p. 5). In support of this position, the FAA cited three cases (to be discussed in more detail later) which it characterized as setting forth the responsibilities of airport proprietors. It was noted that Griggs v. Allegheny, 369 U.S. 84 (1962) established the proposition that proprietors are liable for payment of damages for noise resulting from aircraft operations. The FAA then cited Air Transport Assn. v. Crotti, 389 F.Supp. 58 (N.D. Cal. 1975) as establishing that:

> The airport proprietor is responsible for the consequences which attend his operation of a public airport; his right to control the use of the airport is a necessary concomitant, whether it be directed by state police power or by his own initiative...[A] correlating right of proprietorship control is recognized and exempted from judicially declared federal preemption by footnote 14 [of the Burbank opinion]. Manifestly, such proprietary control necessarily includes the basic right to determine the type of air service a given airport proprietor wants its facilities to provide, as well as the type of aircraft to utilize those facilities...(389 F.Supp. at 63-64.)

Finally, the FAA also noted that the "Crotti principle" had been followed in the then recent decision in National Aviation v. City of Hayward, 418 F.Supp. 417 (N.D. Cal. 1976). In that case, the City had by ordinance imposed a curfew at the airport which it operated. The Hayward court examined the legislative history of the amendments to the FA Act and concluded that these amendments were not designed to prevent airport proprietors from excluding

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(Exh. 231, at 1-2, and App. 1).

Noise standards for foreign aircraft are set by the International Civil Aviation Organization (ICAO), of which the United States is a member. The ICAO adopted noise standards in April 1971, known as "Annex 16" (R. 4392). (The U.S. version of Annex 16 is Part 36). Foreign air carriers must at least meet the Annex 16 standards if they desire to operate in the U.S. When the ICAO did not enact a compliance timetable for Annex 16 by January 1, 1980, the FAA did pursuant to the Aviation Safety and Noise Abatement Act of 1979. Foreign stage II aircraft must meet the Annex 16 standards by January 1, 1985 (14 CFR 91.301, 14 CFR 91.303, November 28, 1980). However, exemptions are available from this deadline.

aircraft on the basis of noise considerations. The Hayward court also found that, to the extent that the curfew ordinance could cause the plaintiff air freight company to use another airport between 11 p.m. and 7 a.m., that the City action did have an effect on interstate commerce. However, the court did not find the curfew invalid for that reason, as the effect was:

> incidental at best and clearly not excessive when weighed against the legitimate and concededly laudable goal of controlling the noise levels at the Hayward Air Terminal during late evening and morning hours. (418 F.Supp. at 427)

The FAA's synthesis of these cases was that:

> The power thus left to the proprietor - to control what types of aircraft use its airports, to impose curfews or other use restrictions, and, subject to FAA approval, to regulate runway use and flight paths, is not unlimited. Though not preempted, the proprietor is subject to two important Constitutional restrictions. He first may not take any action that imposes an undue burden on interstate or foreign commerce and, second may not unjustly discriminate between different categories of airport users....
>
> The Hayward court indicated that the FAA had the authority to preempt proprietor regulation. We have been urged to undertake - and have considered carefully and rejected - full and complete federal preemption of the field of aviation noise abatement. In our judgment the control and reduction of airport noise must remain a shared responsibility among airport proprietors, users, and governments. (Noise Policy, Exh. 13, p. 33-34)

The FAA did note, however, its "substantial power to influence airport development" through its grant-in-aid program pursuant to the Airport and Airway Development Act, 49 USC 1701 et seq., which provided it with new authority to share in the costs of certain noise abatement activities. The Noise Policy went on to specify what an airport proprietor might wish to include in a noise abatement plan, suggesting actions that a proprietor could take directly, those it could propose to local governments, those it could propose to FAA for implementation, and those it could propose to the airlines it services. (Exh. 13, p. 55-57) In short, the FAA encouraged, but did not require, noise abatement planning subject to its veto as regards proposed adjustments in operational controls.

This policy of leaving affirmative noise control actions to proprietors has since been formalized in FAR rules codified at 14 CFR Part 150 (hereinafter "FAR-150"). See "interim rule", 46 Fed. Reg. 8316, January 26, 1981, and final rule, 49 Fed. Reg. 49269, December 18, 1984.

FAR-150 was adopted in part to implement mandates contained in the Aviation Safety and Noise Abatement Act (ASNA Act) of 1979, 42 U.S.C. 2101 et seq., as well as Section 1431 of the FA Act. The ASNA Act provided that on or before February 28, 1981, the Secretary of Transportation should by regulation (1) establish a single system for determining the exposure of individuals to airport noise; and (2) identify land uses compatible with various exposures of individuals to noise. 49 U.S.C. 2102. Once these regulations were established, any airport operator could submit a "noise exposure map" to the Secretary, setting forth existing and projected non-compatible land uses in the area surrounding the airport. 49 U.S.C. 2103. Thereafter, the airport operator could then submit a "noise compatibility program" setting forth the measures the operator has taken or proposes to reduce existing, and prevent future, non-compatible uses within the area covered by the map. 49 U.S.C. 2104(a). The Secretary was required to approve or disapprove any programs submitted to him in accordance with the criteria set forth in the ASNA Act. 49 U.S.C. 2104(b).

In FAR-150, the FAA adopted the noise measurement system known as the Ldn metric. FAR-150 further establishes the procedures, standards and methodology for the development and submission of noise exposure maps and airport noise compatibility programs, and sets forth the criteria to be employed by the FAA in determining whether to approve or disapprove the maps/programs. Approval by the FAA of a noise compatibility program "does not direct any implementing action." 14 CFR Part 150.5(c). Moreover, in some instances proprietors must request "[f]ederal actions" to implement specific measures of a program, which, where appropriate will include an environmental assessment of the proposed action.

In considering the voluntary Part 150 program, it is particularly important to note the limitations contained in the ASNA Act. Section 2106 provides that any noise exposure map and related data submitted to the FAA may not be "admitted as evidence, or used for any other purpose, in any action seeking damages or other relief for the noise that results from the operation of an airport." At the same time, Section 2107 provides that a person acquiring property in an area surrounding an airport with respect to which a noise exposure plan has been submitted may not recover damages for noise "if such person had actual or constructive knowledge of the existence of the noise exposure map", absent "significant change" in airport operations or layout.

In conclusion, the Board notes that the FAA has been characterized by one witness in this proceeding as the "reluctant dragon" of airport noise control (R.21). The FAA's posture does not appear likely to change, given that at least one federal circuit court of appeals has agreed with the FAA's interpretation that Section 611 of the FA Act, imposes a discretionary, and not

a mandatory, duty on the FAA to control airport noise. The comments made by the court in Di Perri v. FAA, 671 F. 2d 54, 56 (1st Cir. 1982) remain as true today as they were in 1982:

> ...while section 1431 may empower the FAA to promulgate airport noise regulations, the agency has not done so. There are, in fact, so far as we can determine, no airport (as opposed to aircraft) noise abatement regulations presently in effect pursuant to this authority. The FAA has so far elected to limit its regulation of aircraft noise primarily to noise abatement design criteria for new aircraft. See, e.g., 14 CFR Sections 36 and 91.301-311. In these regulations, the FAA has been careful to avoid exercising authority over airport noise. (original emphasis, footnote omitted)

Local Governments' Attempts At Controls: Ordinances and Litigation

In adopting Illinois' first noise regulations, the Board specifically excluded airport noise from their coverage, with the intent of initiating later regulatory proceedings. See, In The Matter of Noise Pollution Control Regulations, R72-2, Opinion of July 31, 1973 (8 PCB 703 at 704, 722), (noting that the Board's focus on the area of noise in general was initiated by a proposal to regulate airport noise). In the absence of state regulations in this arena, governmental attempts to control or abate airport and aircraft noise have been the province of the municipal and county governments.

Local governments whose populations are impacted by airport noise fall into two classes: those which are themselves airport proprietors, and those which are neighbors of airports operated by other entities. Under Burbank, a proprietor-government may exercise direct control of its airport to the extent constitutionally permissible (as described in detail later). However, the Burbank decision has precluded use of the traditional police powers over noise. While local governments may still regulate land use, the record in this proceeding amply indicates that land use controls have not been very effective. As summarized by the Attorney General:

> In some instances pre-existing incompatible uses limited the effectiveness of land use controls. (R. 18; R. 45). In other instances affected communities were not privy to the airport's data relative to current and/or future operations that were needed to enact appropriate controls (R. 18; R. 183; R. 235-236; R. 1055-1056 and 1065; R 4911; R 5073). Moreover, where this data was available its utilization by local zoning authorities was not assured. (Cf. R. 2062-2063 with R. 1402-1409 and R. 1848.) A.G. Comments, p. 9.

The ineffectiveness of attempts by non-proprietors to exert police powers is exemplified by some of Illinois' airport noise litigation. In Village of Bensenville, et al. v. City of Chicago, 16 Ill.App.3d 733, 306 N.E.2d 562 (1st Dist. 1973), Bensenville and other communities surrounding O'Hare Airport alleged that aircraft operations from the airport emitted noise and air pollution over the communities so as to constitute a public nuisance. Bensenville therefore sought an injunction prohibiting Chicago from 1) expanding the airport in such a manner as to expose the communities to higher noise levels, 2) allowing the airport's facilities to be utilized by any aircraft which emit noise beyond a certain level and 3) permitting any aircraft which produce noise in excess of a certain level to utilize airport facilities unless such aircraft was in use prior to the date of the requested relief.

Remarking that the "real thrust" of the complaint was to prohibit aircraft while in flight over the communities from producing noise in excess of prescribed limits, the court found the matter before it was controlled by the Burbank decision (which was then some six months old). After extensively quoting that decision, the court held that under the Federal Aviation Act, as amended by the Noise Control Act of 1972, the federal government had, "so occupied the regulation of aircraft noise and air pollution as to preempt any state or local action in that field." 306 N.E.2d at 566.

In County of Cook v. Priester, 22 Ill.App.3d 964, 318 N.E.2d 327 (1st Dist. 1974), affirmed without reaching the supremacy clause issue, 62 Ill.2d 357, 342 N.E.2d 41 (1976), the issue was whether a county, pursuant to conditions imposed in a special use permit issued under its zoning ordinance, could lawfully impose a weight limitation on aircraft using a private airport. Specifically, one such condition sought to restrict usage of one of the airport's runways to aircraft that did not exceed 60,000 pounds.

In attempting to justify that condition, the County argued that the limitation was a safety factor for the surrounding landowners, users, and passengers of users of the airport. As such, the County maintained that it had a legitimate interest and duty in protecting the citizens living in the area surrounding the airport, and was free to regulate activities within its boundaries to that end.

The Appellate Court disagreed, remarking first that the County had failed to show how the safety of the public was impaired by aircraft over 60,000 pounds utilizing the airport. After reviewing the federal aviation statutory scheme, including 49 U.S.C. Sections 1508 and 1348, and relying on the Burbank decision, the court determined that the condition was unenforceable. Specifically, the court viewed the condition as an attempt to manipulate the type and number of aircraft servicing the airport by regulating air traffic beyond the

boundaries of the county under the guise of land use controls. Finding that the effect of the condition on the use of navigable airspace was comparable to that cited in Burbank, the court held:

> "that the level of federal regulation of air commerce by the Federal Aviation Agency [sic] is so pervasive as to deprive other governmental bodies of the power to act, and that the weight limitation ordinance violates the Supremacy clause of Article VI of the Constitution of the United States." 318 N.E.2d at 332.

The Board notes that these holdings are squarely in line with those in other jurisdictions invalidating attempts by non-proprietors to mandate or preclude some specified actions by the airport proprietor which would have a direct effect upon airport operations. These are, by way of example, San Diego Unified Airport Authority v. Gianturco, 651 F.2d 1306 (9th Cir. 1981) (curfew); Luedtke v . County of Milwaukee, 521 F.2d 387 (7th Cir. 1975) (number of flights, hours of operation, aircraft operating procedures and flight paths); U.S.A. v. City of Blue Ash, Ohio, 487 F.Supp. 135 (S.D. Ohio 1978), aff'd 621 F.2d 227 (6th Cir. 1980) (mandating turns after takeoff) Northeast Phoenix Homeowners, Assn. v. Scottsdale Municipal Airport, 636; F.2d 1269 (Ariz. App. 1981) (restraining runway extension, curfew and specific operating procedures), Air Transport Assn. v. Crotti, supra, (SENEL noise limits directly applicable to aircraft in flight as discussed in more detail below).

Not all local attempts to regulate in areas which may impact airports fail, however, as evidenced by LaSalle National Bank v. County of Cook, 34 Ill.App.3d 264, 340 N.E.2d 79 (1st Dist. 1975). At issue in that case was whether a Cook County zoning ordinance which limited building heights for areas within two miles of designated airports had been preempted by FAA regulations concerning airport approach zones. The allowable height of any building under both the ordinance and the FAA regulation was based on the distance of the building from a given measuring point. Under the County ordinance, however, that measuring point was the airport boundary, while under the FAA regulation it was the end of the runway. From these measuring points further but differing computations under both the ordinance and regulation were required to determine the allowable height.

In upholding the Cook County ordinance, the court first discussed the Priester decision, which held that regulation of the field of air commerce had been federally preempted. The Court determined, however, that it was not air commerce, but instead the construction of buildings, that was the object of control by the county ordinance. Accordingly, preemption was not at issue as the goals of the federal and local government were different. Specifically, the court found that while the FAA was concerned with air traffic safety, the County was concerned with

the health, welfare and safety of those near the air field. 34 Ill.App.3d, at 274-5; 340 N.E.2d at 87-88; accord, Praznik v. Sport Aero, Inc., 42 Ill.App.3d 330, 355 N.E.2d 694 (1st Dist. 1976) (state aircraft guest statute was not preempted by FAA safety regulations).

Finding themselves powerless to limit airport noise and expansion, governmental entities have banded together to ask the courts to do so, using various legal theories. In Illinois, expansion of O'Hare International Airport has been the subject of two such suits. In State of Illinois ex rel. Scott v. Butterfield, No. 74C2440 (N.D. Ill. 1974), a group of municipalities organized as the Suburban O'Hare Commission (Suburban) participated in a suit brought by the Attorney General. The allegation was that the FAA had violated the National Environmental Policy Act, 42 U.S.C. 4321 et seq., by adopting a policy of unlimited growth at O'Hare. This case did not come to judgment, but was the subject of a consent decree and settlement agreement dated October 14, 1982 (see Exh. K, L; ATA Brief, p. 18-19 and Attach B., and ATA Supp Comments p. 18-20). Pursuant to this decree, among other things, the City of Chicago agreed to a moratorium on runway expansion until 1995. The City also agreed to engage in voluntary FAR-150 planning, to present a master plan for development at O'Hare to the FAA for approval, and to request the FAA to process an Environmental Impact Statement (EIS) concerning any expansion. The agreement and consent decree additionally established a forum known as the O'Hare Advisory Commission (OAC) for "consideration and resolution" of issues involving the relationship of the City of Chicago's O'Hare Airport to surrounding communities.

On November 14, 1984, the FAA approved an Airport Layout Plan for O'Hare which provided for expansion. On December 4, 1984, Suburban brought suit against the City and the FAA in the federal District Court for the Northern District of Illinois seeking an injunction banning all future construction at O'Hare. The complaint was that the FAA's approval violated the Butterfield consent decree, NEPA, the Airway and Airport Improvement Act of 1982, 49 USC 2201 et. seq., and the Clean Air Act, 42 U.S.C. 7401 et seq. The district court dismissed the complaint for lack of jurisdiction. Suburban O'Hare Commission v. Dole, No. 84C10387, Memorandum Opinion and Order (N.D. Ill. Feb. 28, 1985).

Suburban sought appellate review of the district court order as well as the FAA's approval of the Airport Layout Plan and the adequacy of the EIS. The Seventh Circuit Court of Appeals determined that Suburban was not legally entitled to relief. The members of the three-judge panel also stated that:

> we feel compelled to address the equities of this case. Petitioners conceive of themselves as the innocent, passive victims of a relentlessly expansive O'Hare. They point out that many of the communities

> surrounding O'Hare were established long before the airport had been built. In all fairness, however, these same communities receive enormous economic benefits from their proximity to O'Hare. Moreover, many of these communities have resisted attempts by the City to harmonize their own land-use regulations with the aviation activity at O'Hare. In a perfect world, petitioners would be able to reap the benefits of their location and still be able to sleep without noise disturbances at night. Unfortunately, the FAA and the City are forced to operate in a world where even their most carefully considered decisions are likely to adversely affect some people. We are confident that the proposed development represents an honest and careful attempt to minimize those consequences and to accommodate the conflicting interests in the best possible manner. Suburban O'Hare Commission v. Dole, No. 85-1073, slip op. at 27 (7th Cir. March 13, 1986).

Finally, it should also be noted that in Illinois, as elsewhere, individual homeowners have applied to the courts for airport noise relief using a variety of legal theories of liability, including inverse condemnation, personal injury, trespass, and nuisance. See, e.g., Bryski v. City of Chicago, No. 83 CH841, (DuPage County Circuit Court) (complaint discussed and included in A. G. Comments, p. 62 and A49-60). The Board further notes that in a recent case, the California Supreme Court found that a homeowners' suit alleging inverse condemnation of land by, and continuing nuisance from, airport noise stated a proper cause of action for damages. Baker v. Burbank-Glendale-Pasadena Airport Authority, 39 Cal. 3rd 862, 705 P.2d 866, (1985), cert. denied 54 U.S.L.W. 3561, 3562 (Feb.25,1986).

Airport Proprietors' Controls

The quandary of airport proprietors has been the determination as to what the limits of its duties and authorities are as landlord, in relation to its statutory and constitutional duties to avoid actions which are "discriminatory," "unreasonable" and "undue burdens on interstate commerce."

The Illinois Municipal Code, Ill. Rev. Stat. 1985 Ch. 24 11-101-1, provides that municipalities:

> may establish and maintain public airports within or without [their] corporate limits; ....
>
> may operate any public airport and may charge and collect rents, rates or other compensation for any use thereof or for any service rendered by the municipality in the operation thereof, provided that subject to the capacity thereof, the landing field

> and landing strips shall be available to any person, without unjust or unreasonable discrimination as to services and charges, for landing and take-off by an aircraft; ....
>
> [and] may regulate the use of such airports, the navigation of aircraft over such airports and the approach of aircraft and their take-off from such airports.

Chapter 15 1/2, "Aviation", provides similar, although not identical, authority to establish, operate and regulate airports to various counties, municipal airport authorities, joint city - county airport commissions, multi-county airport authorities, and inter-state airport authorities. However, local government's regulatory powers are not boundless, being subject, for example, to limitations imposed by the Illinois Department of Transportation as well as the legislature. See, e.g., Ill. Rev. Stat. 1985 Ch. 15 ½ 190, 191.

As the Attorney General correctly relates,

> Caught between the local communities' inability to act and the FAA refusal to lead is the airport proprietor. The proprietor in effect is caught on both horns of a dilemma. First, he is responsible for the noise impact caused by the airport, but the disclosure of the extent of the impact may subject him to further liability. Disclosure of that very data, however, may well assist the local community in addressing the impact and thereby lessen the proprietor's eventual liability. Second, the proprietor is subjected to the competing demands of the serving air carriers to increase operations and the local communities to decrease noise. (A.G. Comments, at 16).

While the Illinois courts have not addressed the issue of the permissible scope of proprietor control of noise, case law developed in other jurisdictions gives some indication. A governmental proprietor may exercise otherwise preempted police powers to establish a curfew, see National Aviation v. City of Hayward, supra; and may ban certain noisy aircraft from use of its airport provided that the decision to do so is made in a timely and reasonable fashion, see British Airways Board v. Port Authority of New York ("Concorde I"), 558 F.2d 75 (2nd Cir. 1977); on remand, 564 F.2d 1002 ("Concorde II") (2nd Cir. 1977). However, a proprietor may not require compliance with FAA regulations in advance of FAA's own compliance timetable because of federal preemption of this regulatory area; see Global International Airways Corp. v. Port Authority of New York, 564 F. Supp. 795 (S.D.N.Y. 1983).

Preemption As Affecting Board Regulatory Authority

Having established the context of the ATA's legal arguments, the Board may now proceed to address them. This Opinion has considered the FAA's disinclination to regulate airport, as opposed to aircraft noise, the inability of local governments to exercise what police and zoning authorities they may possess to the satisfaction of themselves as well as their neighbors, and the competing and often conflicting federal, local and commercial interests which airport operators must attempt to satisfy. The argument becomes compelling that state governments could serve the much needed function of establishing noise limits and enforcing coordination of efforts between proprietors and units of local government. In considering the possible role of the state, the issues obviously become: to what extent is state action preempted by federal law, and to what extent is contemplated state action precluded by other constitutional and/or state law requirements.

As to the preemption issue, the Attorney General and the ATA do not dispute that the most relevant federal cases are Burbank, supra, Air Transport Assn. v. Crotti, supra, and San Diego Unified Port District v. Gianturco, 651 F.2d 1306 (9th Cir. 1981), cert den. sub. nom. Department of Transportation v. San Diego Unified Port District, 455 U.S. 1000 (1982).

The ATA believes that Burbank, as echoed in the First District Illinois Appellate Court's decision in Bensenville in 1972 and Priester in 1974, establishes total preemption of police power action by state and local governments (see ATA Brief, p. 23-24, 30-31). The Board rejects this simplistic assertion. To the extent that Bensenville and Priester involved attempts by non-proprietors to exert controls over airport operations and aircraft, these decisions correctly noted the total preemption principle enunciated by the Burbank court in a similar factual situation. Extension of these holdings beyond their facts would be error, in that neither Illinois court considered, or was asked to consider, the Burbank footnote 14 proprietor's exemption now well recognized by the federal courts and actively embraced by the FAA.

The prototype for the Attorney General's regulatory proposal to the Board are noise regulations adopted by the State of California. These regulations have been considered and interpreted by federal courts in the Crotti and Gianturco cases. In Crotti, a three-judge district court was designated to review airport noise regulations which sought to reduce community exposure to aircraft noise. These regulations governed the operations of airports and of aircraft at all airports in California mandatorily operating under a permit issued by that state. The county in which the airport was situated was given the responsibility of enforcing the noise regulations. Any airport's non-compliance with the regulations would subject it to revocation or suspension of its permit.

The regulations were written to control noise in two ways. Generally, one part of the regulations was designed to gradually reduce noise levels in communities surrounding an airport to 65 dB under a metric denominated as the Community Noise Equivalent Level (CNEL). Certain recommended procedures were established under this part of the regulations to attain the CNEL standards, such as encouraging the use of aircraft types with low noise level characteristics, preferential runway usage, reduction of flight frequency during noise sensitive periods, noise-shielding berms, and development of compatible land uses within noise impact boundaries. No recommended procedure was mandatory, and each airport was left to choose any procedure at its discretion, including those beyond what was suggested, in tailoring its own programs. A variance procedure was also provided for those unable to meet the required noise levels, and in certain instances airports with noise problems were required to establish a Noise Impact Boundary by monitoring and measuring aircraft noise emissions.

The other part of the regulations established Single Event Noise Exposure Levels (SENEL). The SENEL set out permissible noise levels governing noise generated by an aircraft directly engaged in flight. Both the CNEL and SENEL standards were challenged on the basis of preemption, with each party relying on the Burbank decision in support of their respective positions.

After analyzing Burbank, the court first addressed the CNEL standards. Here, the court readily concluded that the proprietor exemption contained in footnote 14 of Burbank firmly established the right of the airport proprietor to control the use of its airport. Such control included the right of the proprietor to determine the type of air service provided as well as the type of aircraft that could utilize the airport. Further, the court specifically recognized that the proprietor's control could be exercised either through its own initiative or through a directive initiated by the state through its police powers. 389 F.Supp. at 64. Moreover, the court noted the power of the state to generally regulate its political subdivisions, including local airport authorities, as being "well established as a matter of law" citing City of Trenton v. State of New Jersey, 262 U.S. 182, 185-187, 43 S.Ct. 534 (1923). 389 F.Supp. at 64, n.2.

The court also determined that the monitoring provisions of CNEL standards were "innocuous to air traffic involving ground noise measuring machines and recording sound volume data which in no way intrude upon or affect flight operations and air space management in commerce." 389 F.Supp. at 64-65. Further, the state-dictated employment of shielding and ground level facility configurations, and the development of compatible land uses, were found as "so patently within local police power control and beyond the intent of Congress in the federal legislation that further discussion would be wasteful." 389 F.Supp. at 65.

As the court was reviewing the noise regulations pursuant to a summary judgment motion, however, the court did not decide the issue of what limits, if any, applied to any of the CNEL requirements. Remarking that while the remaining CNEL recommended procedures "appear[ed] suspect" until such time as an airport took a definite affirmative action thereunder, the court concluded that the CNEL regulations were not per se invalid as preempted. Id.

However, the court did find that the SENEL regulations constituted a per se unlawful exercise of police power into the exclusive federal domain of control over aircraft flights and operations, and airspace management and utilization in interstate and foreign commerce. The court therefore enjoined their implementation and enforcement as having been preempted. Id.

In Gianturco, the court was subsequently called upon to review the implementation of the California CNEL regulations. The San Diego Unified Port District, a political subdivision of the State of California, owned and operated San Diego International Airport at Lindbergh Field. Aircraft noise from Lindbergh Field impacted the City of San Diego to such a degree that the Port District, pursuant to California's noise regulations, was required to seek a variance from the regulations from the California Department of Transportation (Cal Trans). The Port District sought its first such variance in 1975. At that time the Port District voluntarily imposed a curfew on operations at the airport between the hours of midnight and 6:00 a.m. In effect, the curfew prohibited any aircraft from taking off during those hours and barred any aircraft not certified under FAR Part 36 from landing during that period. Subsequently, the variance was granted, with the curfew incorporated as a condition of the variance.

In January 1977, the Port District reapplied for a variance. After a hearing, Cal Trans granted the variance, but as a condition thereof, required that the curfew be extended two hours, i.e., from 11:00 p.m. to 7:00 a.m. The Port District objected to the extension of the curfew, and challenged the condition in the federal district court, which found the condition to be preempted by federal law and enjoined its enforcement.

Upon review by the appellate court, Cal Trans submitted two arguments. The first was that Burbank was no longer good law. The basis for this argument was Congress' passage of the Quiet Communities Act of 1978, Pub. L. 95-609, which amended the Noise Control Act of 1978 to establish a federal program for funding of noise abatement plans for sources including airports. The court rejected Cal Trans' "attempt to interpret the Quiet Communities Act as a blank check for local control of aviation noise" 651 F.Supp. at 1314. Finding that the preemption doctrine as articulated in Burbank controlled, the court found that a local government could not adopt regulations impinging on aircraft

operation. The court, however, took care to mention that its results were consistent with Crotti. The court found that the CNEL regulations upheld by the Crotti court:

> permitted proprietors to choose a variety of methods to reduce noise. Although a curfew was one option, it was not specifically mandated as it has been here. [footnote] 25. The [Crotti] court stated that efforts to impose curfews via the state's police power might be suspect but, since the program did not unambiguously require this, it refrained from ruling on the matter.
>
> [Footnote] 25. In Crotti, the state argued in its brief, made a part of the record in this case, that the regulations were not mandatory upon proprietors, but only suggestive. As the state put it, [S]hould a proprietor chose to act using its unpreemptive powers...that is the business of the proprietor. The state has nowhere directed that proprietary power be used. 651 F.2d. at 1316

Finally, the court turned to footnote 2 in Crotti, which observed that the power of a state to regulate its subdivisions was well established. This power, however, was thought by the Gianturco court to be limited through preemption, referencing without further discussion the dicta discussed above. Id.

Cal Trans' second argument was that it was a proprietor of Lindbergh Field within the meaning of Burbank, and could thus impose the curfew pursuant to the footnote 14 proprietor's exemption. The court disagreed. Citing Griggs v. Allegheny County, supra, the court found that for the purposes of constitutional liability for unjust taking of property as well as for establishing proprietorship under Burbank, the criteria to be assessed are ownership, operation, promotion, and the ability to acquire necessary approach easements. The court determined that under state law, it was the Port Authority which satisfied these criteria and therefore was the airport proprietor. The concept of a dual proprietorship was similarly rejected on state statutory grounds.

The position of the ATA is that Gianturco is "fatally dispositive" of the Attorney General's regulatory proposal, because "Illinois public airport authorities have been ceded proprietary powers by the Illinois General Assembly identical in all significant respects to the powers held by their California counterparts", as well as the substantially identical prohibition against acquisition of airports from political subdivisions without their consent (ATA Brief, p. 26-28). The ATA asserts that the Attorney General has conceded as much, citing a statement made in the Attorney General's amicus brief in support of Cal Trans' petition to the Supreme Court for certiorari:

> The Illinois [R77-4] proposal... applicable to all public airports in Illinois, would impose specific noise limitations for airport operations as a whole, with enforcement and variance mechanisms, all similar to the California scheme....The Court of Appeals decision places a large cloud on the efficacy of the proposal, and if allowed to stand could render nugatory the entire regulatory scheme. (Exhibit J, ATA Brief at 29).

The argument of the Attorney General is essentially twofold: that Crotti has continued validity, and that Gianturco wrongly decided that the state did not stand in a proprietary capacity.

In analyzing these cases, the Board has not considered arguments that the controlling cases were wrongly decided, employing instead principles of case construction and stare decisis. The Board finds that Gianturco does not overrule or otherwise disturb the finding in Crotti that CNEL standards, properly applied, may form the basis for a valid state regulatory program. Applying the reasoning of Gianturco, the Board does not find that Illinois is a proprietor within the meaning of Griggs and Burbank; Illinois, therefore, may not dictate what proprietary controls an airport may impose.

In terms of the continuum of state action envisioned by the Attorney General, this result does not affect the State's ability to require "disclosure" and "planning", but does circumscribe the "intervention" options. The Board's ability to a) issue a general cease and desist order, leaving a proprietor to devise its own compliance plan, or b) to deny a variance, leaving a proprietor to adopt a revised compliance plan, remains unaffected; the range of specific directives may, however, be limited.

While this result may have some undesirable effects, the Board notes that it severely undercuts one of the ATA's primary arguments against adoption of airport noise regulations: violation of the interstate commerce clause (ATA Brief, p. 46-53). As earlier explained, the commerce clause prohibits a state from adopting legislation or regulations which places a burden on interstate commerce which is excessive in relation to the local benefits which the state hopes to achieve. The essence of the ATA's argument is that any control of airport noise unduly burdens commerce, because of the interconnection of the air transportation system: for instance, a 10:00 p.m.-7:00 a.m. curfew at O'Hare, in combination with a similar curfew in Los Angeles, would prohibit Los-Angeles-Chicago flight departures for fourteen and one-half hours out of 24. Id. at 51-52. Uniformity of regulations is needed, ATA asserts, and the FAA is the entity in the best position to insure uniformity.

The regulatory scheme proposed by the Attorney General states the noise levels to be achieved, not the method of their achievement. The airport proprietor itself must determine the

method of achievement. This process will inevitably involve consultation with the FAA, which can assess the effect of any operational changes on the air transportation system. Where the FAA does not agree to operational changes because of their undue effects on commerce, and a proprietor cannot achieve full compliance with the noise limitation, the proprietor may resort to the mechanisms for relief provided for in the Illinois Environmental Protection Act, Ill. Rev. Stat. 1985, ch. 111 1/2 pars. 1001 et seq. (hereinafter "Act"): variances, site specific rules, or adjusted standards. Any burdens on interstate commerce may thereby be minimized.

In summary, the Board finds that neither the supremacy nor the commerce clause preempts the Board from regulating airport noise in the manner suggested by the Attorney General.

State Statutes As Affecting Board Regulatory Authority

Having disposed of the ATA's federal law objections, the Board will proceed to consider ATA's assertion that state statutes preclude Board regulation of airport noise.

The ATA's state law claims are that the Board lacks general authority under the Act to regulate airport noise, that furthermore such regulation would be in conflict with Illinois aviation statutes, that regulation of public airports (those operated by governmental entities) to the exclusion of private airports violates equal protection guarantees of the state and federal constitutions, and that the proposed regulations are not economically reasonable or technically feasible.

Title VI of the Act, "Noise", provides in pertinent part:

TITLE VI: NOISE

Section 23

The General Assembly finds that excessive noise endangers physical and emotional health and well-being, interferes with legitimate business and recreational activities, increases construction costs, depresses property values, offends the senses, creates public nuisances, and in other respects reduces the quality of our environment.

It is the purpose of this Title to prevent noise which creates a public nuisance.

Section 24

No person shall emit beyond the boundaries of his property any noise that unreasonably interferes with the enjoyment of life or with any lawful business or

activity, so as to violate any regulation or standard adopted by the Board under this Act.

Section 25

The Board, pursuant to the procedures prescribed in Title VII of this Act, may adopt regulations prescribing limitations on noise emissions beyond the boundaries of the property of any person and prescribing requirements and standards for equipment and procedures for monitoring noise and the collection, reporting and retention of data resulting from such monitoring.

The Board shall, by regulations under this Section, categorize the types and sources of noise emissions that unreasonably interfere with the enjoyment of life, or with any lawful business, or activity, and shall prescribe for each such category the maximum permissible limits on such noise emissions. The Board shall secure the co-operation of the Illinois Institute on Environmental Quality in determining the categories of noise emission and the technological and economic feasibility of such noise level limits.

In establishing such limits, the Board, in addition to considering those factors set forth in Section 27 of this Act, shall consider the adverse ecological effects on and interference with the enjoyment of natural, scenic, wilderness or other outdoor recreational areas, parks, and forests occasioned by noise emissions from automotive, mechanical, and other sources and may establish lower permissible noise levels applicable to sources in such outdoor recreational uses....

For purposes of this Section and Section 24, "beyond the boundaries of his property" or "beyond the boundaries of the property of any person" includes personal property as well as real property. (Ill. Rev. Stat. 1985, ch. 111 1/2, pars. 1023, 1024, 1025.)

First, the ATA argues that Section 25 of the Environmental Protection Act is not "sufficiently definitive or specific" to empower the Board to adopt the wide-ranging regulations sought by the Attorney General. ATA asserts that Section 25 is a general grant of authority to "adopt regulations prescribing limitations on noise emissions beyond the boundaries of the property of any person", as opposed to a specific mandate to regulate airport noise as enacted, for instance, by the California legislature as discussed in Crotti and Gianturco. The ATA also asserts that airport noise regulation falls outside the scope of the permissive authority of Section 25 to the extent that the

proposal would cover a) noise emitted by aircraft while operating miles outside the airport's boundary, and b) the "property" emitting the noise--the aircraft--is not owned by the airport.

Initially, the Board must point out that the second paragraph of Section 25 specifically mandates the Board to categorize "unreasonably interfering" noise sources and to prescribe noise limits. The lack of a legislative "laundry list" identifying particular noise sources, such as airport noise, as being subjects of special concern does not impair the general grant of regulatory authority. Section 25 is both definite and specific, particularly when read in the context of the Title as a whole.

In support of its argument that the Board cannot "limit the aggregation of noise caused by aircraft operating miles beyond the boundaries of the airport" (ATA Brief, Oct. 26, 1983 at 59), the ATA cites the following language from In The Matter of Proposed Noise Regulations for Toys, R72-16, 6 PCB 131 (October 31, 1972):

> It will be seen from the above-quoted provisions [Sections 23-25 of the Act] that the Board's jurisdiction for the adoption of regulations in this field related to noise emitted beyond the boundaries of the property on which the noise has been generated...(emphasis added).

Reliance on this incomplete quotation is badly misplaced. The toy noise proposal was to impose a 100 dB limit on noise from toy guns and an 85 dB limit on noise from other toys measured one foot from the toy. The sentence following that quoted above contains the essence of the Board's rationale for dismissing the petition:

> The proposed regulation is essentially one in the category of consumer protection and does not fall within the area of control envisioned by the Legislature for which the Board is authorized to enact regulations.

Furthermore, Professor David Currie, the principal draftsman of the Act, has stated that the "beyond the boundaries" language of Section 25 of the Act "excludes industrial hygiene, as in the previous air statutes; [meaning that] the Board has shown no inclination to duplicate the work of other agencies in indoor air pollution." Currie, Pollution at 123 (1975). Thus, the Board has not attempted to regulate noise, such as toy noise, which does not generally escape the boundaries of the property on which it is generated. The Board has, however, adopted regulations limiting noise emissions from mobile sources on roadways [R74-10, 25 PCB 517, 641, Order May 12, 1977], since mobile source noise reaches and impacts the general environment.

Next, the ATA argues that "the proposed regulation purports to target Illinois public airport proprietors even though the entities do not own the property, i.e., the aircraft, which are the source of the noise being emitted", and that the regulations adopt the "guise of regulating the airport proprietor in order to reach the source of the noise itself, i.e., the aircraft in flight" (ATA Brief, Oct. 26, 1983, at 60). However, while the noise is generated by the aircraft, the impact of that noise depends upon the location of the airport property, its size and configuration, the flight paths (especially during take-offs and landings), the timing of arrivals and departures, airport operating procedures, surrounding land uses, and other factors, many of which are under the control of the airport proprietor. As the Attorney General has pointed out, "just as '[p]lanes do not wander about in the sky like vagrant clouds' ([quoting] Burbank, 411 U.S. at 633, planes likewise do not take-off and arrive (with their indivisible noise) on vagrant clouds, but at proprietor located and controlled airports" (A.G. Reply Comments, Nov. 28, 1983 at 19).

Clearly, the airport proprietor's original decisions as to airport location, configuration and design, as well as ongoing decisions regarding new construction, operating procedures and additional land or easement purchases have a real effect upon airport noise impact. The Supreme Court, in the context of an air easement case, recognized this fact:

> It is argued that though there was a "taking", someone other than [the airport proprietor] was the taker -- the airlines or the C.A.A. acting as an authorized representative of the United States. We think, however, that [the proprietor], which was the promoter, owner, and lessor of the airport, was in these circumstances the one who took the air easement in the constitutional sense. [The proprietor] decided, subject to approval of the C.A.A., where the airport would be built, what runways it would need, their direction and length, and what land and navigational easements would be needed. Griggs supra, 369 U.S. at 89 (1962).

The rationale used by the Supreme Court here, that the responsibility for a taking accrues to the decisionmaking entity, is one which the Board has long and consistently applied in analyzing liability for pollution under the Environmental Protection Act:

> The [Act] makes it unlawful not only to 'cause' but also to 'allow' pollution. We think this language goes beyond the common law and imposes an affirmative duty on persons in a position of potential control to take action to prevent pollution. . . the question for our decision is whether, in light of the [Act's] policy, a respondent is in such a relationship to the

> transaction that it is reasonable to expect him to exercise control to prevent pollution.
>
> EPA v. James McHugh Construction Co.,. PCB 71-29, 4 PCB 511, 513 (May 17, 1972).

See also, EPA v. Village of Millstadt, PCB 78-132, 31 PCB 391 (Sept. 7, 1978) ("The Act prohibits any person (including corporations) from causing or allowing a violation of the regulation, regardless of whether such violation was caused or allowed as a result of a contractual arrangement"); EPA v. Meadowlark Farms, Inc., 6 PCB 537 (PCB 72-343, January 16, 1973) ("We are not concerned with the refinements of ownership of the [source of pollution] as much as with the capacity of controlling its pollutional discharge. Respondents cannot be selective about what aspects of the [source] are under its control. The burdens must be accepted with the benefits"), affirmed, Meadowlark Farms, Inc. v. Pollution Control Board, 17 Ill.App.3d 51, 861 (5th Dist. 1974).

Thus, the Board finds that regulation of airport noise, provided such regulation is accomplished in a constitutionally permissible manner, is both authorized by the Act and necessary to implement the purposes of Title VII.

The ATA's assertion of conflict between aviation statutes and noise regulations promulgated under the Act can be dismissed with little discussion. The ATA contends that the aviation statutes authorizing municipalities (Ill. Rev. Stat. 1985, ch. 24, 11-101-1, previously quoted at length) and other governmental entities (Ill. Rev. Stat. ch. 15 ½ generally, and specifically 187-194) to operate airports require them to provide unlimited access to all persons. ATA asserts that airport noise regulation would prevent compliance with this requirement, based on language prohibiting "unjust or unreasonable discrimination." The statutes do not preclude "reasonable discrimination" for purposes of noise abatement; the statutes in fact go on to provide for regulation of the use of the airport and the aircraft's navigation, take-off and approaches.

However, Section 47(a) of the Act requires that the "State of Illinois and all its ... subdivisions shall comply with all ... provisions of the Act and of regulations adopted thereunder." Compliance with an airport noise regulation presents no inherent conflict with the aviation statutes authorizing regulation of airports in a "just" and "reasonable" fashion.

The final argument of the ATA concerns the proposed regulation of noise from public airports only. The first noise regulations, adopted in Docket R72-2, were challenged on similar grounds. The validity of these regulation was upheld in Illinois Coal Operators Assn. v. PCB, 59 Ill. 2d 305, 319 N.E.2d 782

(1974). One of many areas of challenge was the exemption of sounds emitted by construction equipment from the regulations, when identical equipment used in mining was not also given an exemption. It was argued that this differing treatment violated the equal protection clauses of the state and federal constitutions, as well as a state prohibition against special legislation.

The Illinois Supreme Court cited numerous authorities which specify groundrules to be used by the legislature in creating classifications for differing treatment; these apply to the Board in its use of its quasi-legislative powers of rulemaking:

> We would remark that so far as legislative classification is concerned, it has been recognized that evils in the same field may be of different dimensions and reform may take place one step at a time. The legislature may address itself to one stage of a problem and not take action at the same time as to other phases." 319 N.E.2d at 786 (citations omitted). ....If there is a reasonable basis for differentiating between the class to which the law is applicable and the class to which it is not, the General Assembly may constitutionally classify persons and objects for the purpose of legislative regulation or control, and may pass laws applicable only to such persons or objects. 319 N.E.2d at 785 (citations omitted).

In that case, the court found that there were significant bases in the record for distinguishing between the mining and construction industries, including the temporary vs. permanent use of equipment, the different areas of the state in which the activities were primarily conducted, and the number of persons employed.

Similarly, the Board finds that this record supports a rational distinction between public and private airports. As enunciated by the Attorney General:

> Privately owned airports are a different contaminant source from those owned by public entities. They are typically much smaller and more isolated; and their operations are dominated by general aviation and fixed-based aircraft whose operating needs and noise characteristics are altogether different from the scheduled commercial jet airliners which dominate operations at airports operated by public entities. (Amended proposal of 6-12-73, Rule 501 "Purpose").

Additionally, political subdivisions are vested with explicit statutory authority to regulate their airports, which authority may arguably give them greater noise abatement powers than non-governmental airport proprietors possess. Additionally,

state government has an obligation "to manage its activities so as to minimize environmental damage." Ill. Rev. Stat. 1985 ch. 111 1/2, par. 1002(a)(4). For these reasons, the Board finds that it may lawfully address itself first to the noise problems posed by political subdivisions of the state over which the power to regulate is well established. E.g., City of Trenton v. State of New Jersey, 262 U.S. 182 (1982).

The only legal challenge remaining concerns the economic reasonableness and technical feasibility of regulations to be adopted by the Board. This can be answered only after a detailed examination of the record in this proceeding.

CITIZEN CONCERNS

Many persons impacted by airport noise appeared at the Board's hearings and testified about its effect on their lives. A small fraction of those comments will be quoted or referred to in this opinion.

Frequency of Flights

While noise levels are attributable to a number of variables, the frequency of flights was of great concern to residents around the Chicago airports. With 731,742 operations (landings or takeoffs) per year, O'Hare has 2,000 operations a day or an average of 83 per hour. One Elmhurst citizen testified that depending on wind direction, landings occur every 75 seconds and takeoffs occur every 50 seconds at O'Hare runways 4R and 22L (R. 655). A second Elmhurst citizen said that planes land at runway 4R every 15-20 seconds (R. 687, 690-1). A third stated that unbearable noise from runways 22L and 4R occurs every 50 seconds for 14 hours on a northeast wind day (R. 742). A Des Plaines resident testified that noise from planes using runway 22 is continuous from 7:30 a.m. to 9:30 p.m. (R. 992). Another Des Plaines homeowner stated that approximately 90,000 planes fly over his home per year at an altitude of less than 400 feet.

Impact of Noise on People's Lives

Many citizens testified that they could not enjoy the use of their homes or property because of the airport noise. These complaints can be categorized as communication interference. Indoor communication interference occurs when the noise interferes with the resident's ability to hear the television, stereo, radio, telephone, or each other, which happens in many suburbs of O'Hare including Glenview (R. 1008), Elmhurst (R. 366, 718), Schiller Park (R. 711), Des Plaines (R. 2968, 2976, 1039-42) and Bensenville (R. 425). A Bensenville resident summed up the indoor communication interference as follows:

> It is impossible at times to carry on normal conversations in a variety of situations. Sitting

> outside on our patio we are frequently unable to carry on uninterrupted discussion. Inside our home, on days when we do not have the air conditioning on, the noise interferes with our mealtime banter. When using the phone we frequently must stop talking because of the roar of plane, and if we happen to be speaking to someone here in Bensenville who is in the path of the same flight pattern the conversation is interrupted two times, once as the roar is at our house and then at their home, and also with each take off during the conversation [R. 425].

Indoor communication interference problems extend to hospitals and schools. A registered nurse at Lutheran General testified that:

> While working, I have seen how patients respond to noise pollution from planes going in for landings at O'Hare. It appears the patients do become more irritable and nervous when noisy aircraft are heard. The noise interrupts conversation , not to mention the patients' experience when trying to rest.
>
> It's important to have quiet when one is doing certain procedures such as taking blood pressures and this is interrupted by the noise from aircraft [R. 4241].

Airport noise also interrupts church services. The pastor of Our Lady of All Parish in Rosemont testified that:

> In terms of giving homilies on Sunday, things like that, it's very difficult. There are certain days when we have a northeast wind and we just know, the parishioners know we have to cut the homilies short.
>
> There is no way we can really communicate to the people. It's nearly wiped out of existence on those days. Other times, it's not that bad [R. 4236].

A Bensenville resident testified that:

> We go to church services and all throughout the service we have to hesitate. Sermons have to be stopped because of the noise of the aircraft. At any rate, it is very discouraging and certainly disrupting to the message being given during sermons and services. [R. 5842].

Complaints of airport noise extend even to the sports arena. A witness attended a football game that was stopped eight times by the referee due to aircraft noise [R. 404]. A school superintendent stated that:

> [t]hat...is the way we play our football; the quarterback puts his hands up, we wait 'til the plane passes over, and we run the play. I think it is safe to say from impartial research that we spend 20 to 30 seconds for each pass over. [R. 290].

One elementary teacher at a school which sits under runway 22R, testified about the problem:

> The first problem that we have deals with spelling. Whenever the words are given the children will raise their hands and point overhead, which means I can't hear you, there is a jet overhead.
>
> And I have five classes of language arts, which means on certain days we have to stop five to twenty minutes in each class, this is in spelling...
>
> In reading it is impossible to present a new word on the board as a plane is going overhead. We have groups of children coming up and saying, 'We can see the board but we can't pronounce the word.'....And I notice as I have been teaching in Park Ridge the increase in noise level is getting worse and the frequency is increasing [R. 392-3].

The superintendent of the school district testified that O'Hare runway 22L, 22R and 27R operations fly over six of the district's schools and affect five others (R. 387).

Even when schools are air conditioned complaints exist. The Superintendent of Bensenville School Districts 2 and 100 testified that:

> I submit to you that air conditioning is a wonderful thing and we're all enjoying it today, but in the fall and spring boys and girls in our schools can't enjoy air conditioning, they can't even enjoy open windows because of noise pollution. The only defense we have against noise pollution is the windows [R. 287].

People have testified that they have had difficulty sleeping because of airport noise. A Mount Prospect resident stated:

> I did not get any sleep that day, nor did many of my neighbors get much sleep. I am -- I feel that is excessive. I feel it is excessive that I have to be subject to 22 straight hours of noise. I think it is excessive that my children can't go to sleep and therefore cannot go to school the next morning and be educated. I think it is excessive that I cannot go to work the next day and earn a living for my family,

and therefore I am concerned [R. 267].

A Bensenville resident also testified:

> Let me get back to my typical day in Bensenville. Okay. I will be sleeping in my bed at 3:00 o'clock, ten to 3:00 a.m., charter flights to Europe, everybody knows them because you can get a good deal on it, there are at least [sic] flights at night. When they land -- I am sorry, take off over the house at five to 3:00, ten to 3:00, 3:00 o'clock, I will get up every morning to look at the clock, and then I try to get back to sleep. My bed is shaking. I kid you not, it vibrates,.... [R. 401-02].

A Des Plaines resident stated:

> This morning I opened my back door and I said, 'good morning airplanes', because they were back again. You go to sleep with them. You wake with them. I have a four-year old who I can't even put to bed at 8:00 o'clock at night because she says, 'Could you please stop the airplanes?' [R. 2976-77].

Airport noise also interferes with outside communication. One Schiller Park woman complained as follows:

> We can't stand out in the yard. You can't talk on the telephone. You have got to be closed up all summer and you call that right.
>
> They should have all the right, and I have to sit in my house all summer. I think it is terrible in this day and age we should have to put up with such garbage.
>
> And if I was to sell my house, I wouldn't even be able to sell it. I wouldn't want somebody else to go through what I go through.
>
> Something should be done and something could be done....You want to wait 'til we all get a nervous breakdown. I am just about at it. They should pay me for what I am going through [R. 711-12].

Similarly, an Elmhurst resident was disgruntled over the impact of the airport noise on the ability of residents to use the outdoors:

> We had a block party this year and the noise bothered many of the residents of my neighborhood. And I recall it when we were planning this block party, we really prayed that we would have a nice

> warm day, we prayed that it wouldn't rain, we also prayed that the airplanes wouldn't come over. And that is true. We did talk about that [R. 704].

A representative of the Bensenville Home Society, a social service agency which operates a 247-bed facility for the aged in Bensenville, also testified:

> We have beautiful grounds surrounding the facilities which are of little use to us because the residents find the noise so unbearable most of the time from the aircraft that they prefer to remain indoors. This is very sad.
>
> I might add that the Bensenville Home Society has been in existence in that location since 1894, long before the airport was even dreamed about [R. 5841-2].

Airport noise can even interfere with the vital communication services as evidenced by the testimony of Sergeant Mosher of the Bensenville Police Department. He testified as to the effect of airport noise on the department's radio communication system:

> I have occasioned several times when a total communication blackout occurs because of the jets going over. Everyone in the audience here knows that frequency with which they go over and if you can imagine a forty-five second, thirty to forty-five second blackout in our communication, it becomes almost unbelievable how we can communicate back and forth with the frequency with which the jets go over.
>
> We operate under this on a 24-hour basis. Our contact with the jets is so close that I have had officers tell me that while on York Road they can clock the jets on their radar units, it's that close to us, and the noise is that great for us and it does cause a vital problem to us and hampers us to a great extent in our ability to serve the public and the Village of Bensenville. [R. 6587].

In addition to the frustration of being unable to communicate indoors or to enjoy the outdoors, residents are also caused discomfort and expense by noise vibrations. One woman from the Mohawk subdivision in Bensenville testified that "[p]ollution is also vibrations, vibrations that have broken two bedroom storm windows...vibrations that have cracked the patio twice....It has also cracked the ceiling." (R. 6566). A man from the same subdivision testified that planes from O'Hare pass over the subdivision homes at about 150 feet. "We have been continually fixing the ceiling from cracks." (R. 6665-6). Even the Mohawk School in Bensenville vibrates (R. 298). A

Bensenville woman summed up the vibration problem, testifying that:

> [w]hen you sit at the dining room and a plane goes over, my chandeliers shake, the china in the hutch shakes to the point that I put most of it underneath because I'm afraid some day the chandelier is going to fall on top of us and the china is going to come out.... I mean you can see the people in the planes practically looking down on you and you feel like they are staring or laughing at you because you are foolish enough to live in a home that you love [R. 5864-5].

Others testified that they could not enjoy the full use of their home or property (R. 450, 741, 4360). One resident of Des Plaines stated that the noise is so loud "that I can't even tell if the lawnmower is going." (R. 4358). He stated that he was frustrated, and many times ends up yelling and getting irritable. Id.

Another Des Plaines resident spoke of stress:

> The stress factor has been great, as I say. They are talking about those hostages, 39 hostages, or 55 in Iran, and an entire country is willing to sacrifice, but here we have two people in our house who are hostages of the airlines; and I guess there are many, many more, . . . and no one is willing to sacrifice for us [R. 5058].

Others testified as to the stressful situations caused by the noise. An Elmhurst resident stated:

> And I also feel that the rights of my having a home, that is, a healthy home is being violated because I do feel that . . . the noise hurts my ears. And I do feel that it creates a great deal of tension between myself and my wife and my family.
>
> So, I do believe, then, that our individual rights are being violated. And I hope that the Attorney General's office will recognize this fact and will protect us because really we can't protect ourselves [R. 765].

Another Elmhurst resident testified that:

> I am a wreck sometimes. I just want to get a missile and shoot at every one of those planes, at every one of them.
>
> This is emotional testimony, but when you're in the situation you do get emotional [R. 328].

An Elmhurst resident commented on the psychological impact of the noise:

> I only notice the airplanes on weekends. I don't notice them during the week, except when I come home from work. After working in the Loop [I return] to my nice lovely home in quiet tree-lined streets in Elmhurst and my wife is a miserable bitch, pardon the French. She is normally a very lovely woman, but after three or four hours or whatever it takes of airplanes flying over my house is not very nice.
>
> We talk about physiological health and bodily effects, and the like but nobody talked about psychological welfare. And I think this does more damage to us psychologically than it does to us physically. [R. 752].

Things had not improved much by the time of the September 1985 hearings which were attended by far fewer residents. A Chicago resident testified that the Midway Airport noise problem as he perceives it began in "1983 when they started the expansion. In 1983, it was not bad. But 1984, it has just been absolutely terrible" (S. 43).

Another Chicago resident testified about recent noise levels at Midway:

> I live about a half mile from Midway airport that has a large number of older DC-9 planes. These planes are very noisy and fly over low in and out of Midway, causing my windows to rattle. The mortar falls from the walls. You can't hear on the telephone and it interferes with all the TV programs [S. 36-7].

Ground Noise

Several witnesses were more concerned about ground noise than that generated by planes in flight. Airport ground noise results from run-ups, taxiing and aircraft maintenance:

> Ground noise begins with a very loud, you know, big shock and runs for fifteen seconds, twenty seconds, thirty seconds and then shuts off. Then they will figure out there is something else that they have got to fix and do it again. It's the ground noise of that type that has caused us the most problems [R. 4345].

One woman testified regarding the intensity of maintenance run up noise:

My husband and I were awoken at approximately a quarter after twelve at night. There was a terrible sound that was shaking our house. We did not know what it was. We thought at first maybe it was a tornado. It was a bad night, Sunday night. There was lightning and thunder and this sound just took over everything else.

We tried to find out. We called the Police Department to see if they knew what the noise was; they knew nothing of it....

My husband finally called the airport and asked them if they were testing some new kind of run-up which he explained to my husband is they take the airplane to the ends of the runway and rev the engines as high as it will go.

My husband told me -- he says, 'Man, our whole house is shaking.' The noise was unbelievable. He says, 'Well, it will last about fifteen minutes longer.' It lasted a least fifteen minutes longer although it did lessen. They must have moved it either up the runway or to a different runway, but we could still hear it and for anybody that experienced this, it's really something. I mean, the noise was unbelievable and this was in the middle of the night [R. 6661-62].

Another woman testified about the frequency and duration of ground noise:

We used to be able to distinguish rev-ups because they would, as they were doing the other night, they would gun it and shut if off abruptly and that in itself jolts you out of your bed, but they don't always do that, so as a result, I can't tell if it's a plane that is there waiting to take off or a plane that has just landed waiting to go to the terminal....

You see, when you live where we live you get the noise of the planes taxiing....Then you get them coming over slowly and then they go up and, I would venture to say, most planes using those runways are heard in our area maybe two or three minutes, which is a lot when they are, maybe, five minutes apart....

Q. Is the noise on the ground more continuous, perhaps?

A. Yes, you would swear that there was a plane out on Touhy Avenue with its engine running for a half-hour, forty-five minutes at a time.

Q. For that reason, does that bother you more?

A. Well, yes, I would think it would anybody because when a plane is in the air and it goes over and it's gone, you assume that, okay, maybe another one won't come over for an hour, but when it's on the ground and it's constant, obviously, it would be bothersome to anyone who is bothered by it, right? [R. 4313-4318].

A Des Plaines resident, complaining about ground noise testified:

> We do hear other ground noise where, for example, at about 6:00 o'clock at night there must be 35, 40, 50 flights that leave and you hear one taxi up to the end of the runway and then roar it up and take off and that goes on ad infinitum. [R. 4349].

Ground noise and run-ups also occur at other airports such as at Coles County Airport (R. 1785) and Springfield (R. 1711). The O'Hare situation is simply more extreme.

Noise Impact on Property Values

The impact of airport noise on property values was frequently discussed at hearing. The testimony of individual property owners differed according to their location in relation to an airport and their personal experiences. The testimony of a realtor and examination of exhibits provided more detailed information.

A former resident of River Forest testified that she sold her home in three weeks after deciding to move because of noise related to a new runway. Regarding the sale price she said, "We made money on it. But the people didn't know what they were getting into." (R. 219). She also said that sales were "hot" in the area due to its beauty and other amenities. An Elmhurst resident said that his property had "gone down in value considerably" (R. 691). A Chicago resident living seven miles from O'Hare thought that values had generally gone up in his neighborhood, but noted that people in other areas thought their values had declined (R. June 12, 1978, 3049). Another woman said:

> At this time of year, it's too hard to sell your house. You have to pay twice as much if you want to move into a house the same as the one that you live in now, but the noise is so horrible [R. 5861].

A Bensenville realtor was later asked if he had suffered similar effects. He said:

> Very specifically, yes. And very specifically in the residential real estate business, I hear these constant complaints from my customers and clients. There are areas of these towns that are less desirable because of the air traffic [R. 5852].

The Chairman of the Elk Grove Aviation Committee said:

> I would imagine that most previous testimony hinged around the negative economic impact the amendment would have on business in the area. Has anyone considered or evaluated the negative impact on real estate values of residences. Many homes have been sold below market value, and many homes cannot be sold because of the ever-increasing noise pollution [R. 5014].

General von Kann of the ATA did not think that property values had actually declined. He testified as follows:

> There certainly is little evidence of decreased property values if you look at some of your census tracts and you look at such things as the value of a median family home in the so-called impacted area here compared with what has happened to the values in the non-impacted areas [R. 3182].

Impressive testimony on this issue, however, was presented by a licensed real estate broker who has practiced in Des Plaines for fifteen years. He holds an instructor's certificate in real estate appraisal from the University of Minnesota and is a graduate of the Realtors' Institute and a senior member by examination of the National Association of Independent Fee Appraisers. He served as President of the Northwest Suburban Chapter of the National Association of Independent Fee Appraisers for three years and works for a firm which has been actively engaged in real estate brokerage in Des Plaines for fifty-two years. He testified as follows:

> I wish to address you concerning the financial impact of noise pollution on a residential neighborhood. The impact of noise pollution is many faceted and it's difficult to address in a direct manner.
>
> I have chosen the residential neighborhood located south of Touhy Avenue, east of Mannheim Road, west of River Road and north of the Northwest Tollway as an example of a noise polluted area and have compared this area to the balance of Des Plaines north of Algonquin Road. I have omitted the area north of Touhy Avenue and south of Algonquin Road since this will eliminate the transition neighborhoods and provide a clear contrast.

My first conclusion drawn in comparing these two contrasting areas of Des Plaines concerns home improvements. I have found that there is a marked lag in home improvements directed to the enjoyment of outdoor lifestyle such as screened porches, patios and family room additions for homes suitable for this improvement are about one-half as frequent in the noise impacted area.

The lack of patios and other outdoor improvements would appear to be an obvious reaction to noise pollution which we would expect, but the lack of family rooms and other substantial improvements is unexpected and, in my opinion, ominous. This reluctance to invest in one's own neighborhood is a dangerous factor which is normally found in declining neighborhoods to a much greater extent.

I do not suggest that South Des Plaines is in a state of decline. To the contrary, it's an area which is growing and improving, though at a much slower rate than other Des Plaines neighborhoods.

In order to address specific impact of pollution in a dollar amount, I have selected the home style which is subject to the least variation. I have compared only two bedroom, brick ranches with one bath, no basement, no family room, no central air conditioning, but with a garage. I have used the annual sales summary or the northwest suburban multiple listing system for data using 1977 and 1978 as a basis of comparison.

All home sales in the selected areas which meet this description has been included. There have been no omissions. Within this strict description there were four sales in South Des Plaines in 1977 and five in 1978. North of Algonquin Road there were eight in 1977 and four in 1978.

Averaging the sales of 1977 and averaging the sales of 1978, the pattern is established. Homes of this modest description sold for $57,168.50 on an average north of Algonquin Road; yet, the same home in a pollution impact area sold for an average of $53,367.50, a difference of $3,801.

It should be kept in mind that this figure is for a modest, two-bedroom home with few amenities. Most of the homes of the noise impact area are larger and these homes would suffer even greater loss, but for purposes of extrapolation on an overly conservative basis, the approximately 850 homes

> located in this single impacted area suffer an economic loss well in excess of $3,230,000 [R. 4263-67].

Additional evidence of the negative impact of airport noise on residential property values is provided in a 1985 FAA report entitled Aviation Noise Effects. A summary of a number of studies was presented. The range of property value decrease per decibel above 55 Ldn was given as 0.6 percent to 2.3 percent of the property's value depending upon the city studied. The report concluded:

> The bottom line is that noise has been shown to decrease the value of property by only a small amount -- approximately 1 percent decrease per decibel (DNL). At a minimum, the depreciation of a home due to aircraft noise is equal to the cost of moving to a new residence. Because there are many other factors that affect the price and desirability of a residence, the annoyance of aircraft noise remains just one of the considerations that affect the market value of a home [Exh. 229,101].

As will be discussed in some detail in another section, the EcIS concluded that noise decreased property values. The use of the regression analysis method estimated a mean 0.58 percent decline per decibel increase. The inverse condemnation method indicated that reducing noise from 80 to 65 Ldn would add 17 percent to property value (Vol. II at 93).

In addition to the loss of property value, noise impacted persons complained of extra costs associated with responding to noise. The Bensenville Home Society's addition increased in cost by 15 to 20 percent because of insulation, special windows, and other sound deadening features. The Society "sees no justification for paying this cost, seeing that we have been here since 1839 [sic at various places in the record the founding date of this facility is given as 1839 and 1894. Since both predate the airport, this discrepancy does not undermine the thrust of the testimony]. , long before the airport was ever conceived of" (R. 309). Similar feelings were expressed by a member of a church which had to be specially designed to keep out noise (R. 173). Officials at Maine Township High School South spent $700,000 reducing noise impacts (R. 463). A Chicago resident estimated that he spent about $100 per month on air conditioning to keep out airport noise (S. 44). A Bensenville woman summed up the feelings of many witnesses when she said:

> I would appreciate this hearing taking into full consideration the fact that one group of people is being asked to pay a price for the benefit of another group of people....The point is we are paying their freight in terms of noise and inconvenience.

INDUSTRY CONCERNS

While citizens complained about their existing noise problem, industry representatives made a case for continual service. They almost universally based their testimony on the worst case assumption that the noise regulation would require an end to night service and greatly reduce daytime flights. Such reductions would undoubtedly harm businesses dependent upon the status quo. As to the possible impact of regulation on business, the Board will quote a representative sample of their comments.

Curtailment of daytime flights and the cessation of nighttime flights would severely impact the air freight business as indicated by a spokesman for a Rockford firm who also represented the Aerospace Industries Association of America:

> The regulations here at issue pose a severe threat to business. The nighttime closing of Illinois airports, especially O'Hare, and the daytime restrictions mandated by Attorney General Scott's proposal would have disastrous consequences throughout the country.
>
> Within the Midwest, much business that relies to any degree on air transportation will not be able to compete due to the resultant inability immediately to fill orders and ship them out.
>
> Midwest firms dependent on suppliers in other areas need 24-hour direct freight service to maintain manufacturing schedules. In many cases, these firms located near Chicago because of O'Hare's excellent air freight schedules. All-cargo carriers generally stop at O'Hare on both east and westbound flights....
>
> The proposal would also have a significant adverse impact on transcontinental and international traffic now using O'Hare as a "gateway." Shipments from the West Coast to the Midwest will have to depart Los Angeles prior to 5:00 p.m. Pacific Time. Shipments to be interchanged at O'Hare will have to leave Los Angeles before 3:00 p.m.
>
> Shipments into Los Angeles through Chicago will arrive in the afternoon instead of the present early morning deliveries. Efficient manufacturing operations rely on evening departures and early morning deliveries to ensure constant production schedules. Those suppliers unable to route around Illinois will be at a severe competitive disadvantage....
>
> Most of the involved traffic cannot be shifted to motor carriage. Air transportation meets a

special need. Companies shipping by air on a regular basis do so for competitive reasons or because of the nature of their product [R. 4855-4857].

There was also testimony by industry indicating that they require reliable flight scheduling at all times to remain competitive, especially at O'Hare. A Flying Tigers air freight representative testified as follows:

> Manufacturers, wholesalers and retailers all depend on reliable, scheduled air freight services for good economic reasons. One key concern of this shipping community is the inability to predict fluctuating demand in volatile marketplaces around the world. Another is the need to stock and restock key components inventory at manufacturing plants as an alternative to surface transportation modes. A third factor, ... is that the relatively low cost of air freight compared to the value of inventory, is more than compensated by having a product available when and where it is needed....
>
> Air freight in Chicago and throughout the State, and throughout the country, has become...a competitive tool with respect to other domestic and overseas locations....
>
> So the conclusion to us is apparent. In order to remain competitive with both U.S. and foreign firms, Illinois manufacturers and shippers must have reliable prime time scheduled air freight services available at O'Hare and other airports in the State. [R. 4715-17].

A representative of John Deere and Company, a manufacturer of agricultural, industrial and construction equipment, testified concerning the company's emergency spare parts program for machines it manufactures. He stated:

> In conclusion, we want to emphasize that time delays in the agricultural and the industrial and construction industries can be extremely critical. That is why John Deere made a commitment to owners and operators of our equipment to make repair parts for an inoperative machine available at the appropriate dealer anywhere in the U.S. and Canada within 24 hours....Curtailment or cancellation of night flights at O'Hare will have a substantial negative impact on this program [R. 4836].

Likewise a representative of Sperry Univac presented the following testimony:

Sperry Univac is engaged in the development, manufacturing, and sale of computers and component parts thereof.

Our Worldwide Parts Distribution Center is located in Elk Grove Village, adjacent to O'Hare Airport and is located there specifically to take advantage of the large number of flights available at all hours.

There is no manufacturing at Sperry Univac Elk Grove. It is a distribution center for computer parts, with the responsibility to service any point in the world.

Last year, Sperry Univac Elk Grove shipped $232 million worth of parts by air. This consisted of 38,164 shipments weighing 465,000 pounds domestically and 5,700 shipments weighing 868,000 pounds internationally. Some 87 percent of those domestic shipments and two percent of the international shipments moved on flights between 10:00 p.m. and 7:00 a.m.

The task of the Sperry Univac Worldwide Distribution Center is to fulfill our commitment to our customers, that any replacement parts needed will be supplied within 24 hours domestically, and within 48 hours internationally. If we fail to do this, we suffer economic penalties as stipulated by contract, and further, collect no revenue if a machine is not functioning.

In order to accomplish these tasks, Sperry Univac elected to relocate its Worldwide Distribution Center from Ilion, New York, to Elk Grove, Illinois in mid-1971. The choice was simple. Chicago's O'Hare Airport provides a centralized location with a tremendous lift capability. Reduction in the amount of lift at O'Hare would seriously affect our ability to perform to our service standards and force us to relocate the distribution center to an area more sensitive to the needs of the business community [R. 4702-04].

In addition to normal air freight, critical medical equipment is shipped from O'Hare as indicated by the Manager of Regulatory Affairs for Abbott Labs:

The Diagnostics Division is a shipper of shortlife, perishable medical diagnostic test kits to hospitals, clinics and medical laboratories throughout the United States and the entire world.

Abbott maintains a central distribution base in North Chicago from which many of these lifesaving diagnostics are shipped. The kits are used to detect serum hepatitis, thyroid malfunctions, cardiovascular problems and rubella. The vast majority of these kits contain radioactive material. A great number must be shipped with dry ice to preserve their integrity and to prevent them from deteriorating.

Often, customers call for immediate shipment of the product by air to alleviate a health emergency situation. In many instances the first available commercial flight leaves O'Hare Airport in the late p.m. Without these flights, our products would not be shipped until morning and could incur a full day's delay in delivery because trucking delivery schedules at destination airports require shipment availability from the airlines at the earliest possible time in the morning.

The majority of the export flights best suited to A.D.D.'s needs departs between 3:30 a.m. and 6:20 a.m....

For example, orders for products shipped daily to southern California are flown via United Flight 117 departing O'Hare at 9:30 p.m. and arriving Los Angeles 11:35 p.m. These shipments are recovered by 1:00 a.m. and delivered throughout southern California the next day.

Northern California orders depart on Flying Tigers Flight 245 at 4:30 a.m. for San Francisco and are on their way to customers by 8:00 a.m. This pattern is repeated to customers all over the United States....

In order to service our customers' emergency medical needs, around-the-clock departures are an absolute necessity.

A logical alternative to this system would, of course, be to stock these products at multiple locations but this would mean stocking highly perishable nuclear materials at a number of points. Because of a relatively short shelf life on a majority of these products, usually not exceeding forty-five days, the need for disposing of expired material would dramatically increase. This would only serve to add to an already serious national problem of nuclear waste disposal.

It is our opinion that elimination or curtailment of air cargo services during what is now

known as "prime time," i.e., late p.m. and early a.m. would be disastrous to what has thus far been a highly successful system for distributing high priority medical diagnostics to the worldwide health community. [R. 5300-07].

The Corporate Traffic Manager of Travenol Laboratories of Morton Grove said:

> Travenol Laboratories, Inc. is a worldwide manufacturer and distributor of intravenous solutions, blood collection equipment, hospital disposable kits and artificial organs, including kidney dialysis machines and supplies, which employs more than 8,000 men and women in Northern Illinois....
>
> During 1979, we made 16,340 air freight shipments from Morton Grove and the Northbrook facility. These shipments totaling over 976,000 pounds were all classified as "medical emergencies" by our accounts which are basically hospitals, kidney dialysis clinics or, blood reception centers. The shipments which can consist of any of our over 1,200 life support products, are destined to any part of this country - from the largest city to the smallest unincorporated area.
>
> We accept orders at our Customer Service Center in our Deerfield, Illionois Corporate Headquarters until 4:30 p.m. daily. "Medical Emergency" orders are transmitted electronically to our Morton Grove Distribution Center after 4:30 p.m. daily. These orders are selected by our 2nd shift personnel that evening and are picked up that night by our air freight forwarder for delivery and movement on that night's freighters.
>
> As many as 80 shipments per day are received and shipped in the manner outlined above. O'Hare Airport with its great capacity for destinations serviced by air freight, is the key element in our medical emergency delivery capacity. Our customers have learned to rely on us for life support systems. We have learned to count on the air freight service available from O'Hare.
>
> Should O'Hare terminate service between 10:00 p.m. and 7:00 a.m., our customers in need could not get next day delivery since over 85 percent of our order for this type service are received late in the afternoon....
>
> Any closing of O'Hare would have serious effects

> on our customers since certain product lines, because of their very nature, are only stocked at one location -- Morton Grove. Thus, emergency service to our customers would be two days -- not one day as they now experience -- unless we were successful in delivering some shipments to Milwaukee about 75 miles away [R. 5277-82, emphasis in original].

Emery Air Charter operates an airborne intensive-care unit from Northwest Community Hospital in Chicago. Their representative said:

> We operate a fleet of jet airplanes throughout the western hemisphere on a medical transfer basis; besides which we operate the same airplanes in a corporate transport configuration in the same area....
>
> We carry heart monitors. We carry automatic suction devices. We carry respirators -- In layman's terms, it does the same thing as the iron lung, or it breathes for the patient.
>
> We carry any other traction device that may be required for spinal injuries or for necks and backs -- that type of thing....
>
> We use an airborne monitoring system very similar to what you see on your television on Saturday night on EMERGENCY, where the guy plugs the phone into the monitor and sends the vital signs into the hospital.
>
> It sounds funny to say it's like the thing on television, but it's very serious.
>
> We have transferred the last three heart-transplant patients done in this country to the hospital monitoring the heart at all times....
>
> We service virtually every international carrier that flies into the United States. We service 90 percent of the domestic carriers in the United States -- No, it's not at all local [R. 1337-1341].

At the time of the hearing, Emery was expanding to Greater Rockford Airport where they expect to be able to operate at all hours. Currently, 25 percent of their operations are at night. They average four movements per day from Rockford [R. 1341-48].

A representative of Emery Air Freight Corporation testified as to the damaging ripple effect that can result with schedule changes:

All arrivals and departures are arriving from and departing to somewhere else. Therefore, a curfew at a particular airport will impose "effective" curfews at other airports, a situation which is compounded as more airports are curfewed.

Further evidence of the disruptive capabilities of curfews and as a result of the "effective" curfews presented above, is the topic of "scheduling windows." Given effective transit times and ground time constraints, as well as the other scheduling factors mentioned earlier, various curfew scenarios will create time slots only within which flights can operate and observe the various operating and competitive constraints. [R. 4620-27].

A representative of R.R. Donnelly, the largest commercial printer in the country, which is Chicago-based, testified as to the importance of around the clock service to his company:

Attached as Exhibit 1 to my testimony is a schedule of air shipments for the November 19, 1979 issue of The New Yorker. This schedule is a singular indication of the weekly shipping volume of the magazine which is produced in Chicago. The schedule includes 91 air shipments from O'Hare, most of which are destined for nationwide newsstand distribution.

To meet the customer's schedule, Donnelley begins producing complete copies of The New Yorker at 1:00 a.m. Tuesday. And as soon as sufficient quantities are produced, R.R. Donnelley's own trucks begin hauling air containers of magazines to O'Hare Airport for precision dispatch to New York for the prime market distribution.

This first truck must leave the Donnelley facility by 5:30 a.m. to make the dispatch schedule for the early container flight at 7:05 a.m. At least four other truck dispatches are made throughout the course of the day to bring a timely flow of shipments to O'Hare for distribution to the proper airline.

To further amplify the critical service standards of our customer, the New Yorker requires that: 1) Shipments of 200 copies or more must be delivered to the individual wholesaler by 6:00 p.m. Tuesday, 2) Shipments of 100-199 copies must be delivered to each wholesaler by 6:00 p.m. Wednesday, and 3) Shipments of up to 99 copies may be mailed second class, but are to be hauled to seventeen postal entry points with subscriber mail....Regulated common carriers do not openly solicit this type of freight. O'Hare provides the most direct flights to

the greatest number of points, and provides the necessary backup flights to meet our tight production and delivery schedule as indicated by the above-mentioned exhibit....

The New Yorker is not the only weekly we have at Chicago. Others include TIME, People, and Sports Illustrated, all of which depend on quick delivery of dated material. Donnelley prints these weeklies at Chicago and at other locations at premium printing costs for short runs....

The above-mentioned work is a small percentage of our volume funneled through O'Hare. Newspaper inserts, or tabloids as they are commonly known, have insertion date deadlines. We print millions of pounds and ship to hundreds of newspapers for catalog customers, such as Sears, Penney's, K-Mart, Ward's and others....

R.R. Donnelley's Chicago Division transports by air over 300 packages of financial printing per month. Financial printing is comprised of prospectuses, securities, annual reports, et cetera. The printing cycle of this product requires attorneys and issuers to remain on site on a 24-hour basis in order to verify final proofs prior to final printing....

If we were unable to provide overnight service through our three-shift operation and all-night air transportation, there is no doubt that our customers would print this work elsewhere....

Our Dwight Manufacturing Division prints a number of restricted credit card lists or "hot card" lists weekly in quantities of millions. They are distributed as first class mail, and on a weekly basis 120,000 pounds of mail leaves O'Hare during nighttime flights. If air service is reduced, we anticipate that Donnelley's credit card customers may, as with other customers previously noted, begin to look at alternate printers with better air service capabilities. These customers simply cannot wait even one extra day for distribution of their product; if they did, the usefulness of the weekly listing would be minimal and delay could, in fact, result in cards already known to be stolen or lost being accepted by local merchants.

Our Elgin Manufacturing facility produces computerized typesetting on Yellow Page telephone director advertising. Our sales representatives sell this preliminary work on the basis of overnight turn-

> around on page proofs to show their advertisers. There are approximately 208 of these shipments annually, and they are handled exclusively by Federal Express....One day lost on distribution of proofs could negatively affect the major portion of seventeen percent of our directory work [R. 4884-4892].

Representatives of the banking industry testified that any resultant reduction in service levels at Illinois airports, and particularly at O'Hare International Airport, will cause irreparable damage to the banking system of Chicago. A quotation from the American Banker (March 31, 1978) aptly describes the problem.

> ...checks, unlike people, do not prefer to travel in business hours. To the contrary, they are not cleared, processed and ready to head for the airport until the business day is over. And this means that, with the cutting back of airline schedules, the checks are ready to travel just when the airlines are closing down for the night [R. 4670].

The United States Postal Service cites four effects of service curtailment at O'Hare:

> The receipt and dispatch of mail in excessively large volumes on arriving and departing morning flights; [l]arge mail volumes affecting sequenced processing and the choking of the distribution processing system; [o]utgoing mail at origin points backing up until transportation is available; [and a] scarcity or unavailability or storage space for processed mail awaiting transportation. [Public Comment #20, 1-3-78].

Concerning the impact an airport noise regulation could have on the regional economy, the Chicago Association of Commerce and Industry witness said:

> It is our view that any cutback or substantial alteration in the level of that service could profoundly depress local economic activity. Since O'Hare field opened jet transportation in 1959, it has been the greatest economic generator in the history of Chicago, has played the greatest contribution to our economic development of anything that has happened....
>
> A major opportunity for Chicago is to become a great global city, that is, a crossroads, a hub of national and international commerce -- a place from which men and women in business can efficiently and

conveniently cover their major markets. Efforts are being directed even now to improvement of our international terminal facilities at O'Hare. We should be looking toward expansion and not curtailment.

To be global, the city must set its course now to build on its strengths and attract multi-national corporations....

For Chicago, being a global city will mean more business, more jobs and a better quality of life. Proximity to major markets and outstanding air transportation service are essential ingredients to becoming a global center. Chicago now has leadership in the world's air transportation system, and this gives us an edge on other major competing cities.

Disruption of air transportation services resulting from implementing the noise regulations proposed by the Attorney General would be a serious blow to Chicago's stature as aviation crossroads of the nation and international gateway to North America [R. 4491-97].

The president of the Chicago Convention and Tourism Bureau testified as follows:

Right now, our efforts and those of our allied industries in Chicago are attracting nearly eight million visitors each year to the City. Nearly 5.5 million come to Chicago for pleasure and 2.5 million come to attend a convention, trade show, or corporate meeting.

Together, Chicago's visitors spend $1.4 billion each year while they are in the City. Using a modest dollar turnover of four for every dollar spent, this means that the total impact of the travel industry in Chicago is more than $5.6 billion each year. To give you another comparison, the $1.4 billion spent by visitors to Chicago each year is equal to the entire budget of the City of Chicago....

But I can't emphasize strongly enough that the health of this industry, an industry that employs nearly 150,000 people in Chicago, would be seriously affected by any curtailment of service at O'Hare Airport.

For example, last year during the 31 days in June and July that the DC-10's were grounded, our visitor index showed a 6 percent drop in the number of pleasure visitors who came to Chicago. Since the

grounding occurred during our prime tourist season, the economic loss was substantial, more than $13.6 million.

In January, when O'Hare Airport was closed for part of six days during the National Manufacturers Housewares Association Trade Show, attendance at the show dropped 20,000 when compared to previous years and the show that immediately followed....

For example, in the convention industry, Chicago currently attracts more than 1,100 conventions or trade shows each year and an additional 16,000 corporate meetings are held hear annually. They come here because of the City's outstanding meeting facilities, its large number of top quality hotel rooms, and its accessibility through O'Hare Airport. Some 78 percent of the meeting attendees come to Chicago by plane....

With O'Hare Airport operating in an unrestricted manner, we are able to sell Chicago as a city where anyone in the continental United States is less than four hours by jet airplane from Chicago. With more flights than any other airport in the world, Chicago is easily the world's most accessible city. This advantage is often a key factor in selling a convention's site selection committee on coming to Chicago.

If we were to lose this advantage because of restrictions on the number of flights into and out of O'Hare, we would suffer in our convention industry....

Clearly what is needed to help Chicago's travel industry grow is expansion of O'Hare Airport, not restriction. Because of the deplorable international terminal, Chicago has barely tapped the lucrative European travel market [R. 5823-5827].

DEVELOPMENT PATTERNS

The conflict between airport users and residents around the airport has escalated to unprecedented proportions. Some persons living in noise impacted homes moved there with full knowledge that an airport was located nearby. Others are victims of a variety of circumstances that were largely beyond their control such as changes in aircraft types, airport expansions, new runways and operational changes.

Mr. Edward G. Studholme, who has a Masters degree in urban and regional planning and is an aviation noise consultant, pointed out the two major reasons the airport noise problem has

become so severe:

> On the one hand, we have the airports which in 1959 or 1960 began requiring a tremendous amount of acoustical space for their operations because of the introduction of jet aircraft. This was further enhanced or made more severe by the fact that there were great increases in the number of operations at those facilities and because of the capacity of strength and proliferation in flight tracks and in some cases in the number of runways and the directions of them. So, this noise contour which we keep talking about grew by order of magnitude sometimes five hundred or a thousandfold in an area just due to a change in technology.
>
> On the other hand, we have had a tremendous amount of encroachment of incompatible land use upon airports that has been attested to here previously, the proprietors very rarely have any control over this encroachment [R. 2347-48].

People Move to the Airports

Ms. Jill Tiedt, a senior associate with Landrum & Brown who has a Masters degree in urban planning, studied development patterns around O'Hare and Midway airports. She used aerial photographs dating back to the early '60's and some '50's, interviews with local officials and the 1971 Metropolitan Aircraft Noise Abatement Policy Study (MANAPS, Exhibit 223 B-1). According to the MANAPS report, O'Hare Airport, known both as Old Orchard Airport and the Douglas Aircraft Assembly Plant Field, was developed in 1943 as a wartime project. The original airfield consisted of four runways. Over the years, five master plans have been developed for O'Hare Airport. In addition, numerous minor modifications were made. These included runway extensions and widening. Two additional runways were added, one in 1967 and the other in 1971. Although substantial development existed in the O'Hare vicinity prior to 1950, much of the area was developed after the airport became a major facility. She described incompatible development in terms of "infill" or building new homes in established subdivisions, and "new development." As examples of growth in noise impacted communities, she stated that Bensenville's population grew 144 percent between 1950 and 1960 and another 40 percent by 1970. Wood Dale grew 65 percent between 1950 and 1960 and an additional 188 percent by 1970. The neighborhoods surrounding Midway were well established prior to the introduction of jet aircraft. In four of the five Chicago community areas surrounding Midway less than 15 percent of the housing was constructed after 1960. She described the Midway problem as "a result of changing aircraft technology rather than poor planning" and pointed out that "noise from propeller driven aircraft used in the commercial fleet prior to 1958 was not generally viewed as a serious public policy

issue" (R. 6217-6228).

In examining housing unit counts for sections of Addison, Elk Grove, Maine, Bloomingdale and Leyden townships, Tiedt found considerable new construction since 1970:

> In the period from April 1970 to April 1978, 517 single family units and 784 multiple family units were constructed in areas which were already noise impacted and which in 1974 were exposed to noise levels of 75 Ldn or greater. Similar trends exist for areas contained within the 80 Ldn contour and the 85 Ldn contour.
>
> Indeed, during this same period of time, 31 single family units and 70 multiple family units were constructed on land which in 1974 was exposed to noise levels of 85 Ldn or greater [R. 6245].

Several witnesses commented on the fact that airports seem to attract development that will be impacted by noise. According to law school faculty member, Sheldon Plager:

> One of the remarkable things about the lemming behavior of the American citizen is that the idea has been to put the airport out away from where people live, and that has often been the case, and as soon as that happens, everybody moves to the airport. As soon as they get located, they start bitching about the noise.
>
> Now, one could say this sort of a hardnosed way -- "Well, you deserve what you get," but that has not been the way we have dealt with these problems, and probably ought not to be the way. So we end up frequently with a situation in which the airport becomes impacted in part by its own lack of control over its environs, and in part by the fact that the market operates in such a way as to develop around the airport, because a lot of people seem to like to live there [R.45].

Studholme pointed out some of the attractive features that make it difficult for local authorities to prohibit residential development near airports:

> The major factor would be the attraction -- the actual physical attraction -- of incompatible development by airports. People don't just want to live around airports, they want to live there because it's an ideal location to develop property. Airports are sited in areas where the land is flat, where it's drained, where there is a minimum amount of a problem with the vegetation, and then subsequently the area

> is provided with an adequate water, sewer, drainage, very efficient ground transportation access.
>
> These are exactly the criteria that a developer would look for in trying to locate new residential land use [R. 2349].

Dr. William J. Galloway, a physicist and a general aviation pilot, who holds a Ph.D. in physics and a Masters degree in applied physics, suggested that people moving into a noise impacted area often are not aware of the magnitude of the problem until they have lived in the area a while:

> I think the fact that the people who move into a lot of these areas are not aware of what they are doing. I think they are sometimes uninformed of what the noise environment is [R. 5497].
>
> [I] think, really, I think the whole thing was addressed to why do people move into homes near airports. I say I think the answer is first, they want to move there and if the question is can they or can they not abide with the noise is really a question of they have moved in, not necessarily having an understanding of the magnitude of that noise. Once they are there, they are in a position to determine whether or not the other attributes of that living environment are ones they are willing to live with or not....[R. 5707].

An Elk Grove Village resident made this point at a supplemental hearing when asked if planes were present when he looked at the house:

> There probably were. But it was something that you weren't really aware of and never considered. In other words, it didn't enter your mind. I mean, occasionally -- we lived further down in the city, occasionally we would hear an airplane, you know. But it wouldn't really bother us. I mean, an occasional airplane every couple of hours wouldn't really bother me. But when one is every three minutes, you know, flying right over your house, it gets to be very annoying (S. 207-8).

Airport Changes Impact Residents

Although people have moved closer to airports, in many instances populations already present are impacted by changes in airport operations or airport expansion. One of the most dramatic examples of residents being impacted by a new airport was contained in the testimony of a Bensenville resident:

> I might add that the Bensenville Home Society has been in existence in that location since 1894, long before the airport [O'Hare] was even dreamed about. [R. 5842].

In earlier testimony the Director of Engineering for the Society stated that the Society had recently added a 250 bed nursing home and was proceeding with a 149 unit apartment building for the elderly on the same site with HUD funds (R. 307). When asked if the Society would have opposed noise zoning regulations on the use of its property he responded:

> I would think so. We have been here since 1839 [sic], I think we have some rights. We were actually asked by the Village of Bensenville in 1839 [sic] to establish our home for the aged and orphans at that time. And we see no reason why we should be asked to give in because some industry wants to make more noise over our head [R. 313].

Changed airport operations are also a problem and are akin to the situation where the people are there before the airport. As one Park Ridge resident testified:

> However, at the time we moved in the landing procedure at O'Hare Airport was different, and I lived in an area relatively close to that for a period of eight years. So I thought that I had a fair idea of the type of landing procedure used. But obviously I hadn't. [R. 124-5].

A resident from Sugar Grove Township testified:

> Up until last year the Aurora Airport was strictly for small planes. Most of us moved into the area, never thinking the airport would be a threat.
>
> Then Aurora waived its restrictions and allowed a Gulf Stream II jet...to be based at its airport...[t]he FAA cited the Aurora Airport as a satellite airport for O'Hare and wishes to make our airport appealing to corporate business traffic. This is very threatening to the residents. [R. 4167-8].

A Des Plaines resident testified that:

> [w]hen we came into this territory, the City of Chicago did not own the property north of Higgins Road. They bought the property between Higgins Road and Touhy and then rerouted Higgins Road up over the overpass at the Kennedy Expressway and then on out so that the property -- we now live a Hell of a lot closer to the airport than we did. That's because

> they bought it and maybe next week they will buy another piece. [R. 4350].

Midway Airport provides a good example of the impact of a change in airport operations. One Chicago resident commented on past and current operations:

> I have lived there during the time when the runways were dirt, cinder, and so forth. I saw Lindbergh bring mail in there. I saw this when this was the busiest airport in the world, and no one complained. Planes went up and down. But they are not like they are today, with the jets. Now they got new jets that come in there, whish over, and they are not bad at all. But these old ones are absolutely unbelievable. We have people that are sleeping within 500 feet of the take-off of these planes....In fact, one half mile from that take-off point the ground actually shakes underneath your feet [S. 77].

One woman said that she was seldom bothered by noise until the Air National Guard at Springfield obtained F4 Phantom jets (R. 1518), which were described as noisier than the prior models by an airport official (R. 1502). A woman from East Alton testified that jet fighters and commercial jets had only recently begun flying over her home making touch and go landings. Her mother had lived in the same subdivision for 14 years. She responded as follows to the question of whether she was aware that the house was under the airport approach pattern when she bought it.

> It was under the approach pattern for small aircraft. We knew that there was never any jets coming in, Ozark had not started coming in, there was never any jets. Okay, as far as that was concerned, we knew about the small.
>
> There had been a thing going on where they were trying to get them, but the airport was much too small to have larger planes. Air Illinois come in there for a while. They did not come over our subdivision, they were using a different pattern where they took off over empty fields and it wasn't effecting anyone, there was no complaints from that because they were not loud noises and they didn't come in to where they were about to touch the tree tops either. They were landing and taking off from over the farm area, not over residential area. [R. 2262-63].

Others purchased land when runways were under construction or repair for months at a time. A Des Plaines resident bought his home "[w]hile O'Hare Airport runway 22R was under construction and not in use. The neighborhood, then, was not

subjected to the continous bombardment of noise and pollution that started to exist again after the runway was reopened" (S. 190). A Bensenville woman had similar testimony:

> A lot of people all say to me, "Why did you move to Bensenville. Didn't you know it was close to the airport." When my husband and I bought a lot two years ago this month,...it was summer of 1975 when they were resurfacing the runways, we built for about four months. We didn't see a jet in any direction. We saw nothing. We were at the job site every day for 14 hours and never saw a jet.
>
> We moved in, it will be two years next week. The jets did not stop flying the first session for about ten days....
>
> That first two weeks we lived there I called the FAA and said "Hey, what is going on. Where did these jets come from?" And a very nice man, Mr. Callahan said -- and he was very kind, he said, "Well, didn't you know that there were any jets there?" I said, "Sir, no, I got a permit to build and I built my house, nobody said anything about this side of town."
>
> I am at the west end and he found my house on his map and he said that the jets fly 400 feet over my house. He told me that quote I was one mile from the tip of the runway. He said that was a very well used runway whenever there was an easterly wind [R. 399-410].

The problem of unwitting buyers can be compounded by agents who sometimes take advantage of prospective buyers because of the lack of disclosure requirements, according to a study commissioned by the Department of Energy and Natural Resources:

> The effects of aircraft noise on homes near airports can be viewed as latent property defects. Because the noise levels vary throughout any day, and because the effects can be cumulative, resulting in injury or annoyance only after a period of time, a prospective buyer or tenant may not become aware of the noise problem until after the land transaction has been finalized. Sellers, lessors, and their agents sometimes engage in practices intended to disguise noise conditions. For example, real estate agents are known to have shown houses to prospective purchasers only during non-peak air traffic periods [Exh. 239, 116-117].

Tiedt complained that local realtors and developers are under no obligation to warn potential buyers of noise impacts (R.

6279). This fact was generally confirmed by local officials (R. 320 and 453).

Schools and Hospitals

The construction dates of schools and hospitals also show that some predated the noise problem while others were built in impacted areas. For example, the Superintendent of Schools in Bensenville District Number 2 and 100 testified that:

> What about the operation in the classroom; in the fall and spring we can't open windows and we have old buildings, Fenton High School was built in 1954, I think that was about the time O'Hare started to work out; Blackhawk Junior High School was built in 1956, that was after O'Hare. We have no excuse for Blackhawk. Greenstreet 1915, that was before O'Hare was thought of, Tioga 1931, Chippewa 1926, Mohawk in the flight path 1955, Johnson 1958. [R. 287].

The Superintendent of Leyden School District 212 testified:

> I came to the Leyden community in 1958, and at that time why Midway was the main airport. And all of East Leyden, all of our students at that time were in the East Leyden building and we had all of our buildings with open windows and no noise problems....West Leyden then became in use in 1960. It was a new building and everything, and at that time we had no air conditioning and a lot of windows because there still was practically no traffic at O'Hare compared to Midway. But, it soon changed. In 1960, O'Hare started experiencing growth. [R. 334-6].

The Superintendent further testified that noise-proofed additions and reconstructions were completed at West and East Leyden, incorporating the use of windowless walls and air conditioning.

The Superintendent of School District 81 in Schiller Park testified as to the age of the school buildings in his district:

> Well, the school district has been there for many years. Our oldest erected building is 1924, our last building was in 1967. Of course, it is a mystery why that building was allowed to be built less than a half mile, less than five-eighths of a mile, three blocks, from one of the runways at O'Hare Airport, [George] Washington [Elementary] School.
>
> Why it was even built is a mystery. Why homes and school were built in that area is something that we are puzzled about to this day. But the fact

remains that it was built and there are people there [S. 70].

Of the three schools that have been soundproofed with federal funds, Washington was built approximately in 1964 (S. 269), Orchard was built in 1947 (R. 976, 1030), and Mohawk in 1955 (R. 287).

Exhibit 223 B-1 tabulates the names of eleven hospitals surrounding O'Hare whose exteriors are subjected to at least 65 Ldn (Table 12 at 51-2). Also tabulated are data for the year built, when additions were added, construction type, number of beds, whether federal grant funds used, how often affected by the noise, and mitigatory steps. The three hospitals most affected by airport noise are Lutheran General in Park Ridge, Resurrection in Chicago and Memorial in Elmhurst, built respectively in 1960, 1953 and 1926. These hospitals have had subsequent additions.

Land Use and Zoning Concerns

Airport authorities have long recognized the problems caused by noise and have urged zoning boards and other authorities to limit development in noise corridors. Their efforts have met with little success. The Springfield Airport Authority objected to twelve zoning cases and lost them all. The Springfield Airport manager testified that:

> [n]o, we have no control whatsoever over any lands that we do not own. There are no provisions either by zoning -- We objected to 12 different zoning cases involving property adjacent to the airport, and we lost all 12, and we have none. [R. 1484].

The Bloomington-Normal Airport Authority objected but lost in a zoning case where a housing development sought rezoning of an agricultural parcel to medium density residential. The airport manager testified that:

> [i]n the past it was the Airport Authority's intent to lengthen this runway when the need arose. In 1974, however, a housing development located just southwest and in line with the runway was approved by the Bloomington City Council. The Airport Authority and I objected to the zoning changes from Agricultural to Medium Density Residential. In fact, we fought with every possible means, but to no avail. The end result was that we could no longer plan to lengthen the runway to accommodate larger, noisier aircraft. We had to make other plans. [R. 2000].

However, the development of a 48 unit apartment complex was successfully halted by the Mount Vernon Airport Authority when the authority introduced evidence at the zoning hearing. A consulting engineer for the authority testified that:

> A housing developer planned to build a 48 apartment complex financed by HUD, within 1250 foot of the primary runway at Mount Vernon. This required rezoning of the area from R1 to R2, an item which was apparently not seen by the surrounding community nor the airport; and was approved by the zoning board, but disapproved by the City Planning Commission.
>
> The airport attended several of these hearings, and put to record that these units, if built, would be normally unacceptable for multiple or single family residential use. And if one nighttime business jet operation was added, then the proposed site would be considered clearly unacceptable by the Illinois Environmental Protection Agency....The units have not been constructed;....[R. 3087].

The lack of effective airport zoning has contributed to many developments in highly noise impacted areas such as new homes in a 73 Ldn area (R. 3074) and new subdivisions near airport runways (R. 1900-01). A director of the Quad City Airport testified that:

> [t]he last subdivision to the best of my knowledge that has been developed is southwest of the airport in the hills. The heavy hill area. There is another one in process that will also lie southwest from there....
>
> Those subdivisions are in the hills among the trees southwest of the runway the elevation is approximately 100 foot higher than the runway at that point [R. 1900-01].

At Decatur Airport a new residential development and a new junior high school have been built. An attorney representing the Decatur Park District, owner and operator of Decatur Airport, testified that:

> [t]he nearest concentrated residential development to the airport is on the west side thereof, approximately, 1,500 feet from the north/south runway. Within the development on the west side, there is a relatively new junior high school, which school is approximately 2,000 feet west of the north/south runway. This high school was constructed approximately three to four years ago...Also there is a sprinkling of new residential

development approximately 3,000 feet north of the north runway.

Airport operators uniformly suggested that there be requirements for zoning that would allow the noise corridors to be protected from incompatible developments. A major problem occurs where a number of governmental entities with zoning powers exist around the same airport (R. 1900-02, 6281-3). A director at Quad City Airport further testified that:

> [t]o keep track of all the zoning changes we would end up dealing with the city of Rock Island, the city of Moline, the city of East Moline, the village of Cole Valley, the village of Milton and the county of Rock Island. [R. 1900].

The Chairman of the Board of the Greater Rockford Airport Authority provided a possible solution:

> [t]he more comprehensive solution would grant airports specific zoning power over the property around them and would mandate consideration of noise impact when zoning. [R. 1330].

The Senior Vice-President of Operations and Airports of the ATA provided another possible solution:

> [L]egislation or regulation [should be adopted] which would facilitate and indeed require multiple communities surrounding an airport, each of which is now a separate political entity, to act as a single unit or as a single political entity in establishing compatible land uses in areas directly impacted by aircraft noise. [R. 3099].

In response to a question as to how many jurisdictions are involved in land use planning for areas impacted by 65 Ldn or greater from operations at O'Hare, Tiedt testified for the City of Chicago that:

> [a]pproximately 45 communities and two counties, DuPage and Cook County, each of which possess the authority to regulate land use, are located in the vicinity of O'Hare. [R. 6281-2].

She also testified that "[t]wenty communities, including the City of Chicago, are included in the area affected by aviation activity at Midway according to the noise contours in the [1974] FAA study." [R. 6283].

Tiedt stated that the only municipality to respond to the noise problem with a zoning ordinance against noise is Elk Grove Village (R. 6244). She said the MANAPS study concluded that "[r]eluctance to give up control of land at the local level is

the biggest obstacle to regional land use controls around O'Hare" (R. 6235). MANAPS also recommended that the Illinois Zoning Laws Study Commission give further study to regional or state land use controls around airports. Tiedt pointed out that:

> Coincidentally, perhaps, many of the most vocal proponents of the regulatory noise controls on the airport operator are public officials in those communities particularly to the north and northeast of the airport, in which failure to exercise basic compatible land development control is evident [6246].

Under cross examination, however, Tiedt admitted that noise contours which are useful in planning development around airports were not readily available before 1971. Thus, a community had to rely on logic and a knowledge of airport development to plan intelligently [R. 6480].

Even when local officials attempt to plan for noise impacts, they often have difficulty obtaining information necessary for land use planning from airport proprietors. For example, representatives of Des Plaines (R. 317) and Park Ridge (R. 183) testified in 1977 that they had been unable to obtain the O'Hare Master Plan. Studholme gave two reasons why proprietors are reluctant to release noise data to local communities:

> For the proprietor, when he does do a noise abatement assessment and he uses what we call noise contours, he really encounters two very curious problems....
>
> One is if he faces litigation or any kind of adverse situation, he is not going to want to disclose that information at all. It's going to be a very surreptitious kind of activity, he is going to want to know what the noise environment around his airport looks like, maybe for land acquisition, maybe to try to seek to really optimize his operation so he doesn't create much of a problem. But, he doesn't want to show that to the local land use decision makers because there is a great code of ethics in the Court of Law....
>
> The second area that constrains the proprietor in the use of contours is that if he were to disclose this information and show it for some future time frame -- five years or ten years from now, he would be almost in a position of stipulating that that was the way that his airport was going to operate. If somebody was going to base land-use decisions, hardnosed day to day land-use decisions--zoning, and the improvement of the construction for community facilities on his information, then he would

> basically be stipulating this is the way my airport will look now and this is the way it will look environmentally two years from now and ten years from now. In many cases they are not willing to put themselves in the position of not having the flexibility in the future;...[R. 2354-6].

The MANAPS study also pointed out that continually changing airport master plans can make it difficult for local authorities to plan around airports:

> Any survey of planning activities in the O'Hare area must consider the significance of previous airport master planning efforts. The airport master plan more than any single vehicle offers communities in the airport environs a basis for their coordinated planning and development control. The alignment, length and capacity of any given runway have an important bearing on runway utilization and on the aircraft noise pattern. Major shifts in runway alignments can have a significant impact on planning and development control in the airport environs. Due to a number of major modifications in airport master plans since 1947, communities and individuals in the airport area may have become discouraged in their efforts to plan and control development with the airport in mind....It is obvious that the net result of the numerous changes that have occurred in the airport master plans has been the confusion of individuals and government officials in the O'Hare environs. If all of the airport plans were superimposed the result would be to bring an area five to eight miles in radius from O'Hare under the threat of serious noise impact [Exh. 223 B-1, 47].

Mr. John Tyler, who has a degree in mechanical engineering and is President of Aviation Systems Incorporated, discussed the problems local governments face when proprietors can change operations at will:

> Well, certainly if the airport operator has the option of changing ground tract at will, then the community around the airport is absolutely helpless because the community may zone one area for residential and another for manufacturing and have the airplanes going over the manufacturing areas this year and next year suddenly find the airplanes are going over the residential area. [R. 1229]

Clearly, airport noise has a significant impact on those who reside near airports. It is also clear that local land use planners have failed to plan adequately for noise impacts in some instances and been thwarted in their attempts in others. Airport noise can be reduced through a variety of methods which will be

discussed infra, however, before going further it is necessary to determine to what level noise must be reduced to be acceptable.

65 LDN STANDARD

The Attorney General proposes that a standard of 65 Ldn be established for airport noise reaching Class A land. Before adopting this standard, the Board must determine at what level noise creates a public nuisance which unreasonably interferes with the general welfare of the public. This determination includes consideration of physical and psychological effects as well as impacts on business and recreational activities and the general quality of the environment. Before considering the acceptability of 65 Ldn as a standard, it is necessary, as a preliminary matter to discuss how sound is measured and modelled.

Sound Measurement and Prediction

The proposal sets a standard for noise emissions from public airports to Class A land. The standard is expressed in terms of day/night sound equivalent levels computed from A-weighted sound intensity levels in decibels.

Sound intensity is measured as decibels with respect to a reference root mean square pressure of 0.00002 pascals. An A-weighted network is used to correct for the ear's differing perceptions of noise levels at different frequencies. A-weighted decibels are called "dBA's".

There are two methods of averaging variable dBA's: the sound equivalent level, or "Leq", and the day/night sound equivalent level, or "Ldn". The latter is used in the proposal. However, since Leq is used in this discussion, and since it is conceptually simpler, it will be described before the Ldn.

An Leq can be computed over any interval. In this Opinion, unless otherwise specified, "Leq" will be taken to mean an Leq computed over a 24-hour interval. The 24-hour Leq of a variable noise is the dBA level of a constant sound, lasting 24 hours, with the same energy as the variable noise.

To compute a 24-hour Leq, one divides the day into "n" different time intervals. One then measures the dBA level at some point during each interval, and attributes this dBA to the entire interval. An estimate of the 24-hour Leq is computed as follows, where Li is the dBA measured in interval i, lasting ti seconds:

$$Leq = -49.4 + 10\log \sum_{i=1}^{n} (ti)10^{Li/10}$$

The estimate of Leq becomes more accurate as the number of intervals increases. Instruments are available which sample essentially constantly, and which provide a direct readout of Leq.

The Ldn is closely related to the 24-hour Leq. The only difference is that a 10 dBA penalty is added to any noise level measured at night, in order to reflect the greater impact of night noise on the receiving population. "Nighttime" is defined as the hours of 10 p.m. through 7 a.m. Alternatively, and equivalently, any one nighttime noise event is counted as ten equal noise events.

For example, under the Leq system, if there were 90 day and 10 night operations, the Leq value would be computed on 100 operations. Using the same hypothetical situation under the Ldn system, the Ldn value would be computed on 190 operations. The 190 figure is obtained by multiplying each of the 10 night operations by a factor of ten and adding the resulting sum to the 90 day operation figure. (S. 288-91).

It is important to understand how the sound expressed in Ldn varies with the number of operations. If 55 Ldn is reached by one operation, 65 Ldn will be reached by ten and 75 Ldn by 100 similar operations (R. 940). A doubling of the number of sources will cause an increase of 3 dB. Likewise to decrease an Ldn contour by 3 dB requires a 50 percent reduction in the number of sources (R. 1097). Thus if 1,000 operations result in 80 Ldn, a reduction to approximately 35 operations would be required to reach 65 Ldn (R. 1100). These estimates assume that day and night operations have been cut in a certain proportion. An operator could actually achieve greater reductions by cutting nighttime operations preferentially. Furthermore, since operations actually vary widely in noise impacts, an operator could achieve greater reductions by eliminating the noisiest operations.

The Ldn can be computed as follows, where L is the dBA measured in a daytime interval, "td", or a nighttime interval, "tn", in seconds.

$$Ldn = -49.4 + 10\log\left(\sum_{d=1}^{D}(td)10^{Ld/10} + 10\sum_{n=1}^{N}(tn)10^{Ln/10}\right)$$

The noise at a given point produced by an aircraft operation typically is variable and lasts several seconds. This variable noise level is converted to a one second Leq, called an "SEL", for use in computing the Ldn at the point. The SEL is the dBA level of a constant sound lasting one-second which has the same energy as the variable noise over the length of time it persists. Because aircraft noise events usually last more than one second, the SEL is usually greater than the actual maximum dBA level achieved by the operation. Exhibit 61 consists of a

collection of charts which display the SEL at various points in front of and to the side of the runway from various aircraft and operations.

The SEL charts can be used to predict Ldn levels from aircraft operations at points around an airport. Since the noises have been converted to a common one-second interval in computing the SEL, application of the Ldn formula becomes a matter of counting the number of operations of each type. Formulas and a systematic procedure are set forth in Exhibit 61. Computer software is available to perform these calculations. Ideally the output is a contour map of Ldn levels predicted around the airport. This is called a "footprint", because the contours from a single runway often look like a footprint.

Several noise descriptors other than Leq and Ldn are mentioned in the record. One of the most common is the Noise Exposure Forecast referred to as NEF which is used to predict the noise impact on people. NEF contours can be developed around airports in a manner similar to Ldn contours. The scale difference between Ldn and NEF is 35. In other words, a level of 30 on the NEF scale is equivalent to 65 Ldn, and 40 NEF is equal to 75 Ldn (R. 513-14).

The Composite Noise Rating (CNR), Noise Pollution Level (NPL), and Community Noise Equivalent Level (CNEL) are other descriptors. An approximate rule of thumb is that Ldn is approximately equal to CNEL, which is approximately equal to NEF plus 35 which is approximately equal to CNR minus 35 (Exh. 32, p. 28). SENEL is the Single Event Noise Equivalent Level.

The Acceptability of 65 Ldn As a Standard

The Ldn levels from a variety of locations have been documented and some of that data is useful to gain a perspective on the descriptor. A tomato field in a California farm has an Ldn of 44, a wooded residential area in San Diego 51, a Boston row house on a major avenue 68, downtown Los Angeles with some construction activity 79, and a third floor Los Angeles apartment next to a freeway has an Ldn of about 88. Normal suburban residential areas have an Ldn of about 55, while urban residential areas have an Ldn of about 60 (Exh. 40).

A 1985 FAA report, entitled Aviation Noise Effects discusses the advantages of using the Ldn metric, which it referred to as "DNL", as the noise indicator:

> While a dialogue continues within research circles concerning weighting functions, the DNL has emerged as a sound and workable tool for use in land use planning and in relating aircraft noise to community reaction. The substantiating basis for the DNL can perhaps best be summarized as follows:

1) Pragmatically speaking, it works. Engineers and planners have acquired over 30 years working experience with a nominal 10 dB nighttime weighting function. This experience has been successful, contributing to wise zoning and planning decisions.

2) The nominal 10 dB ambient noise levels in many residential areas at nighttime provides a sensible basis for the weighting factor. (p. 15).

After fifteen years of use, the DNL has shown itself to be a workable tool for the noise community. Its use as the accepted measure in time of day considerations, with its nighttime penalty of 10 dB between 10 p.m. and 7 a.m., will continue unless future research can suggest a reasonable alternative. (p. 85).

The document also reviewed the recommendations and findings of other agencies concerning the levels at which noise becomes unacceptable. The Department of Defense discussion included the following:

The Department of Defense has also developed a comprehensive program to minimize the harmful effects of aircraft noise (Ref. 4). The Air Installation Compatible Use Zones (AICUZ) program requires that all military installations be studied in depth to determine those land areas which should be specially considered in development because they are affected by aircraft noise (the AICUZ program also considers how susceptible an area is to aircraft accidents in its compatibility decisions). This system is also based on the DNL metric.

The AICUZ noise zones and their compatibility with development are presented in Table PP.

Regarding the policy of the Department of Housing and Urban Development the report said:

The purpose of the HUD regulations is to protect individuals from noise in their communities and places of residence. Basically, HUD policy states that HUD assistance is prohibited for projects with "Unacceptable" noise exposures (noise levels above 75 dB (DNL) and is discouraged for projects with "Normally Unacceptable" noise exposures (i.e. a noise level above 65 dB but under 75 dB). These noise levels take into account noise from highways, railroads, and aircraft. (P. 97).

TABLE PP
AICUZ Noise Zones and Response

NOISE ZONE	DNL	RESPONSE
3	Greater than 75 dBA	Zone of highest intensity; frequency and intensity of noise is such as to be loud and annoying. (Inhabitants may complain repeatedly and even form groups to protest).
2	65-75 dBA	Second most intensive zone; noise is more moderate in character. (Inhabitants may complain vigorously and concerted group action is a possibility).
1	Less than 65 dBA	Lowest noise level zone; the noise may, however, interfere occasionally with certain activities of the residents. (pp.95-97).

Source: Exhibit 229, p. 97.

The FAA land use table is reproduced on page 96 of the report. It lists various land uses with respect to their suitability at various noise levels expressed as Ldn. All listed uses are "compatible" at less than 65. Between 65 and 70 most residential and school uses are "not compatible and should be prohibited." Between 70 and 75 various public and commercial uses including nature exhibits and zoos are not recommended. Above 75 almost all uses other than a few commercial and manufacturing uses are "not compatible" or require special design or construction measures.

The report also recognized that sleep interference (P. 51), annoyance (P. 26) and speech interference (P. 43) can result from exposure to aircraft noise. The researchers reached several conclusions regarding the direct impact of airport noise on human health:

> The people in a community surrounding an airport are in no danger (under normal circumstances) of hearing damage due to aircraft noise. (P. 42).
>
> Although many airport neighbors have claimed a direct health impact from aviation noise, there is little valid scientific basis for such claims. (P. 61).

The 1971 Metropolitan Aircraft Noise Abatement Policy Study

for O'Hare (Exh. 223 B-1) recognized 30 and 40 NEF (Noise Exposure Forecast) levels as adversely affecting certain land uses. These levels correspond to the 65 and 75 Ldn levels used by the O'Hare Noise Abatement office. The authors of the study stated that:

> [t]he 65-75 Ldn contours depict areas where residential land uses are considered 'normally unacceptable' by standards established by the Department of Housing and Urban Development (HUD) and the FAA. The 75 Ldn and greater noise contour represents areas where residential uses are considered 'clearly unacceptable' by the federal government. (Exh. 240, at 8).

The 1976 FAA Aviation Noise Abatement Policy (Exh. 13) made the following statement regarding the effect of noise on people:

> Aircraft noise disturbs the normal activities of airport neighbors -- their conversation, sleep, and relaxation -- and degrades their quality of life. Depending on the use of land contiguous to an airport, noise may also affect education, health services, and other public activities.
>
> Although there may be indirect and subtle social and psychological harms, aircraft noise is predominantly an annoyance problem. It does not present any direct physical health danger to the vast majority of people exposed.

Pursuant to Section 5(a) of the Federal Noise Control Act of 1972 (42 U.S.C. 4901 et seq., 86 Stat. 1239) a USEPA committee looked at what level would protect the public health, safety and welfare with "an adequate margin of safety" (R. 828). It interpreted that phrase to mean "with no permanent damage to the human bodily function" which in turn means without any permanent threshold shift on the human ear (R. 829-30).

The USEPA Committee found that 96 percent of the population would be protected with an adequate margin of safety from hearing loss with an Leq value of 70 dB(A) per 24 hours (Exh. 40 at 3). Dr. Von Gierke, a member of the USEPA committee who has a doctorate in engineering, agreed with that finding at hearing (R. 825; Exh. 32 at 33-4, R. 684).

The committee also found that noise levels over 55 Leq (24 hour) would interfere with outdoor activity and people would be annoyed (Exh. 40 at 3, Exh. 32 at 34, R. 840). Indoor activity interference and annoyance occurs at 45 dB (24 hour Leq and Ldn). Id. It should be remembered that in the case of airport noise a given Leq often reflects a higher noise level than an Ldn because the latter has a nighttime penalty.

The committee reported that at 55 Ldn people generally experience 100 percent sentence intelligibility indoors and 95 percent sentence intelligibility outdoors. At this level there is no average adverse community reaction to noise and while 17 percent of the population expresses some annoyance, only one percent register complaints (Exh. 40 at 23). The level of annoyance rises with the noise level and is due to interference with such activities as speaking, listening to the television or radio, sleeping, and with vibrations in buildings.

Dr. Henning Edgar Von Gierke, who has a Ph.D. in engineering and is director of the Biodynamics and Bioenergy Division of the Aerospace Medical Research Laboratory of the U.S. Air Force at Wright-Patterson Air Force Base in Ohio, and who is also one of the authors of the study commented on it in his testimony:

> We stayed with the Noise Control Act specification that we should specify a level with an adequate margin of safety, below which the noise would have no effect on the public health and welfare, we said that 55 Ldn is probably this level. Below this, you have considerably no effect. Above this, you slowly start to get an effect and probably from 65 on you have a marked effect. And as we stated in another study for the EPA, above 75 is really the exposure area where once you try to do something about it as soon as possible. [R. 844].

Dr. Von Gierke testified that approximately 95 million Americans are exposed to Ldn levels below 55 decibels, 71 million to between 55 and 65 Ldn, 31 million to between 65 and 75 Ldn, and 3.7 million to more than 75 Ldn (R. 846). He also said that based on a number of surveys it has been determined that at 55 Ldn approximately 18 percent of the population is highly annoyed while at 65 Ldn that figure increases to 30 percent (R. 942).

In a separate paper (Exh. 32), Dr. Von Gierke reported the results of some of his studies of noise impacts:

> As for speech communication, the following approach was taken to quantify the noninterference of environmental noise with speech: indoors, in private homes, 100% sentence intelligibility is required for relaxed conversation in typical living rooms for all talker-to-listener separation distances. This is achieved for Leq less than or equal to 45 dB....Outdoors 95% sentence intelligibility appears to allow for adequate, reliable speech communication for people who are walking or standing close together, approximately 1 to 2 meters apart. Such conversation is possible in noise levels up to approximately 60 dB steady A-weighted sound pressure level. Noise levels at this magnitude are also

> consistent with the desire for speech privacy, an attribute easily lost in the urban environment should background noise levels be too low. This sound level of 60 dB outside (with the average noise reduction of houses with partially opened windows assumed to be 15 dB) results in indoor levels of 45 dB, the same levels identified for satisfactory indoor conditions. Therefore, the same outdoor level satisfies both the outdoor and indoor speech communication criteria....
>
> When the attitude of people toward their living area was studied and their reasons for desiring to move away were explored, noise did not represent a significant factor until environmental noise levels exceeded Ldn 55 dB....

Studholme, testified that "[a] standard based only on health and welfare, not considering any economic constraints or technical constraints, would be exactly as the EPA specified, which is 55 Ldn." (R. 2421).

Dr. Galloway, however, a noise expert and witness for the Attorney General, testified that 55 Ldn was impractical and that 65 Ldn is a reasonable and desirable noise level to protect the public health, safety and welfare (R. 5383-86).

The testimony of the citizens at hearing strongly buttresses the conclusion of the above cited reports and witnesses regarding the ability of airport noise to disrupt normal routines. Although many specific comments were quoted earlier in this opinion, they will be summarized here:

Numerous people complained of sleep interference or difficulty in sleeping (R. 266, 450-1, 719, 1010-11, 5024, 5060, 6569-71) and headaches and nervousness (R. 327, 1521-3, 5060, 5859). People complained of difficulty in talking intelligibly outside or inside when the windows are open, talking on the telephone, listening to television, and using the backyard or patio (R. 424, 705, 711, 719, 741, 969-70, 1002, 1010-11, 1042, 2986, 4349). There are reports of structural damage such as broken and rattling windows, ceiling cracks, and vibrations to homes around O'Hare (R. 6566-69, 6665, 5043-4). Two people testified that they wear headphones around the house (R. 1039-5043).

Communication interference occurs not only at home, but also at school (R. 5075-6, 4235 et seq.) It has been termed the "jet pause syndrome" or the "Bensenville syndrome" (R. 388, 284, 288) and is especially prevalent during warm weather when windows are open. One school still experiences the problem even when forced to keep its windows shut (R. 5857-8). A student from this school implored that someone stop the noise because the students and teachers have difficulty in hearing each other. Id. A teacher

from another school stated that on certain days she loses five to twenty minutes of classtime per class due to the jet pause syndrome (R. 392). Another loses thirty seconds per flight (R. 6573). A school superintendent states that although there is no precise measure of the interference to the educational process of a child, that nonetheless it is happening (R. 284-5). In an informal survey high school teachers at one high school were asked what percent of the time classes were halted due to jet noise. Twenty-one responded one to five percent while eight said six to eight percent of the time (R. 286). When asked what percent of the time does jet noise cause a loss of effectiveness in class proceedings without halting activities, eleven responded one to five percent while five said from six to ten percent. Id. Another informal survey elicited written student and teacher responses some of which were read into the record. One student commented that the noise is annoying and that class has to stop every sixty seconds (R. 6574). Teachers responded that slow learners, special education children, bilingual children and children with weak concentration skills are especially impacted by the noise (R. 6574-6).

During the supplemental hearings of September 1985, a doctoral dissertation was submitted as Exhibit 235A by Dr. Kenneth L. Kaufman, Assistant Supeintendent of Schools in Bensenville, entitled "An Investigation of Teacher Voice Signal Amplification Treatment for Mediating Speech Communication Interference from Jet Aircraft Noise Intrusion and from Minimal Hearing Loss in First and Second Grade Classrooms". In the study, classroom teacher voice amplification was evaluated to assess its effect in overcoming two suspected forms of speech communication interference: jet aircraft noise intrusion (JANI) and minimal hearing loss (MHL).

Voice amplification was successful in raising students test scores. Those in the group with amplification did significantly better on standardized tests than the group without amplification, "with significant differences occurring in the linguistic subskill tasks of phonics-consonants, auditory discrimination and phonetic analysis" (Exh. 235A). In auditory discrimination, test results for the amplification group exceeded those of the control group comparable to one year and one month in grade level equivalents while in phonetic analysis, the difference was five months. Id.

It must be pointed out that the Kaufman study did not associate airport noise as a substantial contributor to MHL; attempts to do so were inconclusive (S. 144-6). Dr. Kaufman, however, suggests that JANI is worse on first and second graders (S. 137).

Reduced to costs, the study predicts that with MHL children, educational costs rose because of MHL children's need for special tutoring and the frequent misdiagnosis of MHL children as special educational students (S. 154). Therefore, there is a loss of

teacher time and it takes more teacher time per learning unit (S. 157-8). Both the insulation of schools and the installation of air conditioning units causes increased costs to all involved (S. 158-9).

Several witnesses testified regarding possible health effects of airport noise. While testifying in answer to a question, Dr. Galloway stated that he was not aware of physiological damage resulting from aircraft noise:

> If one means "physiological damage," a measurable physiological change such as hearing impairment -- to my knowledge, no such situation exists around commercial airports.
>
> There have been some instances in the past at some military installations where there have been some claims of having some impairment of hearing as a result of airport noise involved with airport operations. I do not believe in the case of any commercial, civil airport operations, there is any evidence of literal physiological damage....
>
> You asked about studies. This is not to say that there may not be some long-term effects in some high-noise areas where residents may be exposed for very long times. But I don't know of any evidence to show that is so. That's all I can say. (R. 5472).

However, one Bensenville resident stated:

> I personally feel that I have suffered some loss of hearing as a result of living amid this noise pollution. I believe careful study would show this to be true for many of us who live here (R. 6584).

An otorhinolaryngologist, based on his knowledge of the literature, testified as to the general health effects of noise. He stated that over 80 dB damages the inner ear cells and that there would be an irreversible hearing loss (R. 5243). This condition becomes more pronounced after repeated exposure. Id. Besides hearing loss (called "acoustic trauma"), he testified as to noise interference in relation to sleep. Loud noise disturbs brain activity (determined by electroencephalograph recordings) and the rapid eye movement (REM) phase of sleep (R. 5233). Furthermore, based on a study of male workers in industrial plants, there is evidence that people subjected to loud noise have increased blood pressure (R. 5234). Those with noise induced hearing loss had with higher blood pressure than the control group. While this suggests a relationship to other situations, such as airport noise, it is not definitive and more studies need to be done. The doctor mentioned other noise-related effects such as glandular disturbances, coronary artery disease, and fetal abnormalities in rats (R. 5234-9).

It is well established in the record that the Ldn metric is a reasonable measure of aircraft noise and its impact on people, that it is widely used by government agencies for that purpose and that it will be in use for the foreseeable future. The testimony of residents near airports confirmed the predictions of the experts and exhibits regarding the impact of noise on daily life. The proposed 65 Ldn standard for the protection of the public is reasonable especially in light of the testimony supporting an even tighter standard based solely on health and welfare.

The Board finds that 65 Ldn is an appropriate standard for purposes of controlling airport noise. The technical feasibility and economic reasonableness of such a standard will be discussed in following sections.

NOISE MODELLING AND MONITORING

The noise standards proposed in Section 904. Subpart B are based on annual averages. A data collection and reporting program is established within Section 904.301. Pursuant to this section the proprietor must record and report all information needed to run the FAA Integrated Noise Model (INM) described in Exhibits 254 and 255. By way of example, such information would include data on runways, ground tracks, approach profiles and runway utilization and number of operations. This data will be used to develop noise exposure maps and for enforcement purposes. The Attorney General's original proposed rule 504 had been amended, possibly to avoid the Illinois Environmental Protection Agency's (Agency) position that stage length, aircraft number and type was insufficient for computer modelling (R. 5408).

As originally proposed, Subpart B (proposed rule 503) simply stated the noise standards, but did not specify whether they were daily or annual averages. This ambiguity was noted in the hearings (R. 2590-2600, Exhibit 112). If the appropriate standard is based on an annual average, then exceeding the standard on one day will not subject the proprietor to a violation of the annual average (R. 2479-80, 2594-6). Because the proposed language did not specify, one could assert that a proprietor could be found in violation of the standard based on data for one day (R. 2590-2600, Exhibit 112). The Board, however, believes that the ambiguity in proposed rule 503 is unacceptable. Therefore, the Board is amending it to specify standards based on an annual average as the 365 day average, in decibels, day/night average sound level (See 14 CFR 150.07). The Board believes that a standard based on an annual average is amply supported by the record (Exh. 61, 110).

Sound levels around an airport will need to be determined in two instances. The first is for planning purposes wherein a proprietor needs to know the sound levels around an airport and

any sound level changes due to various operational changes. The second is for enforcement by a third party of any adopted noise standard.

Sound levels may either be directly measured or they may be modelled. Modelling is accomplished by use of a computer model. The utility of models as planning tools was generally acknowledged throughout the record. There is a dispute, however, as to the use of models in enforcement proceedings to enforce noise standards. The basis for the dispute is the question of the accuracy of the models. Additionally, the participants disagree as to how actual sound level measurements should be used to determine violations. Specifically, how many days of actual measurement are needed to show a statistically significant violation of an annual Ldn average and at what confidence level. Many witnesses testified concerning these problems, especially for the ATA, the Attorney General's Office, the City of Chicago, and the Illinois Environmental Protection Agency.

When determining how to measure sound, three key concepts need to be understood. The first concept is the measurement tolerance or accuracy of the equipment to be used. For example, at Capital Airport, the decibel noise meter was calibrated to record noise within plus or minus one decibel (March 11, 1980, transcript at 40).

Second, confidence intervals must be chosen to reflect the degree of accuracy wanted. At a 90 percent confidence interval, if 100 samples are collected, 90 of them on the average will be within the interval (Exh. 223 (C-1) at 2-10). Mr. Robert D. Hellweg, manager of the Noise Technical Operations Section of the Illinois Environmental Protection Agency who holds Bachelor and Master degrees in aeronautical and astronautical engineering, testified concerning the accuracy of confidence intervals:

> [i]n English terms, it means the number of data points increases as the confidence interval increases. If you want to be 99 percent confident, that requires more data than if you wanted to be 90 percent confident. The number of data points increase with increased accuracy.
>
> If you wish to be plus or minus 10 percent you would require more data points than if you wanted to be plus or minus 25 percent. Also, the number of data points would increase as your variance increases; that is, as the data scatters more, one must have more data points to have an accurate estimate of the mean value.
>
> Unfortunately, one cannot know the standard deviation of your data until you have measured. One cannot know before you go out to measure what the standard deviation is, that is, how much the data

varies. You can only determine this from measurements [March 11, 1980 transcript at 41-2].

The third concept to be considered is data independence. If the data points are statistically independent, fewer data are required to achieve a desired accuracy within a specified confidence interval than if the data points were were dependent. Unfortunately, one does not know if the data will be independent until after measurements are taken.

Witnesses disagreed on several aspects of data collection and its usefullness. The ATA witness considered Ldn as a land use planning tool only rather than an enforcement tool (R. 3639). An Agency witness stated that a 95 percent confidence level should be used in measuring for enforcement purposes. He testified that to measure a significant average annual Ldn at 95 percent confidence, one would have to measure at the site for 85 days (March 11, 1980 transcript at 51-5, Exh. 197 S-V-Y).

The City of Chicago witness testified that he would like to see 100 percent confidence (R. 6505). However, a witness for the Attorney General's Office testified that:

> [W]hen measuring any kind of a dynamic process, one is never going to measure the average value of that process correctly within one hundred percent or, let's say, zero percent error as long as the process is dynamic. It's changing all the time, so there isn't any way one can measure the precise value of whatever this process is [R. 5774].

Dr. Galloway suggested the use of a 90 percent confidence interval with a tolerance level of 1.5 decibels. It has been used previously by other regulatory agencies:

> Well, the 90 percent, one-and-a-half decibel interval that we suggested as a possible use in this regulation, is used, for example, in Part 36 to determine the reliability of the measurements or acceptability of the measurements in the certification process. It's also used in some of the foreign certification processes. It's used in the International Civil Aviation Organization, ICAO [R. 5776-77].

The final problem to be addressd is data independence and how it relates to the measurement of airport noise. Hellweg summed up the problem best when he testified:

> Why would the data not be statistically independent? What does that mean? What it means is that the measurements we take today are related to the measurements or the sounds that occurred the day before.

> How could this happen at an airport? We are measuring sounds from distinct jets that occur today; the day before were different jets that operated.
>
> There are several reasons why the data may not be independent. The most obvious is weather conditions.
>
> If the wind is blowing from the west today, there is a high probability that the winds would be blowing from the west tomorrow or the day before and wind factors and weather factors mean that operations on specific runways are related on a day-to-day operation.
>
> Other factors that would make the data not independent would be the schedules of aircraft. On a day-to-day basis -- airline schedules follow a day-to-day basis and there may be a jet scheduled to leave at 11:00 o'clock at night every day and this would indicate some relationship between the sound levels we measured today to the sound levels that were the day before. [March 11, 1980 transcript at 42, 43].

Regarding the issue of how many days of measurement are required to determine an accurate estimate of the annual day/night sound level, another witness for the Attorney General's Office, Studholme, testified that on-site measurement of airport noise on a specific Class A parcel need only take two days (R. 2512), even though the engineering firm he is employed with recommends at least two weeks of measurement (R. 2514).

Hellweg testified that 85 days of measurements were needed based on the statistical accuracy of 31 days of actual noise measurements at a residence 4,000 feet from runway 4-22 at Springfield's Capital Airport (See March 11, 1980 transcript at 30 and following; also Exh. 197, 198).

The data from Capital Airport were run through the run test and the trend test (Exh. 197) to determine if they were statistically independent. Both tests showed the data to be statistically independent at the 95 percent confidence interval (Exh. 197 J, K, L, and M). When data is not statistically independent but is dependent on prior data, an autocorrelation analysis is performed on the data (Exh. 197, G, H).

Hellweg then analyzed the data of 13 airports in Exhibit 198 to see if they were statistically independent. The values at 12 of the 13 airports were found not to be statistically independent (March 11, 1980 transcript 52-3, Exh. 197S). Therefore, for the data to be statistically significant when measured on a

continuous basis, the data would have to come from a larger sample size of days measured.

While Hellweg's statistical analysis is in-depth, it omitted calculations at other confidence levels. It further did not include solutions as suggested by Dr. Schomer and Mr. DeVor to the problems of measuring airport noise. In Exhibit 198, which data was used for further analysis by Hellweg, Dr. Schomer and DeVor concluded that the high number of days needed for continuous monitoring could be reduced by measuring randomly, thereby injecting more independence into the data:

> Because of the correlation factor generally exhibited in most of the noise series, the number of sampling days can be significantly reduced by inducing randomness in the selection of days sampled. That is, sample days can be selected sufficiently far apart to induce randomness in the data gathered, rather than performing continuous monitoring over the total number of days. Because of the long-term seasonal weather effects exhibited in some of these data, it is recommended that samples be selected from throughout the entire year. A variety of strategies can be employed based on this analysis. For example, one could:
>
> a. Sample for a continuous period of 30 to 60 days.
>
> b. Sample 14 days chosen randomly throughout the year (using different days of the week).
>
> c. Sample for 4 one-week periods -- each chosen from a different season.
>
> The above can be summarized as a recommendation for employing 14 days of totally random sampling throughout the year, or four weeks of quasi-random sampling taken one week at a time from each season, or eight weeks of totally continuous sampling to achieve a precision of +2 to -3 dB of the true yearly CNEL or Ldn at a 95 percent level of confidence [Exh. 198 at 14, 15].

Therefore, the lack of data independence, which causes the number of monitoring days to increase in the airport noise measurement scheme, is not a stumbling block to the proposed regulation. The measurement method chosen, if not continuous, must inject enough independence in the data so as to be statistically significant at least the 90 percent confidence level.

The firm of Bolt, Beranek and Newman, which reviewed the AGO's proposed rule commented on the variability problem as follows:

> Because of the variability in airport operations and in individual aircraft noise measurements, repeated measurements of either DNL or SEL values are needed to define the yearly average DNL to an acceptable level of precision. However, continuous year-long noise monitoring is not required, since measurements over much shorter periods of time, acquired in conjunction with airport operations information, will permit accurate prediction of yearly-average DNL values.
>
> Where noise monitoring is required to establish DNL values (see Section 5) it is recommended that field measurements be made to achieve a 90% confidence interval of ± 1.5 dB. This degree of precision can clearly be attained within reasonable time periods (order of 2 weeks) provided the following basic operational information is obtained:
>
> 1) The number of operations of the noise-significant aircraft, and runway usage during the field measurements.
>
> 2) Yearly-average number of operations of noise-significant aircraft; and the yearly-average runway usage.*
>
> The above operational information is the key to adjustment of monitoring data to obtain yearly-average data of the desired precision [Exh. 217 at 57 and 58].

The next issue concerns the accuracy of models and their use for enforcement purposes. Objections to the use of models stems from their having certain "margins of error." One computer model, the FAA's Integrated Noise Model (INM) Version I (Exh. 110, Wyle Model), is said to have an accuracy of plus or minus five decibels (Exh. 110 at 1-10). The INM itself provides that "[a] validation study of the INM is currently in progress. The INM (or any other method) cannot predict noise impacts with pinpoint accuracy. It is anticipated that the observed values of aircraft noise in NEF, Leq, Ldn, and CNEL will fall reliably within +/- 5 dB of the levels predicted." (Exh. 110 at 1-10). One ATA witness, Richard E. Coykendall, who has a degree in mechanical engineering and is an Aircraft Development Manager for United Airlines, testified that "I think they [the FAA] have clearly stated it should not be relied upon to be more accurate than plus or minus 5 dB." (R. 3641). What this means is that "an 80 Ldn noise contour could possibly range from 85 to 75 Ldn and a 65 Ldn could range from 60 to 70 Ldn." (R. 6470). The impact of a ±5 decibel variation is given in the testimony of Chicago. At O'Hare, a - 5 dB error on the 80 Ldn contour would overestimate

the impacted housing units by 9,800 while a + 5 dB error would overestimate by 2,200 units (Exh. 223, III, 3).

The validation study of the INM generally shows that the accuracy of Version I of the INM (Exh. 110) differs by category of aircraft. In testimony regarding the validation study (Exh. 223C-1), Mr. Holder for the City of Chicago testified:

> In the case of two and three-engine narrow body aircraft, it shows that the...difference between -- the observation and the noise calculated is on the order of minus three to zero decibels.
>
> As you move down that becomes greater in the four-engine category, in the order of five to six to seven decibels.

When questioned whether the validation study would tend to confirm or deny the plus or minus five decibel accuracy of the INM, Holder testified that "I would tend to think it would confirm it." (R. 6531).

The Agency on cross-examination of Holder questioned his conclusions on the accuracy of the INM given that the FAA had only examined the accuracy of individual categories of planes on arrival and on departure. What the Agency felt was necessary was an average difference between observed noise level and INM prediction based on the differences between observed noise and INM calculations for individual aircraft (R. 6534, 6538-45). The Agency intimated that the accuracy of the INM was greater than the FAA validation study (Exh. 223C-1) indicated (R. 6537-8).

Nevertheless, even if an accuracy of plus or minus five decibels for the INM is assumed, the issue becomes whether it can be used for enforcement purposes. The Attorney General suggests that the INM be used for enforcement purposes at a confidence interval of 90 percent with a tolerance level of plus or minus 1.5 decibels (AG Comments October 26, 1983 at 26). The Attorney General argues that when a sound level exceeds the noise standard over and above the plus or minus 5dB error of the INM, then a violation is proven. Actual monitoring would not be needed. If a modelled violation was only five decibels above the noise standard, however, monitoring would be needed to show the violation because the modelled violation would fall within the INM margin of error.

EFFECTIVENESS AND PRACTICALITY OF NOISE REDUCTION METHODS

A large number of steps can be taken to reduce noise around an airport. The various methods will vary in their effect and acceptability as well as their cost at different airports. This section discusses a variety of methods without implying that a proprietor may unilaterally implement them. Proprietors will have to individually assess the methods and determine which are

acceptable and legally permissible at their facilities and whether the FAA or some other agency must approve implementation. The Board anticipates that a variety of methods will be utilized. It is unrealistic to assume that any one method will solve the problems at a particular airport.

Retrofit, Replace and Re-engine

Individual planes can be quieted by retrofitting existing engines with sound absorbing material (SAM) or making other changes to the aircraft or engines. A plane may also be re-engined with quieter engines. Another option is to retire older aircraft and replace them with newer models. General von Kann, Senior Vice-President of Operations and Airports for the Air Transport Association, stated that in terms of effective noise reduction it is best to replace, re-engine, and retrofit in that order (R. July 27, 1978 at 3087-90).

Retrofitting reduces noise by a few decibels at relatively low cost. For example, a DC-9 SAM retrofit costs about $273,000 per plane while a DC-8-61 SAM retrofit runs $2.3 million. To re-engine the same planes would cost approximately four and ten million dollars respectively (R. July 27, 1978, at 3089-92). Retrofitting often does not benefit fuel economy, and in some cases leads to reduced fuel efficiency (R. 3148). On the other hand, replacing engines or planes can lead to substantial fuel savings. For instance, a re-engined DC-8 saves 10 to 15 percent on fuel (R. 3163), while the new 767's and A-300's save 15 to 25 percent fuel compared to older planes (R. 3096). Some individual models, however, are difficult to re-engine. For example, the 727 cannot be re-engined without a tail redesign (R. 3614). As to the feasibility of replacement, airlines are reluctant to retire planes that are otherwise useable just because they are noisy (R. 5436).

The history of one company's efforts to come into compliance with FAR Part 36 was provided by Flying Tigers, an air freight carrier. During the April 8, 1980 hearing, a representative described the different options available to reduce the noise emitted from its DC-8 aircraft fleet. Retrofit per aircraft in 1979 would have cost two million dollars and would have provided a 33 percent reduction in the noise footprint of the aircraft (R. 4728). Re-engining in 1979 would have cost $11 million per aircraft and would have provided a 90 percent reduction in the noise footprint. Id. By public comment submitted on November 4, 1985, Flying Tigers informed the Board that it has "replaced out [sic] entire DC-8 fleet with quieter, more fuel efficient 747's and 727's within recent years and are in 100% compliance with Part 36 regulations". (Public Comment 131).

At the 1978 hearings, General von Kann gave the cost of bringing the national fleet into compliance with FAR 36 as about seven and one half billion dollars (R. 3092). To place this in the context of then current air service, he pointed out that a

two percent tax or surcharge on airline passengers would generate about two billion dollars (R. 3095).

By the time of the 1985 hearings, 89 percent of the total U.S. registered fleet of jet aircraft was in compliance with FAR Part 36 (Gr. Exh. 231 at 2). The remaining planes received exemptions which expire in 1988. The City of Chicago attributes the decrease in the overall size of the 1984 65 Ldn contour at O'Hare to the airlines' increased use of quieter aircraft (Exh. 240, contour map enclosure).

The success of airlines in meeting Part 36 demonstrates that technological advances in aircraft design can help reduce airport noise levels. In 1978, Tyler testified that incentives are necessary to encourage the development and purchase of quieter aircraft. He spoke of the impact the Port Authority of New York had on aircraft design and procurement with its decision to establish limits on takeoff noise:

> At that time I was in charge of Noise Abatement Research and Development of Pratt and Whitney Aircraft, and the establishment of that limit by the Port Authority of New York and New Jersey became the target which our customers said must be met by the next generation of aircraft....
>
> Now, the next generation are going to be significantly quieter again due to again an increase in bypass ratio and the use of sound absorbing material and all of the other technology features that make airplanes quieter. Our problem is to provide incentives for airlines to buy quieter airplanes rather than noisy ones.
>
> And let me just say that the process by which this occurs comes in negotiations between the airlines and the manufacturers at the time when an airplane is being developed. And, I have personal experience on this since I was in charge of Aircraft Noise Abatement at Pratt and Whitney, and my department was able to develop noise abatement features which were frequently not incorporated in the engine because the customer felt that the benefits were not worth the cost....
>
> And airlines like any other company, if you make it desirable from their standpoint to make them quieter they will make them quieter, but if they have no incentive why spend an extra dime [R. 1171-1179].
>
> [N]ow, during the period following the implementation of the original Part 36 Noise Regulations, there has been significant change in the technology and as I mentioned earlier, we are just

> very fortunate that the improvement in engine performance is accompanied by a reduction in noise. These two go hand in hand, so that the next generation of aircraft could be significantly quieter than the last generation. In fact, testimony presented before the Aviation Subcommittee last spring by Pratt & Whitney indicated...a 10 dB reduction below the original Part 36 Requirement [R. 1231-32].

The chairman of the Bensenville Environmental Protection Coalition made a similar point in 1985:

> One means of encouraging the development and the purchase of new improved and beneficial aircraft designs and engines is to set goals in the form of standards and to set regulations which must be met. Competition between manufacturers or [sic] aircraft and aircraft engines is such that they need the impetus of regulations to be met.
>
> I was at a recent meeting for the organization NOISE, and one of the engine manufacturers stated very plainly competition dictates what they build, and they are building quieter aircraft engines largely due to some of the strict standards set at Washington National. I think that is very important. I think Illinois should be setting standards like that [S. 250-51].

Coykendall believed that noise emissions were already considered in aircraft purchase decisions:

> [T]he recent competition we had between the Boeing 767 and the air bus, we made explicit comparisons between the so-called guaranteed noise levels of the airplanes.
>
> The extent to which they were expected to fall below the Stage 3 requirements and these facts were one of the key points of information provided to our executive staff for their evaluation in the overall judgment of the airplanes.
>
> So I think that it is totally incorrect to say that the noise requirements are not part of the consideration in the acquisition of new airplanes. They figure very heavily and are receiving quite a lot of attention [R. 3824].

It was generally agreed that while it helps, new technology will not solve the airport noise problem. General von Kann pointed out that hardware changes alone would not solve the noise problems around airports, especially in the absence of land use

controls (R. 3100). A citizen stated, "I question whether the quieter engines in the new generation of aircraft is a satisfactory balance to more aircraft and more flight paths which will impact more areas more frequently." (S. 250).

Takeoff and Landing Procedures

Operational procedures during takeoffs and landings can be modified to reduce the level of noise emitted. These procedures emphasize controlling thrust and the drag caused by flaps, since noise is generated by the engines and airframe. When and where a pilot applies thrust has considerable influence on an individual plane's noise pattern. A balance between thrust and flap settings must be maintained because as a practical matter both cannot be reduced simultaneously, especially on takeoff (R. 3269). An added benefit of reduced thrust is that it increases engine life and reduces maintenance requirements (R. 3247).

Captain H.B. Benninghoff, a pilot who is Assistant Vice President of Flying for America Airlines and participated in numerous noise abatement tests, discussed takeoff procedures. He pointed out that planes operate within a fairly narrow band of operational choices and must reach a safe altitude before flaps or thrust reduction occurs (R. 3269). After reaching a safe altitude:

> You can either leave takeoff thrusts on the engines and reduce flaps as the airplane increases speed, maintaining adequate stall speed margin, or you can reduce thrust to some intervening setting and leave the flaps alone, do not move the flaps or retract the flaps. You cannot do both. The airplane needs -- any airplane needs a certain amount of thrust for the drag which is takeoff flaps in this case [R. 3270].

Other witnesses commented on the noise impact of the two takeoff procedures. The rapid climb procedure calls for rapid acceleration until the aircraft reaches zero flap at which point there is a thrust cutback, usually occuring four miles from takoff roll, which is about two miles from the airport boundary (R. 1102-03). This procedure emphasizes speed rather than initial climb, although the aircraft is continually increasing in altitude (R. 1117-19). The rapid climb produces more noise near the airport; but, once a certain height is attained, there is a thrust cutback, reducing noise after a certain distance from the airport. In contrast, the reduced thrust takeoff uses less than full thrust from the beginning (R. 155), which would tend to emit less noise closer to the airport than the rapid climb approach.

Benninghoff believes that "the benefit derived from takeoff noise procedure change is highly overrated. There is very little there." (R. 3366). He also feels that these procedures will do little to benefit people living within three miles of the runway

(R. 3284). He also expressed concerns about safety if takeoff procedures were varied, stating that the ATA Flight Operations Committee and pilots want a single standard procedure. He spoke from the pilot's point of view:

> [C]ompliance with takeoff procedures is based on conformance to procedures and techniques that are committed to memory. There are no checklists when you are flying an airplane in terms of actual manipulating of the controls, and to burden pilots with a multiple number of takeoff departures would create a concentration problem on a non-standard situation, which creates a burden in terms of the primary job of getting safely aloft [R. 3340-41].

Benninghoff cited additional complicating factors in takeoff such as type of plane, weight, weather, and ground obstacles (R. 3333-41). He also pointed out that different planes have different climbing characteristics. Thus any takeoff procedure must take these factors into account to prevent aircraft from overtaking each other and violating departure separation distances (R. 3278).

Operational procedures during landings also may be modified to reduce noise. However aircraft vary in their design specifications and consequently, their performances are different. Varying thrust and flaps has some quieting effect, but the distance required to line up large planes on approach limits the available options (R. 3482). Reduced flap landings were ordered by the FAA effective after March 28, 1977 (R. 1114, 2016).

A landing procedure known as the two segment approach was discussed by several witnesses. While aircraft generally land using a three degree slope until touchdown (R. 3314), the two segment approach keeps the craft at a higher altitude using a six degree slope as long as possible. The plane then picks up the next intercept using three degrees until landing (R. 3313). Because the plane itself is further from the ground longer, noise emissions are reduced by six or seven decibels (R. 551). The FAA decided not to prescribe the two segment glide slope procedure as submitted by the USEPA in its regulatory proposal (Exh. 145, 41 Fed. Reg. 52388-92, R. 1148). The FAA found that this procedure as proposed presented a safety problem due to an unacceptable increase in wake vortex encounters based on current minimum aircraft separation standards (Id. at 52391). In other words, planes would encounter air turbulence caused by prior planes. In order to allow sufficient time for these wake vortices to diminish, the FAA says the spacing between planes would have to be doubled, resulting in an increase in delays and energy consumption and resulting in "inefficient use of the national airspace." Id. Additionally the FAA investigated icing possibilities, the high sink rate, effect of tail winds and wind shear, a descent rate that may not be met by some aircraft,

increased pilot work load and potential airspace and traffic conflicts Id. The FAA concluded that the two segment approach is "not consistent with the highest degree of safety in air commerce and not in the public interest." (Id. at 52392).

Benninghoff testified that based on American Airline's simulator studies it was determined that aircraft could handle a two segment approach although the upper segment would differ depending on aircraft type. He further testified that:

> [I]n fact all aircraft couldn't fly an upper segment of six degrees due to weight, flap drag, kinetic energy, and as I recall, from our simulator tests the maximum upper segment that could be flown with a Boeing 747 was four degrees, with a DC-10 was four and a half degrees, with a 707 was five and a half degrees....[R. 3250-1, 3321].

The simulator study shows that while the 6/3 glide slope may not be feasible, other two segment approaches are, depending upon the upper slope limit. The airline representative stated that the two segment approach is feasible based on an earlier 1971 study (Exh. 140, NASA), but that pilots want vertical and lateral guidance coupled to the autopilot (R. 3320-25). The ATA maintains that two segment approaches are feasible but that the FAA has abandoned the idea (R. 3584).

Preferential Runways

Noise impacts can be reduced by using preferential runways. Relief is gained by using runways near less populated areas and by switching the use of heavily used runways over a certain number of hours. FAA approval is required before using this procedure (Exh. 13, p. 56(d), R. 2656-9). FAA policy proscribes preferential runway use if there is more than a fifteen knot crosswind at eighty degrees (R. 3291-3). Barring such a wind, once a controller assigns a runway, the pilot still may refuse to use a preferential runway for safety reasons (Exh. 114, 14 CFR 91.87(g), R. 2661-66). If a pilot does not wish to use a preferential runway, that pilot must wait for a non-preferential runway (R. 1194).

Other runway options mentioned are the use of over-water approaches (R. 1235) and the establishment of noise corridors over tollways for arrivals and departures much like the use of rivers as noise corridors at Washington National Airport (Exh. 208 A-D, R. 4921-3, 5016).

Turning while in flight is another procedure to avoid noise sensitive areas. In fact the FAA has ordered turns at O'Hare Airport in Chicago for aircraft departing on runways 27L and 32R (Exh. 124 Tower Orders, R. 2884-87). Testimony showed that nationally over forty percent of American Airlines aircraft made noise abatement turns of more than ninety degrees after takeoff

(R. 3591-3). General von Kann testified that such routing costs more:

> You take a routing that, say, uses up five minutes more than a direct routing would be, or two or three minutes. Now, you add fuel, you add crew time. That's easy enough to figure out. Then you multiply this by the thousands of times you do it and sometimes you do it and sometimes you don't do it depending on wind conditions and other factors. I think it is obvious on the face of it if you add five minutes...to as few as ten percent of your flights, you would come up with a very sizable figure [R. 3153].

One witness said the use of preferential runways in Los Angeles added ten minutes to flight time at night, at a calculated cost of $25 per minute (R. 3358).

Taxiing

It was suggested that planes could be towed to runways or use fewer engines when taxiing. Such procedures would reduce noise to residents near terminals and runways (R. 39-40). An ATA witness stated that because there are no residences near the terminals at O'Hare, this procedure would not be effective (R. 3264). O'Hare area residents disagreed (R. 4313-18, 4349). Where residences are close to terminals at other airports, towing may be a viable option.

An ATA witness testified that towing would cause problems for planes which need special starting equipment. Powerful tractors with auxiliary electrical and air start units would be needed to tow the plane. For those aircraft without onboard auxiliary power units, the tractor would have to start the engines of the aircraft (R. 3264-5). While testimony suggested that planes which are taxiing are under federal control (R. 1951-3), it is not clear whether planes being towed would be under federal control.

Engine Runups

Runup noise includes ground runups, which are preflight engine tests that are part of an aircraft's regular maintenance. Airports can control the location and timing of these engine tests and require soundproofing in maintenance areas as another noise reduction method. Aircraft engine maintenance is frequently conducted at night so that planes are available for service in the morning. The O'Hare noise abatement office claims that in 1984 it attained 100 percent compliance with its restriction of nighttime runups to three locations away from residences (Exh. 240). However, two citizens at the 1985 hearings complained of runup noise (S. 62, 239). Pre-flight engine runups accounted for bulges in the noise contours at the Springfield and Coles County Airports (R. 1711, 1869). According

to Tiedt, in 1978 O'Hare averaged three and one-half maintenance runups per day which were each one to two hours in length (R. 6277).

Dr. Zinschlag of the Coles County Airport testified regarding the importance of pre-flight runups:

> [T]he airport authority has enacted ordinances...that forbid running up of airplanes in certain areas -- forbid continuing noise that is not deemed to be absolutely necessary, for the safety of the people in the plane. We consider this word paramount -- safety, safety. When we fly an airplane, we want to be safe. We want to know that the equipment is safe. We can't say you can't run up an airplane at the end of a runway because it makes noise before it takes off. The pilot has to do this so he can check all of his electrical instruments to know what his engines are doing to see whether they test out so that he doesn't lose power on a take off. This is a lot more impact than is noise [R. 1784].

General von Kann testified that most maintenance is done at night and that, "[S]ometimes runups are required following maintenance to make sure the engine is operating normally." (R. 3263). He also said that delaying runups until daytime would delay morning flights. Id.

The proprietor of Capital Airport in Springfield required one company to move its aircraft and maintenance facility to the opposite end of the airport away from a subdivision (R. 1508-09). At the same airport the Air National Guard installed a half million dollar "hush house" where noise from all of their maintenance runups is suppressed (R. 1510). When testifying about ground operations, Dr. Galloway said that most commercial operators have test cells and that orientation of aircraft during tests can help (R. 5345).

Berms

The use of berms, which are large, narrow ridges of earth, could benefit a large number of people who live close to airports. Berms are most useful at reducing noise which is generated at ground level. O'Hare is currently constructing a berm that will ultimately be 3,500 feet long and 50 feet high to reduce noise in Bensenville. Two other berms are also planned at O'Hare (Exh. 240). Construction of a berm at Peoria could reduce the noise to 110 severely impacted homes to below 65 Ldn (Exh. B at 8-9, Tables II-2 and II-3 at 21-2). Another 2,000 foot berm at Peoria would protect 22 more homes while the same size berm at Decatur would protect 11 homes from noise levels 65 Ldn or over (Exh. B at 8-9).

Soundproofing

Another noise reduction method involves the insulation or soundproofing of noise impacted homes and schools. While insulation does nothing to reduce the noise impact at the receiving property, and therefore would not cause compliance with any noise standard, it will reduce the amount of noise coming into a building. It may prove useful in conjunction with easements and in demonstrating mitigation. The authors of the EcIS (Exh. A, B, C, D) found it a technically feasible method.

Three schools in a 75 Ldn contour near O'Hare have been soundproofed (Exh. 240 at 10). Funding for each school was eighty percent federal, ten percent City of Chicago, five percent by the municipality involved and five percent by the local school district (Exh. 251, A, B, C; S.398, S.274). The result of soundproofing Washington School was described by the president of the Board of Education in Schiller Park:

> I just mentioned a few minutes ago to you that one of the teachers told us that she saw an airplane overhead and never heard it, which...was a compliment because usually...you just couldn't teach. [S. 269].

Future school soundproofing may be in the offing. The federal government has been providing estimates for soundproofing other severely impacted schools (S. 273-4). The City of Chicago "will extend its soundproofing program to schools within the 70 Ldn continuous noise contours for 1995...."[Exh. 240 at 11].

Additional procedures such as updating building codes to require noise insulation in new buildings, modifications or expansions could also be useful (R. 1881, 2096, 2938, 6278-80, E. 390-6). Tiedt testified, however, that "[n]one of the communities surrounding O'Hare have building codes which require soundproofing of new structures." (R. 6244).

Insulation and soundproofing, however, are not panaceas. One woman testified that:

> [I]nsulation is an answer if you can afford to air condition your home and it doesn't give you the privilege of listening to the birds sing with planes flying over, and so on [S. 105].

Some residents felt that insulation would make them "prisoners" in their homes given the need to keep doors and windows closed (S. 48,61). There were also comments on the cost of air conditioning necessitated by closed windows. One man estimated that he currently spends 100 dollars per month on air conditioning to help reduce airport related noise (S. 44).

Easements

Besides insulating buildings, a proprietor may wish to purchase a noise easement over the property of a residence impacted with noise greater than 65 Ldn. For payment of an agreed-upon fee the homeowner would choose to experience more noise while the proprietor would have the right to subject that residence to greater than 65 Ldn. The easement would be recorded with the title and would appear in any competent title search.

An example of a noise easement is what the Peoria Airport Authority terms an "avigation easement," which is a combination of noise and navigation easements. The Authority has acquired approximately 30 to 40 easements over individual homes (R. 2064-5). No cost data have been presented for these easement purchases.

Differing testimony appears in the record as to the relative cost of noise easements. Tiedt stated that the general rule for easement cost is one third of the residential property value but that each situation should be evaluated on a case-by-case basis (R. 6380). The authors of the EcIS reviewed the literature and cited four different studies which examined easement costs. They settled on the easement costs around Los Angeles as being representative of costs in general. Easement costs range from 2.5 to 17 percent of the property value depending on whether a residence is in a 65-70, 70-75 or a 75-80 Ldn contour (Exh. B at 38).

Upon purchasing a noise easement, the proprietor would be in compliance with the noise regulations as to some Class A residences. The Board, however, shares the belief of the AGO that easements should be limited to areas experiencing less then 75 Ldn. Above this level a residence becomes essentially uninhabitable and other options, such as purchase in fee simple, would probably provide more protection to the public, especially unsespecting potential buyers.

Purchase

Another compliance method is the purchase by the proprietor of undeveloped land or Class A land from the owner. Prices paid would approximate market value, with relocation benefits and administrative costs added where applicable, as where federal funds are involved. Use of this approach would change the Class A use designation of the land.

A consulting engineer testified concerning Capital Airport's land acquisition program in Springfield:

> [I]t became the policy of the airport to acquire all properties along the existing airport's boundary and the future west belt's location to eliminate the possibility of residential development. It was

> believed in the long-range plan that this land -- has been acquired and will not be used for aviation purposes, such as runways and taxiways. Long-range plan is to use it for some aviation compatible business or industrial development. .... They [Springfield-Capital] have acquired essentially over 200 acres in the south portion of the airport....
>
> [T]here weren't sufficient funds to acquire all of the property at one time, so priority was given to the property south of the property [sic -- airport?] because it was still agricultural property. We wanted to buy it before it was developed; so included in the same program was the acquisition of the residences immediately adjacent to the northeast boundary of the airport.... They have acquired the properties, and they have demolished the houses on the property.
>
> [W]e believe this is just the start [R. 1670-8].

The Los Angeles Airport purchased properties around its facility for noise abatement and passed the cost on by way of landing fees (R. 3150-3225). Greater Pittsburgh Airport bought 6,000 acres and demolished the purchased residences (R. 6179).

Land acquisitions for noise abatement can be accomplished between a willing buyer and seller or by condemnation. Witnesses had mixed emotions about having their homes bought. Aside from cost considerations, however, acquisition is the most preferable solution for some airport proprietors. A consultant for Chicago said:

> In our experience in airport impact situations, fee acquisition has tended to be the most expeditious way of solving the problems and the most final solution. Clearly, there are other alternatives and one can debate the values of those ad infinitum....
>
> Our general experience has been that the fee simple acquisition route is preferable to a navigation easement or that sort of an approach, which is an alternative to perhaps reduce the cost....[R. 6112]

The impact of outright purchase of noise impacted homes depends largely on their number and location. According to the EcIS there were only 2,574 such homes at downstate airports in the late 1970's. About 1,600 were at one airport and 1,045 of those were mobile homes which could probably be easily relocated (See Table 3). The purchase of those homes and relocation of the residents would have a relatively small impact at most downstate airports.

The Chicago airports are another matter. Mr. Jeffrey N. Thomas, Vice President of Booz-Allen Hamilton Management Consultants and manager of operations of its Landrum & Brown unit, and Tiedt of Landrum and Brown provided testimony on purchase impacts for the city using 1979 as the base year (R. 5886). Estimates were given for purchasing homes, schools, hotels, and motels in the severely impacted 80 Ldn contour. It was noted that federal funds may be used for acquiring noise impacted land (R. 6250).

At O'Hare 2,320 homes were within the 80 Ldn contour. The purchase costs were estimated at 119.6 million dollars with relocation and demolition costs adding about 83 million dollars. Total costs for Class A acquisition were estimated at 295.14 million dollars (Group Exh. 223, "Exh. 19", R. 5928-30).

This acquisition would cause certain economic and social disruptions in six communities surrounding O'Hare. Wood Dale would lose 30.7 percent of its population while Rosemont would lose 0.2 percent. The estimated reduced tax extension as a percent of total revenues ranged from 9.0 to 0.1 percent for communities, 7.9 to 0.1 percent for high school districts, and 14.9 to 0.2 percent for grade school districts depending upon their location (Group. Exh. 223, "Exh. 20-23", R. 5939-5940). Thomas pointed out that the tax base would be expected to recover as industrial development occurred on former Class A lands (R. 5940).

If the 65 Ldn contour is used as an acquisition guide, the impact would be much greater. Portions of approximately 45 communities around O'Hare and 20 around Midway are within these contours (R. 6283-85). It is estimated that up to 86,400 homes are in the O'Hare contour (Exh. 240) and Midway has between 6,000 and 36,000 depending upon its level of activity (See Table 4). Purchasing homes with relocation costs in the 65 Ldn contour at Midway was estimated at over 3.2 billion dollars (Group. Exh. 223, "Exh. 54", R. 5994-95).

Nighttime Curfew and Reduced Operations

Reducing noise by cutting back flights or imposing a nighttime curfew received an overwhelmingly negative reaction from proprietors, airlines and industry. Because O'Hare would be the most significantly impacted by cutting back operations, this discussion will focus primarily on that airport while other airports will be discussed in the economic impact section. The industries negative attitude was adequately summed up by Thomas while testifying for the City of Chicago:

> In terms of repercussions of flight reductions on the national aviation system and air service, the impacts are for all intents and purposes incomprehensible given the central role of O'Hare as

> the primary connecting facility in the northern tier of the national airport system....
>
> [O]'Hare is absolutely crucial in its role as a connecting facility. The specific adjustments which would have to be made by each airline serving O'Hare necessitated by reducing flights are impossible to predict. The economies of operation obtained by loading partially filled airplanes with connecting passengers would, to a large degree, be lost. Certain markets would certainly suffer cutbacks in service. Massive shifts of activity to other large midwest airports, such as St. Louis or Kansas City, would quickly increase congestion at these facilities producing unacceptable system congestion.
>
> Moreover, shifting the noise problem to other localities would certainly occur if connecting activity were transferred to other airports, simply does not solve the aviation noise issue. More importantly to the State, an immediate decline in employment, payroll and expenditure levels would be experienced [R. 5920-21].

Due to the nature of the Ldn formula, a rather large decrease in operations is necessary to achieve a small drop in measured noise. Studholme provided a general assessment of the amount of operations reduction required to reach a specified reduction in noise:

> To obtain a one-decibel decrease, you would need a 21-percent reduction. To obtain a two-decibel decrease, you would need a 37-percent reduction. To obtain a three-decibel decrease, you would need a fifty-percent reduction. To obtain a four-decibel decrease, you would need a sixty-percent reduction. To obtain a five-decibel decrease, you would need a sixty-eight-percent reduction.
>
> And if you wanted to obtain a ten-decibel reduction, you would need a ninety-percent reduction in the operations at the facility. This assumes that everything else remains constant; there are the same number of aircraft flying during the night, same during the day, same type of aircraft, same mix, and that things don't change over the period of time when the reduction is taking place [S. 290-91].

Curfews on night operations are often discussed because they create more disturbance. Also in the Ldn formula, the elimination of one night flight is equal to ten day flights.

Mr. Ian Bamber, Director of Schedule Planning and Analysis for United Airlines, provided detailed information on the

importance of maintaining O'Hare's current operations. In his opening statement, he pointed out that a complete nighttime curfew and eliminating 32 percent of day flights would only reduce the noise level by five decibels. Discussing the impact of such actions, Bamber called O'Hare "the most important single airport facility in the world" (R. 3988) and that in 1979, it provided single plane sevice to over 200 U.S. cities and 33 foreign cities. It is also a major aircraft maintenance center (R. 3987-99).

In a similar vein, Thomas testified that O'Hare is the focal point of the northern tier of the nation's air transportation system. Passengers connect there to meet flights to destination cities. O'Hare had about 18,000 interline (arrive and depart on same airline) city-pair connections in 1971 and 7,000 intraline city-pair combinations. The largest of these contributed only one percent of the total intraline connections (R. 5945-46). In commenting on this, Bamber said:

> Because of the complex interrelationship of all of those factors, it is impossible to cancel flights at any one station, particularly an important one like O'Hare without disrupting or completely eliminating flight schedules between other pairs of points which precede and follow the flight cancelled at the affected station. Any airline cancelled at O'Hare would definitely affect airline service literally all over the couhtry by every airline that serves the O'Hare Airport.
>
> Taking a flight out from the middle of a flight sequence, especially to major maintenance point like O'Hare, is like taking the bottom card away from a house of cards [R. 3999].

Bamber provided several examples of how reductions or a night curfew could impact flights. He used Boise as an example of the importance of connecting flights:

> The Chicago-Boise market is a very good example. From Chicago to Boise, Idaho, the local market is only 35 passengers a day. That is not economical to provide nonstop airline service in that market for 35 passengers daily, even if they all wanted to go at one time of the day.
>
> However, there are two daily flights nonstop between Chicago and Boise; and the reason there are, is because we are using connecting traffic which is made possible by bringing in these large connecting banks from the East into Chicago to connect with Boise.

Combining it with the local market, we are able to generate a load to support two nonstop flights. If there were no connections from Chicago to Boise, we could not support a connecting flight to Boise [R. 4061-62].

He used a Honolulu to Chicago flight to demonstrate one impact of a curfew on flights between 10:00 p.m. and 7:00 a.m.:

United's Flight 114 is a 747 which originates its day at 9:00 a.m. in Honolulu, operates through Los Angeles at 5:00 o'clock to Denver, and continues on from Denver and arrives in Chicago at 1:30 a.m. the following morning.

Under a nighttime curfew at O'Hare, we will have to cancel the Denver-Chicago segment. It is the last departure from Denver to Chicago. It has night coach fares. It is very popular for the passengers; and since the Denver-Chicago market has no cargo line service, it provides a very, very heavy cargo and mail flight into Chicago. Therefore, Flight 114 would have to be terminated in Denver. There will be no daylight service available from Honolulu to Chicago. Los Angeles would lose its late evening 6:00 p.m. departure for Chicago, and Denver would lose its nonstop flight.

But not only that, when the airplane gets into Chicago it departs again at 8:20 on Flight 193 and it retraces its steps: Chicago-Denver-Los Angeles-Honolulu.

Since the airplane and crew are in Denver, we would have to cancel the flight Chicago-Denver. So again, Chicago will lose valuable service in the morning. It will be an outright cancellation. There will be no value to retiming it because we don't have an airplane and crew of that type available. Therefore, O'Hare would lose the morning service to Denver and Los Angeles, which is a very popular one.

Again, going back to Flight 114, if you wanted Flight 114 to operate into Chicago before 10:00 p.m., it would have to originate at Honolulu at 5:30 a.m. in the morning. That will be a very unpopular time in a market like Honolulu-Los Angeles and an imposition on passengers destined for Los Angeles and Denver.

The airplane also provides a prime after-business departure from Los Angeles to Denver. That would be moved up to around 2:00 p.m. or 2:30, which

> is very early if you finish your business day and get out to the airport.
>
> The fact that it is very heavy for mail and cargo, a night coach flight from Denver to Chicago would be lost because the flight would have to depart Denver too early to be able to pick up the mail and cargo from the night before, and night coach fares will not apply at that early time [R. 4021-24].

Bamber discussed other problems related to a curfew. Planes fly into Chicago for major maintenance. Over half arrive after 10:00 p.m. and leave between 6:00 and 7:00 a.m. Changing this would have a ripple effect throughout the schedule (R. 4008, 4110). Over 6,900 people who use night flights each day would be inconvenienced (R. 4128). A curfew would also disrupt cargoflights since 60 percent of cargo arrives at night (R. 4010). The U.S. Mail service is highly dependent on night flights (R. 4015, 5957). Both Bamber and General von Kann agreed that night flights could not be shifted to daytime because of existing congestion (R. 3171, 4026).

Dr. Richard R. Shaw, an Assistant Director General-Technical for the International Air Transport Association, testified that O'Hare ranks fourth in the nation in international passengers (R. 4387). It would be difficult to use alternate airports for these passengers since they must enter the country through a port of entry (R. 4408). He also pointed out that most international agreements provide for no restrictions on airline service (R. 4427).

Some cities do impose full or partial curfews. These include Kansas City, Houston, Los Angeles, Washington National, as well as Geneva, Sidney, Tokyo-Narita and Hong Kong (R. 4028, 4422). The impact of curfews depend on such factors as their location, numbers of connecting flights, and availability of alternate airports. Bamber pointed out that curfews at Washington and San Diego do little damage (R. 4073).

Reducing airport operations would also have important secondary effects on the economy of the entire Chicago metropolitan area. Approximately 27,300 people work at O'Hare or its off-site locations. The payroll in 1979 was $536 million. Indirect employment such as hotel/motel, air cargo firms and freight forwarders brought the total employees to 75,652 with an annual payroll of $753.71 million. When induced employment was added the number reached approximately 124,403 people with a payroll of $1.46 billion (R. 5916). The total economic benefit of the airport including payroll and direct and indirect expenditures was estimated at $5.68 billion. The economic impact study conducted in conjunction with the O'Hare Master Plan found that in 1976 O'Hare ranked as the seventh leading employer in the Chicago Metropolitan Area and (combined with Midway) represented approximately 0.7 percent of the metropolitan area employment and

5.3 percent of the gross metropolitan product in 1977 (R. 5918). Much of his analysis related to how the compliance options would reduce overall economic activity.

The first scenario involved reducing O'Hare operations to a level that would shrink the noise contours (80 Ldn) such that they would not reach Class A land (R. 5919). Thomas listed the cutbacks necessary to meet this standard:

> A total reduction of 43 percent of day and [all] nighttime operations would have been required in 1979 in order to comply with the 80 Ldn noise level, that is, so that no Class A land would be affected....
>
> To reduce exposures of Class A land to levels of 80 Ldn or higher, the following cutbacks were made: All military operations were deleted; all air cargo flights were deleted; commuter, air taxi and general aviation traffic was reduced by 45 percent; international scheduled traffic was reduced by 46 percent; domestic scheduled traffic, as I have already discussed, was reduced by 46 percent.
>
> I think the implications of these cutbacks are awesome, requiring the elimination of 1,091 flights each day [R. 5947-48].

This scenario would result in an annual loss of $2.02 billion dollars annually. In addition to this, flight fees to remaining aircraft operations would probably be increased to cover losses in airport revenue due to the reductions. This would put O'Hare at a disadvantage and might lead to further reductions (R. 5924). According to the marketing director for the Greater O'Hare Association of Commerce and Industry, a major reduction at O'Hare would also severely impact the surrounding communities as "17 out of every 100 jobs" in the area were directly tied to O'Hare (R. 5252).

The second scenario involved purchasing impacted Class A lands and evaluating the fiscal and social costs of this action on those communities affected by such a policy. The social impacts of this option were discussed in the section on land purchase. In economic terms, the economic cost of this scenario to O'Hare was given as 295 million dollars in a one time expenditure. (Gr. Exh. 223, "exhibit 19", R. 5928-30).

The third scenario eliminated night flights and purchased the remaining impacted Class A properties. This reduction would lead to a loss of 400 million dollars annually and require property acquisition costs of approximately 40 million dollars (Group Exh. 223, "Exhs. 27, 29", R. 5949-51).

At Midway, meeting the 65 Ldn standard would require reducing operations to 20 per day, meaning a maximum of 10

flights (R. 6209). Purchasing 36,600 homes under an unrestricted activity option would cost over 1.5 billion dollars (R. 5968).

Thomas testified under questioning that the Landrum and Brown analysis did not consider obtaining a variance to avoid the need to reduce service or purchase land. It also did not take into consideration other alternatives or combinations of alternatives for reducing noise impacts (R. 6125). It did not attempt to put a value on the impact of noise on surrounding residents (R. 6109).

Land Use and Zoning

Testimony on the role that land use planning can play in preventing additional noise problems around airports has been discussed in prior sections of this Opinion. It is not necessary to repeat those observations here.

A 1983 DENR report titled A Demonstration of Airport Noise Impact Mitigation (Exh. 239) reviewed options for addressing land use issues. Two attorneys, Roger W. Findley, Professor of Law at the University of Illinois and Daniel King discussed the law in this area and potential problems that local airport noise zoning ordinances may encounter. They concluded:

> Zoning for noise-compatible development around airports has not been addressed directly by the Illinois courts or the Illinois General Assembly. However, it seems probable that local governments in Illinois may prohibit noise-sensitive uses in the area near airports, through the exercise of either general statutory zoning authority or home rule powers. Such a local prohibition should be vulnerable to attack only if there is no reasonable basis in fact for the determination that the airport's present or future noise levels would be incompatible with the physical or mental health of residential users of the affected land, or if there is no profitable, nonresidential use for such land....However, in order to ensure that the zoning is able to withstand challenge, the local government must be able to demonstrate that the exclusion of residential uses is consistent with the public well-being and the general use of the district. The exclusion of residential uses is likely to be upheld where land use prior to adoption of the noise-compatibility ordinance was nonresidential, that is, agricultural, industrial, or commercial [Id. 147, 152].

Exhibit 239, Appendix H contains suggested language for amendments to the Airport Zoning Act. Ill. Rev. Stat. 1985, ch.

15 ½ , par. 48.1 et seq. The amendments were recommended by the Illinois Public Airports Association and provide that:

1. The Illinois Pollution Control Board (IPCB) would establish the noise standards necessary to protect the environment, comfort and general welfare of the public from airport noise in noise-sensitive areas.

2. No person could construct any new structure or make new use of any existing structure in any area where the noise levels have been established by the IPCB unless it is demonstrated to the Illinois Environmental Protection Agency in a permit proceeding that the interior noise levels would be below the levels established by the IPCB.

3. Every political subdivision with a noise zone located wholly or partially within its jurisdiction would have to adopt airport zoning regulations for that part of such noise zone consistent with items 1 and 2 above.

4. Where a noise zone exists in connection with a publicly owned airport, the Department of Transportation would, on request of the political subdivision in which the zone is located, adopt and enforce airport zoning regulations consistent with items 1 and 2 above [Id. 58].

Findley and King also considered the possibility of "truth in sales" provisions to require notification to buyers of potential noise impacts. They concluded:

> There appears to be authority to support a noise disclosure ordinance in home rule communities that would extend to all sales and leases of residential property. Such an ordinance could be enforced by a penalty provision, applied to the agents of a property owner as well as to the owner himself.
>
> The home rule ordinance, however, has two severe shortcomings: it could not be applied to property outside the home rule unit's boundaries, and it could not be enacted by a non-home rule government. There is no apparent authority by which a non-home rule government could adopt a general noise disclosure requirement. The use of building codes and zoning ordinances, as well as reliance on state regulation of realtors, seems to offer no practical means of achieving effective disclosure of local airport noise conditions. Local control over new subdivision development, however, may provide some partial satisfaction of the community's interest in having noise conditions fully disclosed to prospective residents [Id., 132].

Alternate Airports

Shifting traffic from crowded, noisy airports was also discussed as a possible alternative. Such shifts are difficult for most passenger service, but are taking place on a small scale for certain passenger and freight operations. Rockford, for example, has been obtaining freight and private jet service since it is relatively convenient to the Chicago metropolitan market by surface transportation (S. 417-19). General von Kann commented on the problems major shifts to alternate airports would cause:

> Now, shifting aircraft to neighboring airports is also one of the alternatives to be considered. In the case of O'Hare a very large number of flights would have to be shifted to produce a significant noise reduction. Such shifting would mean (A) moving flights to Midway, which is unattractive because the airport is virtually surrounded with Class A land and only limited large aircraft frequency could be tolerated before it too would violate the regulations,...(B) A major transfer of flight to airports serving other regional cities not affected by these regulations -- by its regulation, for example, South Bend, Fort Wayne, Janesville, Milwaukee, or St. Louis.
>
> Now, this would represent a significant loss of airline service to Chicago and to Illinois and an irreparable injury to the economy of the city and state and a shifting of the flights would seriously impair the passenger, freight, and mail traffic that must utilize O'Hare as a connecting point.
>
> Moreover, some of these other airports are not operationally capable of accommodating all of the aircraft types utilizing O'Hare now and in the future [R. 3065-66, July 27, 1978].

Bamber also commented on the problems associated with a major shift to alternate airports:

> It will be literally impossible to reconstruct any meaningful part of the O'Hare connecting complex at another airport. The connecting traffic that is aboard the flights, which would be unable to connect at that point, would most likely have to use surface transportation back to O'Hare to continue their journey beyond.
>
> Most of the service at Midway is new service, rather than existing flights diverted from O'Hare. Based on our experience of operating at Midway from 1970 to 1973, Midway does not have the complex or the

airport capability to serve the majority of connecting passengers that right now are going through O'Hare [R. 4072].

ECONOMIC IMPACT STUDY

In regulatory proceedings, the Board is required to consider the technical feasibility and economic reasonableness of the proposed regulation. Ill. Rev. Stat 1985, ch. 111 ½, par. 1027(a). Celotex Corp. v. Pollution Control Board, 94 Ill.2d. 107, 121-124, 445 N.E.2d 752 (1983). The Board must make a finding as to technical feasibility and economic reasonableness pursuant to Section 27(b) of the Act. Citizens Utilities Company v. *Pollution Control Board, et al.*, No.'s 84-0412, 83-0498 consol. (3rd Dist. 1985). The Board will examine the effect of the proposed regulation first on the downstate (outside Chicago) airports and secondly on the O'Hare and Midway airports.

The Department of Energy and Natural Resources (DENR) formerly (IINR) submitted a four volume economic impact study (EcIS) which considers the different alternatives available to meet the phased in noise standards, the respective costs, and the relationship of costs to benefits of the proposed regulation (Volumes I, II, III and IV are Exhibits A, B, C, and D respectively).

Prior to development of the economic impact study, 24 public airports including O'Hare and Midway were expected to be in violation of the proposed 65 Ldn noise standard (Vol. I, Table 2-1 at 11). After study, the EcIS consultants found that 17 airports (14 in Vol. I, Table 1-2 plus O'Hare, Midway, and Lansing) would violate the 65 Ldn noise standard (Vol. I at 1, Table 1-2 at 4, at 119). At the time of the EcIS there was one dwelling unit off the end of runway 27 at Lansing, a non-jet airport, which would be subject to noise in excess of 65 Ldn. (Vol. I at 119). It apears the authors also dropped consideration of East Alton-Civic Memorial Airport under the three levels of noise mitigation methods (Vol. I at 82, Vol. II at xi).

The analysis of airports will be separated into consideration of downstate and Chicago airports, beginning with the 12 downstate airports which the EcIS assumed would violate a 65 Ldn standard. For the purpose of determining the economic impact of the regulation, the consultants studied three levels of action airports could take to reduce their noise impact (Vol. I at 6). Methods least disruptive of service were considered first in the first level. Level two results in changes in time or type of service while level three consists of service reductions. The levels were described as follows:

Level 1: operational changes such as departure headings, noise abatement turns, preferential runways, and barriers and berms (where needed);

Level 2: elimination or reduction of nighttime operations of whole classes of aircraft but their addition to daytime operations to escape 10 dB nighttime penalty;

Level 3: total elimination, both night and day, of some types of jet aircraft operations.

These groups of methods do not represent the only noise reduction actions which can be taken. They are illustrative of one way of meeting the proposed 65 Ldn standard which was convenient for economic analysis. They do not consider variances or other relief from the standard. Every public airport proprietor will have to determine what method or combination of methods would lead that airport into compliance with a 65 Ldn standard. The authors of the EcIS chose a certain combination of methods whose costs are presented below. It is important to remember that for purposes of the EcIS the authors predicted that the noise levels would not grow significantly from 1981 through the year 2000 but would increase only by one to two decibels (Vol. I at 8-9).

Downstate Airports

At the 12 downstate airports 2,575 dwellings were located within the 65 Ldn contours. Of these, 1,045 were mobile homes. Column A of Table 3 gives the number of residences near each airport which were exposed to 65 Ldn or more (vol. II, Table II-1 at 5,6). Of the impacted homes four (0.2 percent) were subjected to over 75 Ldn, one hundred forty (5.4 percent) to 70-75 Ldn, and 2,431 (94.4 percent) subjected to 65-70 Ldn. Breaking down the figures as to location, 62 percent were located at Moline-Quad Cities and 24 percent at Peoria, accounting for 86 percent of the homes. The remaining 14 percent were scattered among the remaining airports. Three of these airports have from 34 to 54 affected dwellings while six have 0.25 or fewer such dwellings. Id. From these figures, the authors of the EcIS concluded "[t]hus the downstate airport problem is essentially one of reducing noise levels by relatively modest amounts for the great bulk of the affected properties." (Vol. II at 7).

In reducing noise levels at the downstate airports, level one methods would only be applicable at four (Decatur, Quad-City, Peoria, and Capital). These would reduce the number of Class A dwelling units subjected to 65 Ldn or more by seventy-five percent (Vol. II at 8). Column B of Table 3 gives the number of residences which will be exposed at 65 Ldn or more after level one is implemented.

TABLE 3
NUMBER OF NOISE IMPACTED HOMES AND PERCENT REDUCTION IN JET OPERATIONS AT DOWNSTATE AIRPORTS FOR VARIOUS LEVELS OF NOISE ABATEMENT.[1]

Airport	A	B	C	D	E
Champaign-Willard	17	17	100	9	50
Danville-Vermillion	10	10	87	0	0
Decatur Municipal	148	44	74	0	0
Galesburg	3	3	27	0	0
Moline-Quad City	1598[2]	228	100	117	80
Mt. Vernon	40	40	100	10	37
Peoria	621	144	100	24	37
Quincy	1	1	42	0	0
Rockford	25	25	100	16	80
Springfield-Capital	36	17	100	4	37
Waukegan	54	39[3]	100	1	20
West Chicago DuPage Co.	21	24	100	9	37
TOTAL	2574	592[4]	NA	190	NA

A: Number of residences subject to noise levels in excess of 65 Ldn.
B: Number of residences exposed to at least 65 Ldn after implementation of level one noise reduction measures.
C: Percentage of jet operations which must be rescheduled to daytime under level two night curfew measures.
D: Number of residences exposed to at least 65 Ldn after implementation of levels one and two.
E: Percentage of jet operations that must be eliminated (level three) to comply with 65 Ldn after levels one and two are implemented.

SOURCE: Data from tables II-1 and II-22 from Vol. II.

[1] This table assumes that proprietor does not choose to purchase noise easements, buy outright or insulate homes and does not seek a variance or other relief from the regulation.
[2] Includes 1,045 mobile homes.
[3] Is given as 54 on other tables in EcIS.
[4] Is given as 607 in other tables, the Board will use 607.

Level one methods include the use of changes in departure headings amounting to five to ten degrees at Moline-Quad City, Decatur and Springfield (Vol. II at 8-9). The costs were predicted to be zero. Another method involves the construction of a 2,800 foot berm along the southeast sideline of runway 22 at Peoria. The berm would reduce noise levels to 110 of 621 homes at a cost of $313,600 (Id. at 9).

The use of additional preferential runways was considered useful only at Peoria and Decatur (they are already used at Rockford and to a certain extent Decatur) (Vol. II at 9). The authors calculated the annual costs associated with possible taxi delays and costs arising from air delays (increased flying time), components of which included aircraft operating and maintenance costs and passenger delay costs (Vol. II at 9). At Peoria, a change in the percentages of flights allocated to different runways would result in a reduction of taxi time. This reduction would save $13,768 in ground operating costs for general aviation jets and $5,937 in passenger time for a savings of $19,705 in ground taxi costs. (Vol. II at 19). In the air the aircraft would have to turn after takeoff which would result in added flight costs of $20,186 and added delay for the passenger, costing the passenger $6,863 of his/her own time. Id. The total of $27,049 is the cost during flight due to preferential runway use. Taken together, the ground savings of $19,705 and the added flight costs of $27,049 yield a net cost to general aviation jets at Peoria of $7,344 (Vol. II at 19). For commercial jets, the savings of $104,483 (less ground time) and the added flight costs of $143,824 yield a net cost to commercial jets at Peoria of $39,341 due to preferential runway use (Vol. II at 19-20).

The use of preferential runways at Decatur would similarly reduce the taxi time of aircraft (Vol. II at 10). For general aviation jets this would result in savings on the ground of $17,992 but added flight costs of $6,617 for a net savings of $11,375 (Vol. II at 15). Ground savings of $60,324 but added flight costs of $22,248 yield a net savings of $38,076 for commercial jets (DC-9) at Decatur (Id. at 17).

Several methods of reducing noise impact were not specifically included in the level one analysis even though they are less drastic than levels two and three. They include the purchase of noise easements over homes, purchase in fee simple and insulation for soundproofing. The EcIS considered the cost of implementing these methods on the 607 homes which would still be impacted after the implementation of level one noise reduction methods.

Noise easement costs vary as percentages of property values: 2.5 percent for property in a 65-70 Ldn contour, 9 percent in a 70-75 Ldn contour, and 17 percent in a 75-80 Ldn contour (Vol. II at 38). Total cost for easement purchases for the remaining 607 homes at the downstate airports would be $824,950. If easements were required only for 70 Ldn or greater contours, then the total

easement cost for these airports would drop to approximately $318,000 based on the number of homes in existence at the time of the EcIS (Vol. II at 38). Easements plus level one reductions would cost about $1.14 million.

Property acquisition also includes the purchase by the proprietor of undeveloped or residential property. Prices paid by proprietors would approximate market value, with relocation benefits and administrative costs added. The costs of undeveloped land is substantially less than land with residences. The EcIS authors looked only at property with completed residences. The total costs of property acquisition (607 homes) after level one reductions was estimated at $29,340,567.

This cost calculation does not take into account any noise-compatible land reuse. Reallocation and resale of these lands for noise-compatible uses such as for farming or industrial development can significantly diminish the total cost. It may also be possible to convert homes to office space. Once acquired, the property land use designation would be longer be Class A, thereby complying with the proposed regulation.

The remaining impacted homes could also be insulated to reduce indoor noise levels. The total cost of such insulation was estimated at $2,001,600 (Vol. II, Table II-8 at 32). This approach, however, would do nothing to reduce outdoor noise.

Referring to Table II-8 (Vol. II at 32), the authors found that over 50 percent of insulation costs at downstate airports would be for homes requiring 5 decibels or less of quieting, with the remaining mostly in the 5-10 decibel reduction range. The average cost per dwelling was estimated at $3,300. Id. The authors mention that a substantial portion of the insulation cost can be recovered, presumably through energy savings.

The authors note that the estimated insulation cost may be low since it is based on decreasing the noise in one decibel increments. In any major insulation program, the cost may differ per decibel depending on the design, structure and materials of each house. The authors hypothesize that if one, two or three decibel reductions by insulation are not perceived as helping by the homeowner, there may have to be a minimum insulation requirement of a five decibel reduction (Vol. II at 33).

Another alternative studied was a purchase guarantee program whereby the proprietor guarantees the fair market value of the property. If a homeowner could not obtain such value, the proprietor would pay the fair market value or pay the homeowner the difference between fair market value and the best market offer (Vol. II at 456). No costs were presented. Use of this technique alone would not reduce the amount of noise to the Class A receiving property.

If level one reductions and the alternative procedures outlined above do not bring an airport into compliance and a variance or other relief is not sought, then the proprietor may have to consider level two reductions. These would include rescheduling nighttime jet operations to daytime operations to avoid the ten decibel nighttime penalty. Level two reductions could be used in conjunction with the other alternatives mentioned above. Columns C and D, respectively, of Table 3 give the percentages of nighttime jet operations that would have to be rescheduled to implement level two and the remaining residences that would still be exposed to more than 65 Ldn.*

A partial reduction of night flights at four of the twelve airports would bring them into compliance while 100 percent night curfews at the remaining eight would still not bring them into compliance. Two of the eight would have four or fewer homes still impacted by over 65 Ldn, and three would have nine or ten homes so situated (Vol. II at 49). Thus, the eight remaining downstate airports (listed in Vol. II, Table II-12, Vol. II at 55) would have to implement level three daytime operational cutbacks as well to come into compliance unless alternative measures such as easement, property purchase or variance were instituted. For example, if Champaign-Willard Airport bought an easement over the two remaining dwellings or purchased them, the reduction in daytime operations may not be needed. The same is true of the single dwelling at Waukegan which otherwise would command a 20 percent reduction to achieve compliance, the four dwellings at Springfield which would command a 37 percent cut in daytime operations, and so on. The percentage of jet flights that would need to be eliminated under level three reductions to achieve compliance with a 65 Ldn standard is given in column E of Table 3.

The EcIS did not place an absolute dollar cost on the level two and three methods because "unfortunately there is no simple way of measuring these costs and attaching to them a dollar figure which could later be added to the other costs of noise abatement." (Vol. II at 50). The substantial problems to travelers and business that would result from curfews and reductions in service are discussed elsewhere in this Opinion and will not be repeated here.

Eliminating flights is a mitigation measure of last resort. Airports generally attract new facilities, create new investments and jobs, and increase the demand for local goods and services, thereby increasing local revenues. Impacts on an

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Appendix B to EcIS Volume I contains day and night flight takeoff data which also incorporates computerized data in Tables B-2 (Decatur), B-3 (Peoria), B-4 (Moline-Quad City) and B-5 (Rockford) (Vol. I at 150-7). Table II-11 (Vol. II at 49) tabulates the effects of night curfews at the downstate airports.

airport affect the area economy. Reduced flight availability and fewer connecting flights can reduce the attractiveness of the area to new businesses and disrupt air cargo schedules. Some of this impact can be mitigated by substituting equivalent propeller service for eliminated jet service (Vol. II at 60-1). On this point the authors commented, "that at some downstate airports jet service recently has decreased as a result of airline deregulation by the C.A.B., and that there has been an increase in the number of commuter airline flights by propeller aircraft." (Vol. II at 56).

The EcIS authors attempted to place a dollar value on the benefit to be achieved by noise reduction. They used the regression and legal methods. The regression method is based on estimating the charge in property value associated with noise levels. The legal method is based on inverse condemnation recoveries as a measure of property value.

Studies in a number of cities determined that the percentage depreciation (appreciation) in property value per decibel increase (decrease) in the noise level varied from 0.29 in Cleveland to 1.10 in Washington, D.C. The mean value was 0.58 percent. The authors used the mean value for their estimates by the regression method. (Vol. II at 90-91). Using the inverse condemnation method, the report concluded that reducing noise 1-5 dB (from 70 to 65 Ldn) benefitted the property 2.5 percent, from 6-10 dB (from 75 to 65 Ldn) 9.0 percent and from 11-15 dB (from 80 to 65 Ldn) 17 percent (Vol. II at 93).

Using the estimated benefits and costs, the EcIS concludes that level one measures in total are clearly economically feasible. The total cost is $311,000 while the benefits range from 1.3 to 1.5 million dollars. The cost of the Peoria berms by themselves did not outweigh the benefits.

Insulation had an estimated cost of $2 million against benefits of $825,000. However, if the benefits of reduced heating and air conditioning costs to homeowners are considered, the cost would be reduced to approximately one million dollars and approach a 1:1 benefit-cost ratio. Similarly, noise easements, which substitute compensation for abatement, have costs equal to their benefits. Property acquisitions were the most expensive alternative at $29 million in costs to $825,000 in benefits. However, much of this cost could be recovered if the land were resold for compatible uses.

The level two and three curfew and reduced service options had benefits of between $2.2 million and $250,000 depending upon the assumptions used (Vol. II at 96-112). The costs could not be reduced to dollar estimates.

The annual cost of enforcement including costs to the airports, Illinois EPA, and this Board were estimated at $70,750 for the downstate facilities (Vol. II at 66).

The authors determined that the cost of meeting the standard could probably be recovered from a small charge such as a landing fee:

> For illustration, consider an abatement option of comparatively moderate cost, such as insulation. If undertaken by the 12 airport authorities, its aggregate cost of $2.0 million (before energy savings) might, as one possibility, be recovered through charges in the form of jet aircraft landing fees. Suppose recovery took place over a 5 year period, with a flat charge on each jet (air carrier or other) landed. Given the volume of operations at these airports, such a charge would be about $5 per landing. This charge is by no means negligible when seen as an increment to the landing fee for air carriers of $24-$30 charged by many airports, or to the parking fee of $7 - $10 charged to business jets. However, the $5 fee diminishes in importance when put on a per passenger basis. Rough calculations indicate that this fee amounts to about $0.25 per passenger landed. [assume 45 passengers for Ozark and 3 passengers for business jets]. This sum is substantially less than 1% of the typical passenger charge for an Ozark flight, or of the implicit passenger charge,or cost of a business jet flight. The $5 landing charge is also seen to be small, though not negligible, when compared to the direct operating costs (1978) of jet aircraft -- about $9.50 per minute for DC-9 and $5.20 per minute for a business jet...
>
> The foregoing observations treat costs as an aggregate for the affected airports. But it should be noted that the insulation burden is not evenly distributed among these airports. The Quad Cities airport in particular has a relatively large share of the dwellings eligible for insulation, but its share of air traffic is not commensurately as large. As a result, insulation costs, if recouped in landing fees, would require charges of around 2.5 times as great as those indicated above. The per passenger cost would be a little less than twice the earlier figure [Vol. II at 66-67].

As with the cost of flight rescheduling and reduction, the EcIS placed no dollar value on reducing the disruption in the lives of people living in high noise areas.

O'Hare International

The discussion of the economic reasonableness of the proposed regulation as it relates to O'Hare and Midway airports

will be similar to the discussion of the twelve downstate airports above. The intensity of the surrounding land uses and the numbers and types of aircraft operations at the two airports complicates the analysis.

According to the authors, In order to reach compliance with the 65 Ldn noise limit of the proposed regulation, O'Hare would have to implement the following changes (retrofits and new, more quiet aircraft already anticipated): use a quick clean up take-off procedure, use reduced flap landings (federally required), ban night flights without adding them to the daytime traffic (Vol. III at 58, 62), with an overall 95 percent reduction in flights (Vol. IV at 80-2). As for changing to newer more quiet aircraft, the national fleet mix has been changing and already is 85 percent in compliance with FAR Part 36 requirements and will be in total compliance in a few years [See September 18, 1985 testimony]. O'Hare's fleet mix is assumed to approximate the national mix. The quick clean up take-off procedure has already been implemented. Thus operational cutbacks were considered necessary to meet the standard.

While Volume III spent a lot of time on landing and take-off procedures which are cost beneficial, in view of the many changes at O'Hare since this EcIS was written, this discussion will not dwell on these topics but will directly address operation cutbacks. As the authors of the EcIS state, "[i]t is apparent that enforcement of the regulation to achieve compliance with the prescribed noise limits would involve the implementation of curfews and operations cutbacks." (Vol. IV at iv). Rather than paraphrase the authors' words concerning the economic impact of the proposed regulation at O'Hare, the Board will quote the findings:

> The use of a [night] curfew at O'Hare would affect up to 65,400 aircraft operations between 10:00 p.m. and 7:00 a.m. per annum. The implications would not be limited to aircraft operations alone. More specifically, enforcement of this scheme would eliminate 3,685,000 night coach fares. Ancillary effects of a curfew include passenger inconvenience, reduced efficiency of airline operations, cancellation and elimination of flights and a severe adverse economic impact on air cargo transport.
>
> The economic impacts of imposing operations cuts as a means of reducing noise is discussed in [Vol. IV] Section H (page 80). The economic effects of an operations cutback would, as the author notes, ". . . lead to decreases in direct employment, payrolls and expenditures for local goods and services by airport tenants [sic], resulting in, ultimately, a variety of indirect and induced changes throughout the Chicago area economy." In this regard, the record in these proceedings indicates that compliance with the Ldn

noise limit would result in a direct employment decrease of over 11,600 with a commensurate payroll reduction of $220,000,000. The latter would induce indirect effects on employment and payroll in the Chicago area by more than 35,168, with a payroll of $345,000,000. Furthermore, the decrease in airport related expenditures of $194,000,000 translates into an indirect and induced decrease of $538.3 million.

Although the foregoing discussion alludes to differential cost and benefits projections, the economic impacts of operations cuts as a means to achieve compliance with the proposed regulations is substantial and readily quantifiable: a reduction in aircraft operations of 45 percent to achieve the 80 Ldn noise limit would, according to an estimate contained in Volume IV, reduce employment in the Chicago area economy by a total of 49,000 jobs with a negative economic consequence of approximately $2,000,000,000 on the regional economy. [Vol. IV at iv-v; See Vol IV at 80-2, 87-89].

The first abatement strategy (See Vol IV, Table III - 7 at 151) considered involves a quick flap retraction takeoff procedure and change in the use of certain runways at night, thereby reducing noise levels at 101,500 homes by about 60 percent, for a total of 42,000 homes left above 65 Ldn.

Purchase of easements for the 42,000 homes, based on certain assumptions, would cost 113 million dollars, which is less costly than insulation. Insulation for these 42,000 homes would cost 210 million to 341 million dollars without figuring the recovery of heating and air conditioning costs, which may reduce these figures by half. Acquisition and demolition of the same homes cost approximately 2.7 billion dollars.

A total nighttime curfew wherein the flights are not added to daytime operations would eliminate 10-12 percent of total airport operations, reducing by 40 percent the 42,000 homes subjected to over 65 Ldn. Before the imposition of any night curfew there would be 28,532 homes in the 65-70 Ldn range, 10,607 in the 70-75 Ldn range, 2,046 in the 75-80 Ldn range and 760 in the 80-85 Ldn range (Vol. IV, Table III-6 at 145). Once a night curfew was imposed, 24,651 homes would still be over 65 Ldn and are broken down as follows: 16,434 (65-70 Ldn), 6,110 (70-75 Ldn), 1,536 (75-80 Ldn) and 571 (80-85 Ldn). Id.

To bring the nearest residence to the airport down to 80 Ldn, however, further cuts would be needed, such as a 33 percent reduction in daytime operations. The cost for the night curfew and 33 percent daytime reduction is estimated at 2 billion dollars in aggregate expenditures and a loss of 49,000 jobs in the Chicago area economy.

Unfortunately, the number of homes subjected to over 65 Ldn but which are then reduced by the 33 percent daytime operation cut are not given. Of course, the number of homes further reduced by a 33 percent day cut would not be as large as the number from the night curfew due to the ten decibel weighting of the night values and the absence of such weighting for day values.

As stated earlier, for total compliance with the final 65 Ldn noise limit of the proposed regulation using only operational cuts, 95 percent of all operations at O'Hare would have to be eliminated.

Midway

Midway Airport and its surrounding land uses are represented in Figure 2-2 of Volume III. The EcIS authors note that "the airport is not buffered at its periphery by open space or by commercial or industrial development. Residential properties abut the airport solidly to the west and south, and somewhat unevenly but still closely to the north and east." (Vol. IV at 158).

The best data summation of the noise effects and contours of Midway appears in Volume IV and will be duplicated here as Table 4.

Four different activity levels are represented by the data in Table 4. At the time of the EcIS preparation (November 1981), the authors chose the 1977 representative noise levels and discarded the 1979 option because of lack of data (Vol. IV at 159). However, it is interesting to note that the 1979 data shows 344 housing units in the over 80 Ldn category and there appear to be 85 Ldn pockets (R. 6207).

As for lowering noise levels at Midway, modest operational changes are not useful because of residential density and runway length (Vol. IV at 158). The lack of substantial nighttime traffic lowers the value of a nighttime curfew to almost nothing. Id.

As in the other airport situations, the alternative mitigation options of easements, property acquisition, insulation and operation reductions were analyzed. The results are tabulated in Table IV-6 (Vol. IV at 178).

Easements on the average would cost $3,350 apiece and $27 million for the 8,000 dwelling units affected (Vol. IV at 167). Sixty percent would be for those dwellings in the over 75 Ldn contour. Id. The benefits of noise easement purchase are equal to their costs.

TABLE 4
NOISE IMPACTS AT MIDWAY AIRPORT, CLASSIFIED BY DATA SOURCE

Data Source and Noise Level	Acres	Area Population	Housing Units
1. 1977 Master Plan contours, 320 daily departures			
65-75 Ldn	1,280	20,000	6,000
Over 75 Ldn	640	7,000	2,000
2. 1995 Master Plan contours, 510 daily departures			
65-75 Ldn	17,280	217,000	65,000
Over 75 Ldn	3,200	36,000	11,000
3. 1979 Landrum and Brown (Exhibit 51) 265 daily departures			
Over 80 Ldn	n.a.	n.a.	344
4. 1985 Landrum and Brown (Exhibit 53) 378 daily departures			
Over 65 Ldn	4,300	118,500	36,600

Sources: (1) and (2) from "Airport Development Alternatives", Chicago O'Hare and Midway Master Plan Public Information Meetings, November 6, 7 and 8, 1979. Entries (3) and (4) are from the exhibits contained in Testimony of the City of Chicago Before the Illinois Pollution Control Board, June 16-20, 1980.

n.a. is not available.
[Excerpt from EcIS Vol. IV, Table IV - 1 at 160].

The acquisition and demolition of the 8,000 dwellings would cost $423 million, exceeding the benefits of $13-27 million (Vol. IV at 168-9). To purchase the 2,000 dwellings over 75 Ldn, costs of $77 million are more than the benefits of $7-16 million. Id.

Insulation costs for the 8,000 dwelling units above 65 Ldn would be $71-102 million, half of which would be for the 2,000 dwellings above 75 Ldn. (Vol. IV 163-6). Once again, calculation of energy savings could cut the costs in half. Despite this, the costs outweigh the benefits of $17-27 million. Id.

The benefits in noise reduction to be achieved by operation cutbacks would depend on the mix of jet and non-jet aircraft to be eliminated or maintained. One estimate indicates that a 97 percent cut in operations would be required from projected 1985 levels, leaving twenty daily general aviation flights which would include a few jet operations (Vol. IV at 170-172: R. 6207). To achieve 80 Ldn rather than 65 Ldn at the nearest property would require a 35-40 percent operations cut (Vol IV at 172). While no costs for operation reductions (in order to comply with 65 Ldn) are given, benefits to households and schools are estimated at $28 million, and when amortized over 10 years, an average benefit per day of $7,671 occurs (Id. at 174-176). The authors compare the $7,671 benefit with the impact of eliminating 620 operations. Id.

DISCUSSION OF THE PROPOSED RULE

In considering this proposal, the Board has been impressed by the complexity of the airport noise issue. The desires of the competing interests are understandable and essentially preclude a mutually satisfactory solution other than "airplanes that make no noise"(R. 5808).

The Board agrees that the people subjected to noise need relief and that efficient, readily available air service is essential to our society. The massive problem at O'Hare and Midway developed over a number of years and it will take a number of years to bring it under control. At the downstate airports, the problem is not as severe and can be more readily be brought under control. Given the planned expansion at downstate airports, they too can expect to experience severe noise problems in the absence of a noise regulation. The Board agrees with Dr. Zinschlag that "Charleston and Mattoon could become like Bensenville if something is not done" (R. 1815).

This Board by itself cannot solve the noise problem. Units of federal, state, and local government as well as the courts, industry, realtors, developers, proprietors and potential buyers and sellers of homes must all participate to some extent if progress is to be forthcoming. For its part, the Board will establish a noise standard for public airports and require that cetain information be made available to the public. This action

by itself will make a small, but hopefully significant, dent in a very large problem. The authority and ability to zone around airports, develop and purchase quieter aircraft, alter flight operations and educate the public about potential noise problems rests with other entities.

The Attorney General amended his proposal several times since 1977. The following discussion is based on the proposal filed on June 12, 1978 (Exh. 127) as modified by AGO Comments of October 26, 1983 and AGO Supplemental Comments of October 11, 1985. The amendments of November 7, 1979 (Exh. 156) are not being considered, although they have not been formally withdrawn. The Board has modified the Attorney General's proposal in several respects. Comments on these modifications and the basic rule are requested during the first notice period. Portions of the proposed rule are discussed below.

Subpart A: General Provisions

Section 904.110

The definition of Class A land for purposes of this rule is that of Section 901.101 except that SLUCM codes 762 and 921 are dropped. This will allow flights to use forest preserves and some parks as noise corridors. The Board recognizes that while parks should be noise impacted as little as possible, it is far more important to protect Class A residential uses. The forest preserves around O'Hare provide potential corridors for routing aircraft to avoid residences.

The Board has included in the regulation definitions of large, small, public and civil aircraft which correspond to those of the FAA in the Title 14 of the Code of Federal Regulations.

The Board has simplified the definition of airport expansion in proposed Section 904.110 to be the construction of a new runway. The AGO's definition in its proposed rule 101(x) (June 12, 1978 proposal) could be interpreted to include any action that increased the noise impact of the airport. Such all-inclusive language could have had proprietors requesting variances or other relief every time a flight pattern shifted or another plane was added.

Section 904.120

The Board has incorporated 14 CFR 150, Appendix A (1985) into the proposed rule. This appendix is from the FAA's Airport Noise Compatibility Planning rules. It details the methods for calculating Ldn and developing noise exposure maps. The use of this appendix should make compliance less burdensome for airports and consultants already familiar with the federal methodologies. FAR-150 concepts are also used in other portions in the proposed rule. It is not the intent of the Board that all provisions of FAR-150 apply to this rule. In particular, noise

exposure maps developed as part of the federal Part 150 program may be modified for use in complying with the proposed rule. Such maps may, however, be used in enforcement proceedings against proprietors. The proposed rule also specifies that the maps contain some information in a form other than that required by the FAR-150.

By incorporating Part 150, the Board notes that the FAA Integrated Noise Model mentioned therein does not specify which version is to be used. The Board necessarily believes the current version is to be used. However, to avoid confusion, the current version, Version 3, will be used by the Board. Therefore, the Board hereby introduces the following documents into the record and adopts them as exhibits:

> Exhibit 254: FAA Integrated Noise Model Version 3 Users Guide; # FAA-EE-81-17, October 1982, as amended by change 2 in August 1983.
>
> Exhibit 255: FAA Integrated Noise Model Validation: Analysis of Carrier Flyovers at Seattle-Tacoma Airport; # FAA-EE-82-19, November 1982.

Exhibit 254 is the user's guide for the current INM version and Exhibit 255 is its validation study.

Furthermore, the following technical documents utilized in Part 150 Appendix A and which the Board has incorporated in Section 904.120 are made exhibits:

> Exhibit 256: "Methods for the Measurement of Sound Levels," American National Standards Institute publication ANSI S1.13-1971, revised 1976, available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018;
>
> Exhibit 257: "Specification for Sound Level Meters," American National Standards Institute publication ANSI S1.4-1983, available from the Standards Secretariat, Acoustical Society of America, 335 45th Street, New York, NY 10017.

The AGO suggested in its supplemental comments that the following language be included in the rule:

> To determine whether emissions of sound comply with this Part, Ldn values resulting from airport operations shall be determined by utilizing any of the following procedures and methods of calculations:
>
> (a) "Calculations of Day-Night Levels (Ldn) Resulting from Civil Aircraft Operations," January, 1977 (EPA 55019-77-450); or

(b) "Federal Aviation Administration Integrated Noise Model," January, 1978 (FAA-EQ-78-01), as from time to time revised; or

(c) Any Federal Aviation Administration approved methodology, such as those listed in 14 CFR Part 150, Appendix A, and as from time to time revised; or

(d) Any procedure adopted by the Illinois Environmental Protection Agency and filed with the Illinois Secretary of State; or

(e) Any other methodology demonstrated at hearing by the proponent of the methodology as demonstrating within a reasonable degree of certainty a statistical correlation of actual with predicted or measured aircraft noise levels [AGO Supplemental Comments at 6].

While these procedures may be useful, the Board notes that most are not capable of being incorporated into the rule due to the incorporation provisions of the Illinois Administrative Procedure Act (APA), Ill. Rev. Stat. 1985, ch. 127, par. 1006.02, as amended by P.A. 84-784 (eff. January 1, 1986).

The APA provides that in any rule where there is incorporation of a federal rule, standards or guidelines of a federal agency or of a nationally recognized organization or association, that there be no later amendments or editions (Id., see also 1 Ill. Adm . Code 220.760, 220.780 as published at 9 Ill. Reg. 20700, December 27, 1985). The AGO's language in subsections (d) and (e) would be too speculative and could not be used in any Illinois regulation. The Board has accepted the AGO's use of 14 CFR Part 150 Appendix A and has also incorporated two of the standards/guidelines of a nationally recognized organization, the American National Standards Institute. The Board is confident that the procedure in Part 150 Appendix A as proposed by the Board in Section 904.120 will prove adequate.

Section 904.121

Proposed Section 904.121 specifies the measurement and documentation methods as well as the equipment to be used in this Part. The calculation of Ldn must be according to 14 CFR 150, Appendix A (1985).

Section 904.122

Proposed Section 904.122 provides for a violation to be shown by modeling. While computer models are not 100 percent accurate, the Board accepts the reliability of the INM and its use as a practical enforcement tool, which should not be overlooked. These modeled results are presumed to be correct

unless rebutted by actual measurement data. Any person seeking to introduce actual measurement data must demonstrate its statistical confidence level as to the average annual Ldn. To be admissible, there must be 90 percent confidence that the measurement is within 1.5 dB of the annual average Ldn. With the possibility of both types of data being used, a more fair system of enforcement will exist than if only one type of data were allowed. The complainant has the burden of establishing a violation.

Section 904.123

This is a standard severability section, and has been added in the event that any portion of the rule is adjudged invalid outright or as applied to any person.

Subpart B: Prohibitions

Section 904.201

The questions of airport expansion before the implementation of the final 65 Ldn standard has troubled this proceeding from the start. The original proposal defined "airport expansion" as follows:

> Any change in or modification to airport property or airport operations, including but not limited to type and number of aircraft and aircraft operating procedures, that increases the noise impact of the airport.

In the context of the rule as then proposed, this would prohibit almost any change in operations by even one plane that exposed additional Class A land to noise in excess of 65 Ldn, even if 80 Ldn was the current standard for previously exposed land. Simply put, adoption of the original rule would lead to innumerable enforcement cases or proprietors seeking variances for simple operational changes.

In its 1983 comments, the AGO attempted to address this problem by limiting the meaning of the term "expansion" as used in its original rule:

> Rule 502 [Section 904.201] should clarify that "expansion" refers to physical expansion, requiring the construction or alteration of facilities that have the potential to signficantly increase airport operations. Examples would include the constructin of new runways, runway extensions, taxiways, gates, strengthening of existing runways to allow utilization by larger aircraft, and the installation of navigation aids; in addition, airport projects which would qualify for (but not necessarily receive in fact) funding under federal grant agreements, such

as those administered under the Federal Airport Act, 49 U.S.C. Section 1101, et seq., or the Airport and Airway Development Act of 1970, 49 U.S.C. Section 1701, et seq., should normally also be included as examples.

Confusion may also be associated with the exclusion of Class A land which has previously been subjected to levels of noise in excess of Ldn 65 dB. At O'Hare, for example, the Ldn 65 dB noise contours are retracting, and there are many Class A properties which have previously been subjected to Ldn 65 dB. Determining which properties have or have not fallen ino this category is difficult, if not impossible. The language of Rule 502 should be modified to establish the Ldn 65 dB contour depicting "existing conditions" at the time of the adoption of the regulations as the reference contour for determining which Class A land areas have been "previously exposed" [Comments, 21 and 22].

In 1985, the AGO further modified the definition, again without providing specific language:

The AGO therefore believes that any action taken by an airport proprietor that results in a reduction of total population impacted by Ldn levels in excess of 65 Ldn would not amount to an "airport expansion" (and be an acceptable variance compliance program) even if, as a result of such action, Class A land not previously subject to Ldn levels in excess of 65 Ldn, were then subjected to levels in excess of 65 Ldn, provided that no Class A land use that was not previously exposed to 75 Ldn or greater levels [AGO Supplemental Comments at 7].

The Board believes that even this current suggestion will lead to confusion. Much time and resources would be required to determine the extent of prior noise contours and numerous variances would be sought to protect proprietors. These resources will be better utilized if focused on compliance efforts.

In defining expansion as the construction of a new runway, the Board notes that its definition allows runway lengthening and other improvements at existing airports without such improvements being classified as expansion. Proprietors should be aware that if they unreasonably subject additional persons to excessive noise during the phase in period, by taking undue advantage of this definition, they may be found to have created a self-imposed hardship in future proceedings. Given that the airport noise standard will reach 65 Ldn in 1994, the difference between the standards in 904.201 and 904.202 will be short-lived.

Section 904.202

The AGO established a noise standard that would be gradually phased in. It was to begin at 80 Ldn six months after adoption of the rule and reach 65 Ldn after seven years. The Board proposes to set an 80 Ldn standard beginning approximately 18 months after adoption. It will reach 75 Ldn about 18 months later and 65 Ldn about eight years after adoption. The dates in Section 904.202 will be adjusted at final notice to reflect these intervals and begin on calendar quarters.

The additional year is necessary to allow proprietors time to determine their noise contours and develop noise abatement plans. It is unreasonable to expect all airports in the state to be able to retain consultants and meet the standard or seek a variance or exception within six months of adoption. The added time will also allow the Agency to prepare for any role it seeks to play in monitoring airport noise and enforcing the regulation. This is particularly necesary in light of the Agency comment presented at the supplemental hearing:

> ...As you are aware, the Agency's noise pollution division has been disbanded for a number of years because it failed to receive funding from the General Assembly. Therefore, the Agency has not been able to maintain a full-time staff for inspections of sources of noise pollution. The Agency has tried to be as responsive as possible to citizens with noise complaints by conducting inspections with several of the former noise division staff who are still with the Agency in other positions.
>
> Due to the displacement of the noise program within the Agency, we would be unable at the current time to adequately enforce the proposed rule, monitor noise levels, or set procedural standards for monitoring noise levels [Exh. 230].

Subpart C: Data Collection and Reporting

Section 904.301

As suggested in the AGO's supplemental comments, Section 904.301 provides that proprietors shall record the data for jet aircraft operations required to code and run the FAA Integrated Noise Model. These records will be submitted to the Agency and be available for public inspection. The system is similar to the discharge monitoring reports currently filed with the Agency by operators of wastewater treatment plants. Such a system will insure that other parties can check the noise exposure maps provided by the proprietor. The original proposal provided that the information be submitted to the Agency monthly. The Board believes that quarterly reporting will be adequate and will reduce the administrative burden.

Section 904.302

Rule 505 of the original proposal contained a detailed variance procedure which included the development of maps showing noise impacted areas and a plan to reduce the noise impacts. The proposed rule does not contain specific variance language because variances are adequately provided for in the Act. However, much of the thrust of rule 505 has been adopted for use in the Adjusted Standard Provision of Subpart E. The rule 505 map concept has been used in Section 904.302 which requires the development of noise exposure maps.

The noise exposure maps will provide local officials with information on the location of areas exposed to high noise levels. The record clearly shows that without this information, they have difficulty planning future development to avoid noisy areas. The availability of this information in the hands of prudent planners and developers should help prevent downstate airports from falling into the dilemma now faced by O'Hare and Midway.

Section 904.303

The required noise exposure maps are to be developed according to the FAR-150 methodologies. This will allow airports and their consultants to utilize material developed pursuant to FAA requirements to help meet the provisions of this regulation. The maps shall contain at a minimum the data and features listed in 904.302. These differ from those in 14 CFR Section A150.101 in some respects.

Up to three separate noise maps may be submitted by a proprietor under Section 904.303. A noise exposure map showing the impact of all operations must be submitted. Airports with significant military operations may provide a map showing what the noise contours wuld be without military flights. This may prove important to proprietors since noise from military aircraft is not to be considered when determining compliance with the standard. A third map may be prepared detailing the noise contours that are expected to result from airport expansion or operational changes. The Board intends that these maps be readily available to public officials, developers and the public at large. The requirements for distribution to the Agency, counties and municipalities and the publication of their availability at the airport are minimal.

Subpart D: Exceptions

Section 904.401

Proposed section 904.401 essentially echoes the AGO's proposed rule 506 (See June 12, 1978 proposal) and is similar to FAR-150. A proprietor is exempt from any violations as to any

Class A land that was not Class A land at the time of the filing and submission of the noise exposure map by the proprietor, was shown on the map and the proprietor made an effort to persuade the local zoning authority not to change a non-Class A to a Class A land use. This exemption provides protection for the proprietor against local governmental authorities who, for one reason or another, have resisted preventing Class A land uses in noise impacted areas where such uses were not located before.

A further exemption is available if the proprietor buys a noise easement or equivalent interest over Class A land, provided that any such noise easement would not exempt a proprietor from violation if the Class A land is subject to 75 Ldn or greater. This limit on the noise easement exemption provides greater protection of the public living in heavily noise impacted areas. It is consistent with the studies which conclude that exposure to 75 Ldn is totally unacceptable for residential use and was suggested by the AGO.

Section 904.402

While proposed Section 904.402 requires the collection and reporting of military aircraft noise data, such noise data is not considered when determining whether a proprietor is in compliance. The proprietor has no control over military aircraft and should not be penalized for airport noise emitted by military aircraft. This lack of control does not relieve the proprietor from the collection and reporting requirements.

Subpart E: Adjusted Standards Procedures

Section 904.504

Under the Act, the Board may grant a variance to a person who would suffer an arbitrary or unreasonable hardship if forced to immediately comply with a regulation. A variance has a five year limit and requires ultimate compliance. In addition the Act provides for permanent site specific relief from a regulation. However the Board realizes that a perpetual site specific rule would be inappropriate in many circumstances given the potential changes in technology and operations which are described in the record. Given this situation, the Board has developed an adjusted standards procedure for airport noise pursuant to Section 28.1 of the Act.

The record makes clear that the AGO intends that proprietors who cannot meet the initial timeframes be given an opportunity to seek relief from the standard. AGO witness Galloway agreed that rational use of O'Hare would not permit it to achieve the 65 Ldn limit by the year 2000 (R. at 5712). Assistant Attorney General Blackwood also spoke to this point:

> [The proposed regulation] requires him to study the problem and --- in the context of applying for a

> variance. They will require him to study the problem at his airport and implement whatever he can implement which is within --- which is feasible to implement.
>
> In other words, to do the best he can do, whatever that may be, and that obviously is a different proposition at different airports.
>
> At some airports, he can impose types of limitations feasibly which would not be feasible at other airports, but he should look at it and do it if he can. I think it's really no different than the kind of thing the Board considers in other variance applications of --- if compliance with the standard is not immediately feasible, then a variance can be issued based upon conditions, in effect, a compliance plan. A plan to do what can be done and leading toward compliance at some future data (R. 2895).

The Board envisions a number of situations where an adjusted standard may prove useful and save considerable time and effort. One such example might involve a small airport with very few jet operations, a limited budget, and no Class A land within miles. The proprietor may propose a proceedure for submitting a map with noise contours calculated by one of the non-computerized method referred to in the record and not reporting operations until a certain number of operations per day is reached. He might attempt to justify the proposed proceedure by demonstrating that much of the analysis required by Section 904.504 would serve no useful purpose given the facts of his situation. A petitioner seeking an adjusted standard must provide enough information to justify any request. The Board does not intend to make assumptions to fill data gaps in petitions.

Section 904.504(a) and (b) list a minimum of 13 noise reduction options that a proprietor should evaluate when seeking an adjusted standard. They are drawn from a list contained in the original proposal except that Part 36 considerations have been dropped. The Board is aware that a proprietor acting alone cannot implement all of the possible noise abatement options. It is also true that some are simply inapplicable to certain airports. Some options require the approval or cooperation of the FAA, an aircraft operator, local governmental unit or private landowner. The Board does not expect that the discussion of each option be accompanied by an expensive an highly detailed consultant's analysis. It is apparent, for example, that some airports will have far more to present under 904.504(b) concerning preferential runways than others. The Board does expect enough credible information to support the petitioner's conclusion and allow the Board to reach a reasoned decision.

The noise abatement plan in 904.504 (c) is expected to lead to a reduction in noise impact over time. The Board realizes

that solutions will not develop overnight. An adjusted standard petition might, for example, involve a plan that incorportes a zoning authority's promise to prohibit sensitive development in high noise areas, an operators agreement not to fly over a nearby city, the acquisition of some impacted homes over a ten year period using funds generated by a landing fee, shielding a maintenance facility and extending the implementation date of the 65 Ldn standard by ten years.

The intent of subsection 904.504(d) is to allow petitioners the chance to avoid the time and expense of studying in depth options that will provide little or no noise abatement or are not practical at the airport in question. Petitioners should be aware that they may be asked to provide more information or attend additional hearings if the Board finds or is given reason to believe that the analysis provided is inadequate.

IT IS SO ORDERED.

B.S. Forcade dissented, W.J. Nega concurred and J.T. Meyer abstained.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Proposed Opinion was adopted on the 10th day of April, 1986 by a vote of 5-1.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board