FAR PART 150 NOISE COMPATIBILITY STUDY

MILWAUKEE COUNTY'S

GENERAL MITCHELL INTERNATIONAL AIRPORT

F. POTENTIAL NOISE ABATEMENT MEASURES

Potential Noise Abatement Measures

Introduction

The purpose of this Chapter is to:

- **Provide a foundation for understanding the roles and responsibilities of various parties in noise abatement and abatement planning.**
- **Identify the range of noise reduction/abatement measures that are either required to be considered in a Part 150 Study or are suggested by the Consultant or public for consideration during the study process.**
- **Provide an initial understanding of how each noise reduction measure might affect noise exposure conditions.**

The measures presented in this chapter are general in nature. This chapter provides a broad perspective of how each measure could address specific noise issues and identifies any known issues with implementation. It is expected that the Study Advisory Committee will assist the Airport and Consultants in identifying more specific noise abatement measures for consideration during this study.

This chapter identifies the following:

- Roles and responsibilities of the parties participating in the Part 150 Study;
- Measures available to the airport operator;
- Measures available to state and local agencies; and
- Measures dependent upon the federal government.

Roles and Responsibilities of the Parties

Before considering specific means of reducing aircraft noise and land use incompatibilities, the authority of various parties must be defined. The FAA's 1976 *Noise Abatement Policy* established the following policies regarding roles and responsibilities:

> "The **Federal Government** has the authority and responsibility to control aircraft noise by the regulation of source emissions, by flight operational procedures, and by management of the air traffic control system and navigable airspace in ways that minimize noise impact on residential areas, consistent with the highest standards of safety. The federal government also provides financial and technical assistance to airport proprietors for noise reduction planning and abatement activities and, working with the private sector, conducts continuing research into noise abatement technology."
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> "**Airport Proprietors** are primarily responsible for planning and implementing action designed to reduce the effect of noise on residents of the surrounding area. Such actions include optimal site location, improvements in airport design, noise abatement ground procedures, land acquisition, and restrictions on airport use that do not unjustly discriminate against any user, impede the federal interest in safety and management of the air navigation system, or unreasonably interfere with interstate or foreign commerce."
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> **State and Local Governments and Planning Agencies** are responsible for providing for land use planning and development, zoning, and housing regulation that will limit the uses of land near airports to purposes compatible with airport operations.
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> The **Air Carriers** are responsible for retirement, replacement, or retrofit of older jets that do not meet federal noise level standards, and for scheduling and flying airplanes in a way that minimizes the impact of noise on people.
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> **Residents and Prospective Residents** in areas surrounding airports should seek to understand the noise problem and what steps can be taken to minimize its effect on people. Individual and community responses to aircraft noise differ substantially and, for some individuals, a reduced level of noise may not eliminate the annoyance or irritation. Prospective residents of areas impacted by airport noise thus should be aware of the effect of noise on their quality of life and act accordingly.

As such, when considering various means of reducing aircraft noise exposure, these roles must be considered. In addition, a substantial history of airport noise reduction precedent has been set over the last few decades nationally and at General Mitchell International Airport (MKE) specifically. The following paragraphs briefly describe these activities and actions.

In the early 1980s, the FAA began issuing rules and regulations that control aircraft noise at the source, the aircraft engine. These aircraft noise standards, established by the federal government, must be met by the aircraft manufacturers through newly-designed engines and aircraft. The government established timetables in which the airlines must comply with noise standards, commonly known as Stage 1, Stage 2, Stage 3, and Stage 4. Full compliance with Stage 2 standards was established January 1, 1988 (FAR Part 36).

Then Congress passed the Noise Act (The Airport Noise and Capacity Act of 1990 [ANCA], PL 101-508, 104 Stat. 1388), which established two broad directives for the FAA. The first directive established a method to review aircraft noise and airport use or access restrictions imposed by airport proprietors, and the second was to institute a program of phase-out of Stage 2 aircraft over 75,000 pounds by December 31, 1999. To implement ANCA, the FAA amended FAR Part 91 and issued a new FAR Part 161. Part 91 addresses the phase-out of large Stage 2 aircraft and the phase-in of Stage 3 aircraft. The airlines were responsible for meeting this deadline and they have all achieved full compliance.

After adoption of FAR Part 150, FAR Part 161 was implemented as a stringent review and approval process for initiating use or access restrictions by airport proprietors, such as curfews and caps on operations. This is in keeping with one of the major reasons for the Act, which was to discourage local restrictions more stringent than the Act's 1999 phase-out of Stage 2 aircraft. Part 161 makes it more difficult for the Airport or any others to implement use or access restrictions, especially those associated with Stage 3 aircraft. These difficulties are so significant that, to date, only one Part 161 plan has been approved by the FAA. This was approved for Naples Airport in Florida. Worth noting, airport/aircraft use restrictions in place at airports before the passage of ANCA were "grandfathered" and therefore allowed to remain in place as long as the airports did not modify the restrictions making them more stringent.

Airports and state and local governments are preempted from regulating the operations of aircraft, with one exception. They may exclude aircraft from an airport for noise reasons as long as the exclusion is reasonable and nondiscriminatory. In addition, it must comply with the provisions of the ANCA, through FAR Part 161, and it must not regulate military aircraft.

The outcome of a Part 150 Noise Compatibility Study is intended to define a balanced and cost-effective program for reducing existing and future noise exposure. The development of reasonable measures is the focus of the FAR Part 150 noise compatibility planning process. The objective is to explore a wide range of feasible measures of land use patterns, noise control actions and noise exposure patterns, seeking optimum accommodation of both airport users and airport neighbors within acceptable safety, economic and environmental parameters. Each measure should:

1) Have the potential of resolving the problem;
2) Be implementable within acceptable economic, environmental, and social costs; and,
3) Be implementable in compliance with federal, state, and local legislation, regulations, and ordinances.

This section contains a description of potential noise abatement and mitigation measures or actions that may be considered for General Mitchell International Airport. A general

evaluation of each is made on the basis of the three factors listed above. In addition, FAR Part 150 identifies a number of measures that the FAA has determined must be considered in developing a Part 150 Noise Compatibility Plan. These required measures are:

- Acquisition of land or interest therein;
- Construction of barriers and acoustical shielding, including sound insulation of public buildings;
- Use of flight procedures (including modification of flight tracks) to control the operation of aircraft to reduce noise exposure to individuals;
- Implementation of any restriction on the use of airport by any type or class of aircraft based on the noise characteristics of those aircraft;
- Implementation of a preferential runway use system;
- Other actions or combination of actions which would have a beneficial noise control or abatement effect on the public; and
- Other actions as recommended by the FAA.

These measures are explained in greater detail in the following sections. Each measure is assigned to one of three categories identifying whether the airport operator, a state/local government, or the federal government is responsible for implementing the measure if it is included in the final Noise Compatibility Plan (NCP). The potential measures presented in the following paragraphs are general in nature. It is expected that the Study Advisory Committee will assist the Airport and Consultant in identifying more specific measures to evaluate for noise abatement or mitigation. As these more specific measures are identified, they will be evaluated and presented in subsequent Working Papers, Study Advisory Committee meetings, and public workshops.

Tables F1 and F2 list a range of noise abatement and land use compatibility measures that will be discussed, as well as specific noise issues these measures are designed to address.

General Measures Available to the Airport Proprietor

Denial of Use of Airport to Aircraft Not Meeting FAR Part 36 Standards

This measure might be implemented by limiting access to the Airport for aircraft that do not meet certain noise standards. Most turboprops and other large aircraft produced after 1964 were required to meet FAR Part 36 standards. Older, non-complying (Stage 1) turbojets over 75,000 pounds maximum gross takeoff weight, which have standard airworthiness certificates, were required to be retrofitted or cease operating in U. S. airspace as of January 1, 1985 (Part 91, Subpart E). Effective December 31, 1999, all

aircraft weighing more than 75,000 lbs met Stage 3 noise levels. Therefore, all civilian aircraft today over 75,000 pounds are Stage 3 aircraft. Aircraft types weighting less than 75,000 lbs are not required to be Stage 3.

This measure is feasible where the majority of the aircraft fall within the parameters of FAR Part 36. However, to restrict Stage 3 or Stage 2 aircraft less than 75,000 pounds, the provisions of Part 161 must be complied with. This includes a cost/benefit analysis of the proposed restriction (with FAA approval of the methodology or results) and proper notice must be given, not only to the public, but to all affected parties.

TABLE F1 - Operational and Facility Measures Studied in the Part 150 Process

	Measures for Consideration	Ground noise	Departure flight noise	Approach Flight Noise	Landing Roll Noise	Mainte-nance Activity Noise	Ground Equip. Noise	Sample Implementation Measure
Airport Layout Plan	Changes in Runway location, length or strength	◆	◆	◆	◆			New parallel runway. Runway extension. Pavement overlay.
	Displaced Thresholds[1]	◆		◆				Relocated existing runway threshold.
	High Speed Exit Taxiways	◆			◆			Examine locations of taxiway exits to reduce use of reverse thrust.
	Relocated Terminals	◆				◆	◆	Construct new terminal buildings and/or concourses.
	Isolating Maintenance Run-ups Use of Barriers	◆				◆	◆	Barriers. Hush House/Ground Run-up Enclosure.
Airport and Airspace Use	Preferential or Rotational Runway Use	◆	◆	◆	◆			Increased east flow or Increased west flow Balanced flow.
	Preferential Flight Tracks Use of Modification to Approach and Departure Procedures		◆	◆				Monitor compliance with existing corridors. Greater compliance with departure procedures. Develop "minimum" population flight tracks.
	Restrictions on Ground Movement of Aircraft	◆						Implement taxiway use restrictions.
	Restrictions on Engine Run-ups or Use of Ground Equipment					◆	◆	Minimize the number of nighttime run-ups.
	Limits on Number or Types of Operations or Types of Aircraft	◆	◆	◆	◆	◆	◆	Conduct a Part 161 Study.
	Use Restrictions	◆	◆	◆	◆		◆	Part 161 Studies.
	Raise Glide Slope Angle or Intercept			◆				Modify glide slope antennas
Aircraft Operation	Power and Flap Management		◆	◆				Identify appropriate departure climb profile to reduce noise.
	Limited use of Reverse Thrust				◆			Implement reverse thrust reduction procedures.
Noise Program Management	Noise-related Landing Fees	◆	◆	◆	◆			Conduct a Part 161 Study
	Noise Monitoring		◆	◆		◆		Noise Monitoring upgrades.
	Establish Citizen Complaint Mechanism	◆	◆	◆	◆	◆	◆	Establish a noise complaint hotline
	Establish Community Participation Program	◆	◆	◆	◆	◆	◆	Host quarterly public airport workshops

[1] Displaced Threshold describes a situation where the actual landing area on a runway is not at the physical end of the runway, but at some distance on the runway from the physical end.

Table F2 - Land Use Measures Studied in the Part 150 Process

Measure for Consideration		Sample Implementation Measure	Noise Issue						
			Ground noise	Departure flight	Approach Flight	Landing Roll	Training Flights	Maint. Activity	Ground Equip.
Corrective	Acquisition	Acquisition of single family residences Acquisition of vacant residential land Acquisition of multi-family residential	◆	◆	◆	◆	◆	◆	
	Sound Insulation	Insulation of single family residential Insulation of multi-family residential Insulation of public buildings Insulation of schools	◆	◆	◆	◆	◆	◆	
	Mobile Homes	Relocate mobile homes to another location	◆	◆	◆	◆	◆	◆	
	Identify Noise Remedy Boundaries	Areas of Eligibility	◆	◆	◆	◆	◆	◆	◆
Preventative	Zoning		◆	◆	◆	◆	◆	◆	◆
	Building Code Modifications		◆	◆	◆	◆	◆	◆	◆
	Comprehensive Plans		◆	◆	◆	◆	◆		
	Noise Overlay Zone		◆	◆	◆	◆	◆	◆	◆

Capacity Limits Based on Defined Noise Levels

The following measures are required to be evaluated by FAR Part 150. However, they would require an FAR Part 161 Cost/Benefit Study prior to adoption. Prior to the approval of a Part 161 study, all non-restrictive measures must be evaluated to determine if they can achieve noise abatement or mitigation. Therefore, this Part 150 Study will evaluate and carry forward the non-restrictive measures available to an airport.

Restrictions on airport use or airport access might be based on the desire to keep noise below some specific level. However, such restrictions often have economic consequences and should only be considered after all other attempts at noise reduction have been exhausted. The implementation of this type of restriction might take three broad forms:

Restrictions Based on Cumulative Impact: With this measure, a maximum cumulative impact (such as the total area within the existing DNL 65, 70 or 75 contour) would be established as the baseline cumulative impact, and then, an airport's operations and/or fleet mix (mix of aircraft types) would be adjusted or limited so as not to exceed that maximum in the future. This could be accomplished through "capacity limitations," whereas either the aircraft types, based upon their relative "noisiness," or the numbers and mix of aircraft, would be limited or adjusted so as not to exceed the existing noise impact. One variation of this measure can be referred to as a "noise budget."

Restrictions Based on Certificated Single-Event Noise Levels: Most aircraft today have been certificated by the FAA, as part of the FAR Part 36 process described earlier. The certificated noise levels are published as part of the most recent update to *Noise Levels for US Certificated and Foreign Aircraft* contained in Advisory Circular 36. Based on the published noise levels, it might be possible to devise limitations that could prevent aircraft from exceeding those noise levels. This measure could be formulated so as to set a threshold noise level that cannot be exceeded at any time, or different noise levels can be implemented for either daytime or nighttime operations. An aircraft's compliance with this limit would be determined from the published FAA certification data. It should be noted that aircraft can be operated at less than certificated noise levels under certain operational conditions, which then becomes a means that air carriers continue to operate despite the noise level limit.

Restrictions Based on Measured Single-Event Noise Levels; Recognizing that aircraft noise levels vary widely, it might be possible to set limits based on actual, measured single-event noise levels. Aircraft exceeding this limit would be prohibited from using an airport. This does not mean that the airport, the community, or citizen groups can set up a microphone and noise-level limit and challenge the pilots to "beat the box." Compliance with the single-event level would be measured over an extended period

of time for many single events, and violation would then be determined from repeated excess noise.

These are also the types of restrictions that are under the jurisdiction of Part 161 and are historically used in place of a general Stage 2 aircraft restriction. However, military aircraft are not subject to such restrictions. Although considered, these restrictions were not modeled or proposed due to the Part 161 implications.

Landing Fees Based on Noise

This measure is based on the premise that all or part of the landing fee for each aircraft would be focused on the noise emitted by that individual aircraft. This would apportion the "cost" of producing the noise to those aircraft that contribute the most to it. In theory, this measure would be designed to encourage the use of quieter aircraft and might actually generate additional revenue for the Airport. To avoid discrimination, the noise fee would need to be based upon a published standard for single-event noise levels, such as those contained in Advisory Circular 36. The opposite strategy also might be used. In other words, quieter aircraft would be apportioned a lesser fee than noisier aircraft, thus serving as an incentive for quieter aircraft. In this manner, operators reducing noise generated by their aircraft might be rewarded.

The cost of implementing this measure, in terms of manpower, finances and public relations, would not be offset by the revenue or benefit derived from it. The administrative cost involved in maintaining records of aircraft types and numbers, and billing statements, are not commensurate with the noise reduction achieved. In addition, this measure would not apply to military aircraft as they do not pay landing fees. The implementation of this measure would require a Part 161 Study.

Complete or Partial Curfews

Airport curfews can be an effective but costly means of controlling noise intrusion into areas adjacent or close to an airport. However, curfews can have a significant negative effect on both aviation interests and the community. In addition, other communities may also be impacted if flights are discontinued and passengers are unable to obtain the required air service. Thus, curfews can create an unreasonable burden to interstate or foreign commerce.

A curfew can take various forms: restrictions on some or all flights during certain times of the day or night, or restrictions based on certificated aircraft noise levels contained in AC 36-3H. Curfews are usually implemented to restrict operations during periods when people are most sensitive to noise intrusion. This most often occurs during the nighttime hours, particularly between the hours of 11:00 p.m. and 7:00 a.m.; these measures can be effective if there is a significant number of night flights and a notable

amount of nighttime noise disturbance. Curfews have been upheld by a Federal District Court in California for a general aviation airport (Santa Monica Airport),[1] while at the same time, they have been denied by a Federal District Court in New York (Westchester County).[2] The implementation of a complete or partial curfew would require a Part 161 Study.

Ban All Jet Aircraft

This measure is sometimes proposed at airports to relieve noise impacts, but this is not legally possible. It not only puts an unreasonable burden on interstate commerce (which is an area of regulation reserved for the federal government), but also results in a discriminatory regulation that violates the tenets of the U.S. Constitution. This measure also violates the equal protection clause. An outright ban on all jet aircraft cannot be legally implemented, and therefore, is not recommended.

Acquisition of Land or Interest Therein

The most complete method of controlling and mitigating noise is to purchase the impacted property (referred to as acquisition in fee simple). However, this method is also the most costly since it removes the property from the tax base of the community. Certain land areas are more critical than others, and it may be appropriate to purchase land to mitigate severe noise impact where the purchase of full or partial interest may be the only means of achieving compatibility. This is especially true for residences within the 75 DNL noise contour. However, in the case of General Mitchell International Airport there are no residences within the existing or future Base Case 75 DNL noise contours.

Instead of acquiring property, airports sometimes purchase an easement from the property owner that effectively purchases the right to create noise or restrict development. An easement is sometimes preferred because it keeps property on the tax roll. There are three main types of easements associated with airports: 1) a clear zone easement associated with the runway protection zone (RPZ); 2) a noise easement; 3) and an avigation easement that combines portions of both. Easements can be purchased, condemned or dedicated through the land use subdivision process. Easements also are acquired by airports when the airport provides sound insulation, discussed later.

Another method of keeping noise-affected residential property on the tax rolls is to purchase the property, then resell it for a compatible use or for residential use, but retain the rights to create noise (such as placing an easement on the property when it is sold). In other words, an airport operator could purchase a property, then resell it to the original homeowner or anyone else, but retain a covenant or easement which identifies

[1] Santa Monica Airport Assoc. v. City of Santa Monica, 659 F. 2d. 100, [9th Cir., 1981

[2] Westchester County v. United States of America, 571 F. Supp. 786 [Southern District of New York, 1983

the airport's right to fly over the property and create noise. This would result in the property owner giving up his/her right to initiate litigation against the airport due to the specified noise impact. In addition, this method would allow the market to set the price and value of the noise easement which would be retained by the airport. An airport could also develop or resell the property to another government agency for a compatible use (golf course, nature area, cemetery, etc.), or the agency could purchase the property outright for its own use. This would have to be coordinated with the airport staff and management to ensure redevelopment with a compatible use.

Instead of purchasing land, sound insulation (or attenuation) is often recommended for areas near airports. Sound insulation is the process of adding structural components, such as insulation, to a building to reduce the inside noise levels to a specific degree. Normally, a 25 to 30 dB(A) reduction from outside to inside noise levels is recommended. Such noise reductions are normally achieved by adding double-pane windows, installing solid core doors, installing special ventilation systems and sometimes employing certain wall treatments. Many residents prefer this measure because it reduces the inside noise levels and allows the homeowner to remain in his/her home. Sound insulation, when funded with public monies, often requires the granting of a noise easement in return. General Mitchell International Airport has had a successful sound insulation program for several years and the majority of the homes within the existing and future base case noise contour have been sound attenuated or offered sound insulation.

No matter what portion or right of land is purchased, if federal assistance is used, the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970 (also known as the Uniform Act) must be followed.

Noise Barriers (Shielding, including earth berms and walls)

Noise generated from ground-level sources can result from engine run-up and maintenance operations, aircraft movement on the runways and taxiways, and aircraft engine reverse thrust on landing. Noise intrusion from these sources is usually only significant to those areas close to an airport. One method of mitigating this type of noise is through the use of noise barriers or earthen berms. These can protect adjacent areas from unwanted noise by blocking the path of noise. Another method is through the strategic and well-planned location of airport buildings and structures that can provide shielding to adjacent areas to block noise. Run-up and maintenance areas can be located away from noise-sensitive uses adjacent to an airport, and if necessary "hush houses" or “ground run-up enclosures” (GRE) can be constructed to absorb sound for specific run-up and maintenance operations. General Mitchell International Airport has constructed a ground run-up enclosure and it has significantly reduced engine run-up noise at the airport.

Construct a New Runway in a Different Orientation

Often the construction of a new runway with a different orientation will shift noise away from noise sensitive uses to either less populated areas or compatible areas (commercial lands, rivers etc). For instance, at airports that have a north-south runway orientation, perhaps an east-west orientation or slightly different angle, might be considered. The orientation of a runway is dependent upon many factors, including prevailing winds, topography, obstacles and other conditions. A new runway cannot be constructed if wind direction and topographic conditions are such that safety criteria cannot be met. In addition, both existing and future land uses must be considered so that the noise is not shifted to other populated areas. This is an expensive measure that must be beneficial to both the airport users and the surrounding community. Presently, there are no plans to construct additional runways at General Mitchell International Airport within the timeframe of this Part 150 Noise Compatibility Study.

Runway Extensions

Often a runway extension can reduce noise impacts to areas close to an airport. A runway extension can allow aircraft to gain altitude sooner and produce less noise exposure. In addition, a runway extension may enable aircraft to fly certain flight paths (such as making turns after departure) not possible with an existing runway length. However, there are tradeoffs with an extension that must be considered. With an extension, the area closest to the extended end can experience greater noise levels due to lower approach altitudes, and aircraft beginning departure roll closer to those areas. This sometimes can be corrected by establishing a displaced threshold so that aircraft land farther down the runway and maintain altitude over the area beyond the extension. Displaced thresholds generally are not recommended by the FAA due to safety considerations.

An additional factor to consider with a runway extension is that many times a longer runway will enable more or heavier, larger aircraft to use the runway. This may be desirable since many of the larger, heavier aircraft are new-generation aircraft and actually are quieter than smaller aircraft presently operating. Runway extensions also can be used as a noise abatement measure to help reduce the need for using reverse thrust upon landing, which can generate a considerable amount of ground-level noise. There are no plans to extend runways at General Mitchell International Airport within the time frame of this Part 150 Study.

Touch-and-Go Restrictions

Restrictions on training flights performing touch-and-go operations can mitigate noise impacts at airports where there are a significant number of training operations, especially jet training. Touch-and-go operations occur when the pilot approaches the runway as if

landing, the aircraft touches down on the runway, then lifts up for departure in a series of practice runs. Restricting touch-and-go training is particularly effective if the operations occur during the nighttime and early morning hours, when such operations can be most intrusive. However, such restrictions may not be legal as they often are found to limit access or be a capacity restriction. Capacity restrictions are different from access restrictions based on noise (which may be possible subsequent to a Part 161 Study) as capacity restrictions are beyond the ability of an airport operator to implement. They are pre-empted by federal regulation. There are very few touch-and-go operations occurring at General Mitchell International Airport and this is not a viable measure for this study. In addition, military aircraft are not subject to touch and go restrictions.

High-Speed Exit Taxiways

High-speed taxiway exits can help reduce noise impacts by allowing aircraft to exit the runway at a higher rate of speed, thereby reducing the use of reverse thrust. Two types of taxiway exits typically are developed on an airport:

1) a high-speed exit that is usually angled; and,

2) a regular taxiway exit that is angled at 90 degrees (thereby requiring the aircraft to come to a near stop before turning).

This measure is viable only with runways of sufficient length to allow aircraft to slow down early enough to use high-speed exits, which usually are placed closer to the middle of the runway, nearer the terminal. High-speed taxiway exits do little good as an independent measure, and typically must be implemented along with other measures.

Noise Monitoring Program

Noise monitoring or sound-level measurement programs can enhance the effectiveness of noise abatement and compatibility programs at airports. These airports have used the systems to demonstrate changes in aircraft noise exposure and to identify noise levels associated with specific aircraft events. Noise monitoring often is used as a means of showing progress toward reducing the problem. Most systems have several remote microphone units that sample the weighted sound level once or twice per second, record the samples, and transmit the data to a minicomputer system with printouts. Any FAA-approved noise monitoring system would have the following minimum capabilities: continuous measurement of dBA at each site; hourly LEQ data; daily LDN data; and single-event; maximum A-weighted sound level data. General Mitchell International Airport has had a permanent noise monitoring system in place for several years. The system combines aircraft noise monitoring with flight track monitoring and provides valuable information concerning aircraft operations and associated aircraft noise levels. This system should be reviewed to assess effectiveness and identify potential areas of improvement.

Noise Complaint/Citizen Liaison Program

Many airports in the United States provide staff in a Noise Abatement Office to receive and respond to citizen complaints of aircraft noise. A comprehensive noise complaint system has many advantages, including identification of unusual conditions based on citizen complaints that lead to a notice sent to an aberrant pilot, public accessibility of information about the airport operation and noise conditions, data collection to identify sensitive areas, and positive public relations. At most airports, one person is designated to receive and address noise complaints from citizens. The complaint officer keeps a file on each complaint, noting the time, place, type of complaint, type of aircraft and N-number or other identifying characteristics of the aircraft, if known. This gives citizens a central office to lodge noise complaints and to obtain information concerning aircraft operations or changes in flight procedures. General Mitchell International Airport currently has such a system in place and is keeping records of noise complaints. This system will be reviewed and recommendations made for improvement, as necessary and appropriate.

Options Available to State or Local Governments

Land Use Controls

Federal guidelines contained in FAR Part 150 indicate that residential development, along with other noise sensitive uses such as schools, churches, hospitals, rest homes, etc., should not be located within areas exposed to 65 DNL or greater noise levels. These guidelines are recognized not only by the FAA but also by the Department of Housing and Urban Development, Department of Defense, and the Environmental Protection Agency, as well as numerous state and local agencies. Land use and development controls are one method of ensuring such noise sensitive uses will be restricted within the noise contours. It should be remembered that it is within the discretion and authority of the local unit of government to determine the types of lands that are incompatible with noise levels and to define their own threshold of sensitivity. In the case of the communities in the vicinity of General Mitchell International Airport, no local noise related controls have been established.

One of the primary tools used by local communities to guide development within the jurisdiction is a comprehensive planning process. Land use and development controls which are based on a well-defined and thoroughly documented comprehensive plan are among the easiest and most powerful tools available to the local unit of government to ensure land use compatibility. It is the responsibility of the local unit of government having land use jurisdiction to implement these controls to protect its residents from aircraft noise impacts and to protect the airport from encroachment of incompatible land uses. This is particularly important when more than one unit of government has

land use control authority for the area outside an airport's boundary. It is extremely critical that the local unit of government accept the responsibility for ensuring land use compatibility in its planning and development actions. It also is important that the state government provide the necessary enabling legislation that will allow the local unit of government to institute land use controls. The most common forms of land use controls available to the local governments include: zoning, easements, transfer of development rights, building code modifications, capital improvement programs, subdivision regulations, and comprehensive planning. These forms of land use controls will only be briefly outlined in the following paragraphs.

Zoning. Zoning is the most common and traditional form of land use control in the United States today. It controls the type and placement of different land uses within designated areas. It is used to encourage land use compatibility while leaving property ownership in the hands of private individuals or business entities, thus leaving the land on the tax rolls. Zoning is not applied retroactively and is not necessarily permanent. It is most effective in areas that are not developed but could develop with compatible uses. As stated earlier, all jurisdictions have typical zoning ordinances in effect concerning the way land use districts are delineated between residential, commercial, industrial, public, and other uses.

Easements. An easement is a right held by one party to make use of the property of another for a limited purpose, as defined in the easement.

Transfer of Development Rights. The transfer of development rights involves separate ownership of the "bundle of rights" associated with property ownership. The concept involves the transfer of the right to develop a certain parcel of property to a certain density/intensity to another parcel of property under separate ownership. This would allow the property that obtains the added development rights to develop to an intensity/density that is beyond that which would normally be allowed. An airport operator could also purchase these rights from the landowner and retain them or sell them to another landowner. This concept can be used to retain property in compatible uses and still compensate the landowner for loss of development. The idea depends upon market conditions of the area and (there is some disagreement on this point) upon the availability of state enabling legislation authorizing the development of the concept at the local level.

Building Code Modifications. This measure is to modify existing or potential building codes to include specific sound insulation provisions for structures within areas affected by aircraft noise. Recommendations may be made to the various jurisdictions concerning sound insulation, as appropriate.

Capital Improvements Program. This is a document that establishes priorities and costs on the funding and development of public facilities (roads, streets, sewers, libraries, etc.). It can be used very successfully in concert with subdivision regulations and a comprehensive plan, to control not only the areas of development but also the

timing of development, by controlling the timing and location of public facilities construction.

Subdivision Regulations. Subdivision regulations are used to control the design and placement of public and private facilities in the conversion of raw land to developed property. Many of the jurisdictions surrounding the Airport have adopted subdivision regulations.

Comprehensive Planning. Comprehensive future land use planning, when it is coordinated with the zoning ordinance, subdivision regulations and the capital improvements program, can reduce or avoid land use incompatibilities in the future. Many of the jurisdictions surrounding the Airport have adopted comprehensive plans for their areas of jurisdiction.

All of the land use controls mentioned above will be analyzed in greater depth as to their feasibility for implementation when the final noise contours are produced and a Future Noise Exposure Map is presented.

Options Dependent Upon the Federal Government Approval

Departure Thrust Cutback (Departure Climb Profile)

During initial takeoff, the power or thrust used by the aircraft to gain altitude is usually at its maximum. This measure would involve the application of thrust cutbacks at various stages of take-off. Because of system-wide needs, each operator has developed its own standardized take-off procedure. This measure is recommended when aircraft operators have the opportunity to use a different departure thrust setting and still be within safety limits as per the particular type of aircraft, given the characteristics of the particular airport. Often it is better for aircraft to climb faster and turn earlier than to fly over noise-sensitive areas at lower power. In addition, this measure cannot be implemented without the direct concurrence of the FAA, taking into account operational, safety and airspace considerations. The FAA's Advisory Circular (AC) 91-53A titled "Noise Abatement Departure Profile" defines two standard departure procedures for aircraft: a "close-in" departure and a "distant" departure. The close-in departure typically reduces noise near the airport, but may increase noise farther from an airport (such as 8 to 10 miles away). Conversely, the distant procedure concentrates noise closer to an airport (such as within 3 to 5 miles), but reduces noise farther away.

Flight Management (FMS)/Global Positioning System (GPS)/Required Navigation Procedures (RNP or RNAV)

Global positioning satellite (GPS) systems have enabled a wide range of new flight procedures at airports that effectively rely on computer technology to direct the flight of the aircraft. These systems use satellites to determine exact aircraft location, and with the addition of a ground unit, can very accurately determine altitude. Computers onboard the aircraft use this information to direct the flight. These types of systems are considered to be the precision instrument landing system of the future, and are less expensive to equip and maintain both onboard and at ground facilities. A precision instrument landing system is currently in place on both ends of the longest runway (Runway 1L/19R with varying capabilities during different prevailing weather and visibility conditions) and on runway end 7R of Runway 7R/25L, the second longest runway. Runway end 25L has a non-precision approach. The use of GPS for approaches, coupled with FMS (Flight Management Systems) or Required Navigation (RNAV or RNP) for departures, will be explored as part of this study to assess whether flight tracks can more accurately be followed; thereby reducing noise levels over noise sensitive areas.

Designated Noise Abatement Take-off/Approach Paths (Flight Tracks)

This measure is very similar to that described previously, except that it concerns designated paths that aircraft follow on approach or takeoff to minimize the overflight of noise sensitive residential areas. Such take-off/approach flight tracks specify the location relative to the ground of aircraft at certain altitudes and during certain turning procedures. These procedures are dictated by the relative location of noise-sensitive land uses and considerations of aircraft operational safety and air traffic control procedures. Generally, air traffic control procedures can be managed to avoid specific areas; however, this may create unintended consequences that reduce airport and airspace capacity or increase noise to other areas not previously overflown. Turns during the last three (3) to four (4) miles of the final approach in good weather, and within the final six (6) to seven (7) miles during poor weather, are undesirable for safety reasons because they do not allow pilots of large commercial airliners to establish and maintain a stabilized approach. Aircraft bank angles near the ground need to be restricted to no more than 15 to 20 degrees and are not to be initiated when the aircraft is below 500 feet above ground level (AGL). These procedures cannot be implemented without the concurrence of the FAA, taking into account operational, safety and airspace considerations.

When evaluating noise abatement flight tracks, consideration should be given to the following measures which, when developed around specific community needs, could reduce aircraft noise impacts. The measures include:

- Equalizing or dispersing noise – this is often an approach when attempting to fairly distribute operations around an airport;
- Concentrating noise – this is the opposite of equalizing/dispersing noise. By concentrating noise, paths are established that result in consistent overflight of specific area(s) to concentrate noise over that area. This approach often provides the predictability of over flight patterns sought by residents. New technology, such as FMS, enables a greater ability to concentrate noise if desired. Concentrating noise typically enables land use compatibility actions (such as sound insulation) to remedy any residual incompatibilities.
- Concentrating noise close-in (within 3 to 4 miles), and dispersing noise farther away – this approach is a combination of the previous two and would result in concentration of noise primarily in the 65 DNL contour, but disperse noise outside the 65 DNL.

When considering flight paths, the Study Advisory Committee should indicate its desires relative to the above approaches.

Preferential Runway Use System

A preferential runway use system typically identifies the runway end(s) that for departures creates the least impact on the surrounding community and emphasizes the use of that runway(s). Such programs use these preferred runway end(s) the majority of the time, establishing operations in a certain direction, with operations occurring in the opposite direction held to a minimum. This measure is very closely related to wind direction and airspace safety considerations. The FAA has the responsibility to implement this measure through air traffic routing, with aircraft safety being the prime concern. This is available only for use during certain wind conditions and is recommended only when there is a severe noise compatibility problem directly off other ends of the runways. At General Mitchell International Airport, during an average day, about 50% of the jet departures are on Runway 19, 25% on Runway 7R, 13% on Runway 1L and about 12% on Runway 25L. Jet arrivals occur about 42% of the time on Runway 25L, about 25% on Runway 7R, about 20% on Runway 1L and about 13% on Runway 19R. This varies with the wind direction during any given day. The Airport currently has an informal nighttime preferential runway system in place, with Runway 19R being the preferred runway for all turbojet departures and Runway 1L for arrivals. This is a contra-flow operation which is only in effect between 10:00 pm and 6:00 am, and when weather and traffic conditions allow.

Power and Flap Settings

A variety of aircraft operating procedures are possible for implementation at an airport. These include minimum flap landings and delaying flap and gear deployment. On approach, an increasing level of noise is generated as flaps are applied to slow the aircraft. Similarly, noise levels typically increase when the landing gear is lowered. To

help minimize fuel costs and flight time, most operators of large jet aircraft have adopted procedures for reduced flap settings and delaying flap and gear extension, consistent with safety and current aircraft and air crew capabilities. During VFR (good) weather conditions and low traffic conditions, large jet aircraft generally land with minimum flap settings.

Existing Actions

The Airport completed the previous FAR Part 150 Study in 1994, and the FAA issued its Record of Approval for that Study in March 1995. The FAA approved, and the Airport has implemented, several noise abatement/mitigation measures contained in that document. The Record of Approval can be found in the Appendix along with the Tower Order and Airport Operations Bulletin. The Airport implemented three new noise abatement measures along with continuing two existing noise abatement measures. Sixteen land use mitigation measures were approved by the FAA, of which eleven were outside the jurisdiction of the Airport to implement since the Airport has no land use control authority. The remaining five land use mitigation measures have all been implemented except for the Phase 2 avigation easement/sales assistance measure. The remaining seven continuing measures have all been implemented. These include publishing noise abatement procedures in the Airport Facility Directory, continued coordination with key agencies, maintaining complaint response system, monitoring aircraft activity and fleet conversion status, developing flight track and noise monitoring system, evaluating and update the Noise Compatibility Plan, and establishing noise abatement and mitigation staff.

Summary

The potential measures presented in this chapter are general in nature and provide a broad perspective of actions that could be recommended for further study and implementation. It is expected that the Study Advisory Committee will assist the Airport and Consultants in identifying more specific noise abatement or mitigation measures to evaluate using the guidelines and information provided. As these measures are identified, they will be reviewed and presented in subsequent Working Papers, Study Advisory Committee meetings, and public workshops.