Duluth International Airport
F.A.R. Part 150
Noise Compatibility Program Submittal
October 21, 1997
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F.A.R. Part 150 - Noise Compatibility Program
CHECKLIST FOR NOISE COMPATIBILITY PROGRAMS

The documentation required for the Noise Compatibility Program is referenced in this checklist. The checklist is provided to assist FAA reviewers in their evaluation of this document.

I. IDENTIFICATION AND SUBMISSION OF PROGRAM:

A. Is this submittal appropriately identified:

1. FAR 150 NCP?
   
   Response Yes.

   Reference Page 1-1 of this text.

2. A NEM and NCP together?

   Response No.

3. Program Revision?

   Response No.

B. Is the airport name and the qualified airport operator identified?

   Response Yes.

   Reference Page 1-1 of this text.

C. NCP transmitted by airport operator cover letter?

   Response Yes.

   Reference Front of this text.
II. CONSULTATION: [150.23]

A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during NCP development?

Response       Yes.
Reference       Section 6.

B. Identification of consulted parties:

1. All Parties in 150.23 consulted?

Response       Yes.
Reference       Section 6.

2. Public and planning agencies identified?

Response       Yes.
Reference       Section 6.

3. Agencies in 2., above, correspond to those indicated on the NEM?

Response       Yes.
Reference       Section 6.

C. Does the documentation satisfied 150.23(d) requirements:

Response       Yes.
Reference       Section 6.

1. Documentation shows active and direct participation of parties in B., above?

Response       Yes.
Reference       Section 6 and Appendix B.

2. Active and direct participation of general public?
Response

Yes.

Reference

Section 6 and Appendix B.

3. Participation was prior to and during development of NCP and prior to submittal to FAA?

Response

Yes.

Reference

Section 6 and Appendix B.

4. Indicates adequate opportunity afforded to submit: views, data, etc.?

Response

Yes.

Reference

Sponsor Certification, Section 6, and Appendix B.

D. Evidence included of notice and opportunity for a public hearing on NCP?

Response

Yes.

Reference

Appendix B.

E. Documentation of comments:

1. Includes summary of public hearing comments, if hearing was held?

Response

Yes.

Reference

Appendix B (as applicable).

2. Includes copy of all written material submitted to operator?

Response

Yes.

Reference

Appendix B (as applicable).

3. Includes operator’s responses?

Response

Yes.

Reference

Appendix B (as applicable).

NCP Checklist - page 3
4. Includes operator’s disposition of written and verbal comments?
   
   **Response**  Yes.
   
   **Reference**  Appendix B (as applicable).

F. Informal agreement received form FAA on flight procedures?
   
   **Response**  n/a.

III. NOISE EXPOSURE MAPS: [150.23, B150.3; 150.35(f)] (This section of the checklist is not a substitute for the NEM checklist. It deals with maps in the context of the NCP submission.)

A. Inclusion of NEMs and supporting documentation:
   
   1. Map documentation either included or incorporated by reference?
      
      **Response**  Yes.
      
      **Reference**  Section 1.1.
   
   2. Maps previously found in compliance by FAA?
      
      **Response**  Yes.
      
      **Reference**  Appendix B, notice dated 2/26/97.
   
   3. Compliance determination still valid?
      
      **Response**  Yes.
      
      **Reference**  Appendix B, notice dated 2/26/97.
   
   4. Does 180-day period have to wait for map compliance finding?
      
      **Response**  No.
      
      **Reference**  Compliance Notice, 2/26/97.

B. Revised NEMs submitted with program: (Review using NEM checklist if map revisions included in NCP submittal)
1. Revised NEMs included with program?
   
   **Response** No.
   
   **Reference** n/a.

2. Has airport operator requested FAA to make a determination of the NEM(s) when NCP approval is made?
   
   **Response** No.
   
   **Reference** n/a.

C. If program analysis uses noise modeling:

1. INM, HNM, or FAA-approved equivalent?
   
   **Response** Yes.
   
   **Reference** INM 4.11, NEM Submission; Section 3.

2. Monitoring in accordance with A150.5?
   
   **Response** Yes.
   
   **Reference** NEM Submission; Section 3 and 4.

IV. CONSIDERATION OF ALTERNATIVES: [B150.7, 150.23(e)]

A. At a minimum, are the alternatives below considered?
   
   **Response** Yes.
   
   **Reference** Section 1.3, 2, 3, 4.

1. Land acquisition and interests therein, including air rights, easements, and development rights?
   
   **Response** Yes.
   
   **Reference** Section 4.

2. Barriers, acoustical shielding, public building soundproofing?

   NCP Checklist - page 5
Response: Yes.
Reference: Section 4.

3. Preferential runway system?
Response: Yes.
Reference: Section 3.

4. Flight procedures?
Response: Yes.
Reference: Section 3.

5. Restrictions on type/class of aircraft (at least one restriction below must be checked)?
   Response: Yes.
   Reference: Section 3.
   a. Deny use based on Federal standards?
      Response: Yes.
      Reference: Section 3.
   b. Capacity limits based on noisiness?
      Response: Yes.
      Reference: Section 3.
   c. Noise abatement takeoff/approach procedures?
      Response: Yes.
      Reference: Section 3.
   d. Landing fees based on noise or time of day?

NCP Checklist - page 6
Response No.
Reference n/a.
e. Nighttime restrictions?
Response Yes.
Reference Section 3.

6. Other actions with beneficial impact?

Response Yes.
Reference Sections 3 and 4.

7. Other FAA recommendations?

Response Yes.
Reference Sections 3 and 4.

B. Responsible implementing authority identified for each considered alternative?

Response Yes.
Reference Sections 3, 4, and 5.

C. Analysis of alternative measures:

1. Measures clearly described?
Response Yes.
Reference Sections 3, 4, and 5.

2. Measures adequately analyzed?
Response Yes.
Reference Sections 3, 4, and 5.

3. Adequate reasoning for rejecting alternatives?
   
   Response Yes.

   Reference Sections 3 and 4.

D. Other actions recommended by FAA:

   Should other actions be added?
   (List separately, or on back of this form, actions and discussions with airport operator to have them included prior to the start of the 180-day cycle)

   Response Yes.

   Reference Per Sections 3 and 4.

V. ALTERNATIVES RECOMMEND FOR IMPLEMENTATION: [150.23(e), B150.7(e), 150.35(b), B150.5]

A. Document clearly indicates:

   1. Alternatives recommend for implementation?

      Response Yes.

      Reference Section 5.

   2. Final recommendations are airport operator’s, not those of consultant or third party?

      Response Yes.

      Reference Section 5 (DLH concurs with PAC/TAC Conclusions).

B. Do all program recommendations:

   1. Relate directly or indirectly to reduction of noise and noncompatible land use?

      Response Yes.

      Reference Section 5.
2. Contain description of contribution to overall effectiveness of program?

Response  Yes.
Reference  Section 5 (supported by sections 3 and 4).

3. Noise/land use benefits quantified to extent possible?

Response  Yes.
Reference  Section 5 (supported by Sections 3 and 4).

4. Include actual/anticipated effect on reducing noise exposure within noncompatible areas shown on NEM?

Response  Yes.
Reference  Figure 1-2 reflects dispersion of flight tracks. Other effects discussed in Sections 3 and 4.

5. Effects based on relevant and reasonable expressed assumptions?

Response  Yes.
Reference  Sections 3 and 4.

6. Have adequate supporting data to support its contribution to noise/land use compatibility.

Response  Yes.
Reference  Sections 3 and 4.

C. Analysis appears to support program standards set forth in 150.35(b) and B150.5?

Response  Yes.
Reference  Sections 3 and 5.

D. When use restrictions are recommended:

NCP Checklist - page 9
1. Are alternatives with potentially significant noise/compatible land use benefits thoroughly analyzed so that appropriate comparisons and conclusions can be made?

Response n/a, use restrictions not recommended.
Reference n/a.

2. Use restriction coordinated with APP-600 prior to making determination on start of 180 days?

Response n/a.
Reference n/a.

E. Do the following also meet Part 150 analytical standards:

1. Formal recommendations which continue existing practices?

Response Yes.
Reference Sections 3, 4, and 5.

2. New recommendations or changes proposed at end of Part 150 process?

Response Yes.
Reference Section 5.

F. Documentation indicates how recommendations may change previously adopted plans?

Response Yes.
Reference Section 5 (supported by Sections 3 and 4).

G. Documentation also:

1. Identifies agencies which are responsible for implementing each recommendation?

Response Yes.
Reference Section 5.
2. Indicates whether those agencies have agreed to implement?

Response Yes.

Reference Sections 3, 4, and 5 (conclusions developed from pertinent agencies and public officials as part of PAC/TAC committees).

3. Indicates essential government actions necessary to implement recommendations?

Response Yes.

Reference Section 5.

H. Time frame:

1. Includes agreed-upon schedule to implement alternatives?

Response Yes.

Reference Section 5.

2. Indicates period covered by the program?

Response No.

Reference Implementation time frame to be established by local authority.

I. Funding/Costs:

1. Includes costs to implement alternatives?

Response Yes.

Reference Section 5.

2. Includes anticipated funding sources?

Response Yes.
SECTION

1

Introduction

This document constitutes the Noise Compatibility Program (NCP) for Duluth International Airport as part of the FAR Part 150 Study. Its purpose is to review and recommend various noise abatement and mitigating measures based upon the conclusions yielded in the Noise Exposure Map (NEM) submission completed on December 18, 1996, which includes the 1996 Existing and 2001 Future Noise Contour Maps.

It is the goal of the DLH FAR Part 150 Noise Compatibility Program to further identify areas of noise land use incompatibility around DLH, develop noise abatement alternatives to mitigate existing incompatibilities, and recommend actions to prevent future incompatibilities, while taking under consideration the costs and effectiveness associated with the various alternatives proposed.

The NCP comprises the second portion of the FAR Part 150 submission which consists of two basic elements, the Noise Exposure Maps, submitted previously, and the Noise Compatibility Program.

Section 1.1 will briefly describe the NEM as the basis for recommendations contained herein that address noise abatement procedures and mitigation at DLH. For a more in depth discussion of the NEM and supporting documentation, refer to the FAR Part 150 Noise Exposure Map Submittal, submitted under separate cover. Section 1.2 will generally discuss the intentions and strategies of the NCP. Section 1.3 will review FAR Part 150 requirements and the Checklist for Noise Compatibility Programs at the beginning of this text.
1.1 - THE NOISE EXPOSURE MAP SUBMITTAL (NEM)

The NEM report, submitted under separate cover, methodically incorporated various data as well as on-site noise monitoring to generate noise contours, per FAR Part 150 guidelines. The NEM report contains and discusses information pertaining to on-site noise measurements, runway and flight track geometry and utilization, approach and departure profiles, operational activity by type and time of day, as well as noise complaints from airport neighbors. This necessary information was used to compile both noise contours for existing conditions (1996) and a five year forecast future condition (2001). From these noise contour maps, existing land uses were then noted from which incompatible land uses were then depicted. The NEM then identifies areas of incompatible use around airport environs that are of concern.

This process was formally concluded by record of approval from the FAA dated February 26, 1997 which stated that “...the Noise Exposure Maps (NEM) submitted by Duluth Airport Authority for Duluth International Airport under provisions of title 1 of the Aviation Safety and Noise Abatement Act of 1979 (public law 96-193) and 14 CFR Part 150 are in compliance with applicable requirements.”

1.1.1 - 1996 EXISTING AND 2001 FUTURE NOISE CONTOUR MAPS

Figures 1-1 and 1-2 represent 1996 Existing and 2001 Future Noise Contour Maps respectively as presented in the NEM. Areas of land use incompatibility are depicted, reflecting the level of noise impact around DLH. Areas of land use impact as they pertain to the NCP and land use compatibility will be discussed in Section 4.0.

1.2 - THE NOISE COMPATIBILITY PROGRAM (NCP)

As discussed in the NEM, the Noise Compatibility Program seeks to address these areas that have been identified. The NCP will analyze and subsequently provide distinct abatement alternatives that may be implemented by airport management and community leaders which will reduce, mitigate, or possibly eliminate present and future noise land use incompatibilities around the airport and it’s neighbors. Responsibility for implementing various noise abatement and mitigating measures are shared among various agencies, including; the Duluth Airport Authority (DAA), airport users, aircraft manufacturers, Federal, state, and local governments, as well as residents of communities near the airport. Each has a integral role in the difficult task of minimizing noise impact. For example;
The DAA is responsible for the planning and implementation of airport actions designed to reduce noise. These may include, but are not limited to, improvements in airport design and noise abatement ground procedures, or restrictions in airport use. It should be noted that any restrictions implemented may not unjustly discriminate against any user, impede the Federal interest in safety and management of the air navigation system, nor unreasonably interfere with interstate commerce.

The air carriers, air-cargo carriers, and commuter operators are responsible for retirement, retrofitting, or replacement of older aircraft that do not meet Federal (Stage III) noise level standards by December 31, 1999. Their cooperation would also be required for scheduling and operating aircraft in ways that minimize the impact of noise on people (i.e.; minimizing night flights or adjusted take-off tracks), in the event these mitigation measures are identified as viable alternatives for noise mitigation.

General aviation operators are responsible for proper aircraft maintenance and use of accepted flying techniques that minimize their noise output.

Aircraft manufacturers are responsible for incorporating quiet engine technology into new aircraft designs to meet Federal noise standards.

The Federal government has the authority and responsibility to control aircraft noise sources, implement and enforce flight operational procedures, and manage the air traffic control system to minimize noise impacts on populated areas.

Local government and planning agencies are responsible for land use planning, zoning, and housing regulation that will encourage development or redevelopment of land that is compatible with present and projected airport operations.

And finally, residents and prospective residents of communities surrounding the airport should seek to understand the aircraft noise problem and what steps can and cannot be taken to minimize the effect on people. Additionally, prospective residents of areas of aircraft noise should make themselves aware of the effect of noise on their quality of life and act accordingly.

The NCP will initiate a coordinated approach that will assure that these various responsibilities coincide with each other as well as within the framework established by the DOT/FAA Aviation Noise Abatement Policy of 1976 and the Airport Safety and Noise Abatement Act of 1979 to provide a viable working system that promotes actions that benefit all interests at DLIH. These actions should employ a balanced approach which produces realistic and practical solutions fair to both aviation and non-aviation interests.
Other than the various alternatives discussed previously which are implemented by a diverse array of entities involved in aviation, alternatives need to also be looked at from an airport specific standpoint. Most abatement alternatives can be categorized as on-airport actions and off-airport actions. On-airport actions are usually operational in nature while off-airport actions consist of land use actions, urban planning. Although equal emphasis is placed on reviewing and determining the viability of both urban planning and operational solutions, on-airport actions are typically appraised first as introduction of operational changes can often be made quickly to yield immediate results at relatively low costs. Of course, operational changes requiring significant capital investment in facilities can take far longer to accomplish.

Other options are then considered off-airport to address remaining incompatibilities. This can involve land use, planning, or other actions. However, it is the prerogative of local government to establish acceptable and permissible land uses either through zoning or other means. Accordingly, those land use compatibilities recommended or approved under the auspices of FAR Part 150, are not necessarily adopted or acceptable to local government, possibly due to zoning and/or existing laws. Local communities may even elect a wide range of alternatives from no action to those actions which may far surpass NCP recommendation.

1.3 - FAR Part 150 REQUIREMENTS

As in the NEM, FAR Part 150 sets forth definitive requirements for the composition of the NCP and the methods that should be employed in its’ development. FAR Part 150 assures that minimum alternatives are addressed, that they are adequately analyzed, and if viable, a recommendation by which such means may be implemented. FAR Part 150 stipulates that a minimum of seven possible alternatives be considered. Some examples of what alternatives FAR Part 150 requires that be investigated as a minimum, include: air rights, flight procedures, barriers, building soundproofing, land acquisition, etc. Additionally, as in NEM, FAR Part 150 provides a checklist to document that each provision has been met adequately. For instance, all analytical processes, results, and determinations must be documented, including the aforementioned seven alternatives. For convenience, the NCP checklist is located at the front of this document as reference.

FAR Part 150 provides a framework which prescribes that certain criteria will be met in determining the feasibility of various abatement alternatives. In advocating specific standards and systems which seek to reduce existing non-compatible uses and prevent additional non-compatible uses, FAR Part 150 also seeks that in implementing such measures, that:
these alternatives do not cause undue burden on interstate and foreign commerce;

these alternatives are not being unjustly or unreasonably discriminatory.

these alternatives allow for future revision as may be required as circumstances dictate.

As an ongoing process, FAR Part 150 also requires the development of the NCP to be coordinated with local planning officials and other interested parties in addition to aviation and airport officials in the interest of bringing forth mitigation measures that are not only attainable, but realistic and acceptable to those jurisdictions affected by aircraft noise. DLH has met this requirement through the utilization of the Technical Advisory Committee (TAC) and the Public Advisory Committee (PAC) which oversaw, and provided input to, NCP development. As a final step in this process, open Public Workshops were conducted to solicit the input of airport neighbors and other members of the community.

With the integral assistance of both the TAC and PAC committees, this document will identify the required minimum alternatives as put forth by FAR Part 150, along with other potential abatement alternatives that have proven to be effective at other airports throughout the United States, as well as any that may be unique to DLH. Those which could provide beneficial reduction in overall noise impact at DLH will be recommended for a more detailed analysis. Therefore, the alternative or combination of alternatives when implemented at DLH should provide a reduction, if not an elimination, of incompatible land uses within the 65 DNL contour without unfairly restricting the use of the airport. A detailed analysis of each potential alternative identified within this document will be completed to ensure that the alternative can be safely initiated and that economic, social, and environmental impacts do not outweigh the benefits derived.
Section 2

Introduction of Possible Alternatives

As previously discussed, a variety of abatement measures are potentially available. The extent upon which they warrant a detailed evaluation depends on their potential effectiveness in reducing noise impacts, the extent to which they may compromise safety margins and the ability of DLH to perform its intended function, and the likelihood for implementation considering legal, political, and financial circumstances.

This section will provide a brief overview of those abatement procedures which have the potential to reduce the aircraft noise impact on persons living around the airport environs. Possible measures identified herein include immediate noise abatement measures that may be implemented by the airport sponsor as well as mitigating and preventative land use measures that may be introduced by local planning and zoning jurisdictions. These options include both immediate and on-going measures designed to alleviate or possibly eliminate noise impact in designated areas around DLH.

Section 2.1 represents the identification of these potential mitigating measures and the initial determination as to their feasibility as applicable to DLH. Subsequently, Section 3.0 will individually identify each noise abatement alternative, discuss its viability and effectiveness as a noise abatement measure specifically at DLH, and finally provide a conclusion as to its ability of being applied at DLH. Likewise, Section 4.0 will, on a case by case basis, identify each land use alternative, address its plausibility and effectiveness as a land use compatibility measure specifically at DLH, and finally provide a conclusion as to its ability of being applied at DLH.
Section 5.0 will discuss these conclusions collectively, to provide a balanced and coordinated approach to implementing a credible Noise Compatible Program at DLH. It will make recommendations regarding the implementation of the program based upon the aforementioned conclusions coupled with other integral factors such as implementation schedules and costs.

2.1 IDENTIFICATION OF ALTERNATIVES FOR DETAILED ANALYSIS

As stated in Section 1.2, responsibility for mitigation measures overlaps many interacting entities. For pragmatic purposes, and to be feasible locally, FAR Part 150 allocates the responsibility and/or authority of implementing alternatives among three basic agencies; the airport sponsor, state and local government agencies, and appropriate federal agencies. As discussed, FAR Part 150 requires, as a minimum, at least the initial analysis of seven categories of alternatives as listed in the NCP checklist. These seven categories encompass essentially all types of endeavors that should be contemplated. FAR Part 150 takes these basic alternatives and categorizes them by the responsible authority. The alternatives are allocated between two of the three basic agencies; firstly, the airport sponsor, and secondly, state and local government. The allocation is as follows:

- **Airport Sponsor Options**
  1. Denial of use to aircraft not meeting Federal noise standards.
  2. Capacity limits based upon noise:
     a. Restrictions based upon cumulative noise impact,
     b. Restrictions based upon certificated noise levels, or
     c. Restrictions upon estimated single-event noise levels.
  3. Noise abatement takeoff or approach procedures.
  4. Landing fees based upon noise levels.
  5. Noise barriers (shielding).
  6. Acquisition of land and interest therein.
  7. Complete or partial curfews.

- **State/Local Government Options (Strategies to Reduce Existing Noncompatible Use)**
  1. Remedial actions.
  2. Encouragement of existing favorable trends.
  3. Constructive use of planning and zoning.
4. Constructive use of public capital improvement projects.
5. Purchase assurance programs.
7. Acquisition of impacted land.

> State/Local Government Options (Strategies to Prevent New Noncompatible Development).

1. Development control.
2. Zoning.
3. Easements.
4. Transfer of development rights.
5. Purchase.

As can be seen, Federal authorities are not included in this division of authority. The capacity in which Federal authorities, in this case the FAA, have responsibility includes funding, technical expertise and guidance, and foremost, overall review to ensure that the safety of air transportation and the interests of interstate commerce are maintained. The division of authority also reflects a distinction between initial and ongoing implementation responsibility. While the airport sponsor may propose many noise abatement measures which coincide with their responsibilities, often, practical and safe implementation requires FAA coordination. Table 2-1 depicts a series of noise control measures as they address varying noise compatibility problems. Those actions which would require FAA involvement are represented by an asterisk.

The NCP for DLH recognizes that land use control authority resides with local government agencies and that land use strategies are largely limited to corrective action; acquisition, sound insulation, easements, and such. Additionally, the NCP acknowledges that there are factors beyond the control of the airport sponsor which strongly influence local land use decisions. Consultation and interaction between the airport sponsor and local jurisdictions is imperative to allow for a viable and balanced approach to noise control and abatement.

Section 3 will begin to express how this program can be developed in that fashion by analyzing a full array of noise mitigating measures and determining which are feasible within this balanced approach. Although all potential measures will be reviewed under equal and individual merits, those that can be categorized as on-airport and operational should take precedence. The assertion being that those actions can be initiated immediately at relatively low cost, potentially yielding significant results. Next on-airport measures requiring capital investment in facilities will be analyzed. Finally, any and all remaining impacts, can then be addressed by off-airport land use actions. Upon all impacted areas being addressed to
mitigate noise impact, those actions which may be established in an on-going fashion will be recommended for DLH to take a pro-active stance in preventing future noise incompatibilities.

Table 2-2 reflects a wide assortment of on and off-airport, operational and land use, initial and on-going provisions which could afford varying degrees of results at DLH. The viability of each potential alternative are argued in Sections 3.0 and 4.0. As discussed previously, it will be the continued responsibility of the airport sponsor and State/local jurisdictions to advance and sustain those measures advocated in the Noise Compatibility Program.

Additionally, it should be noted that measures already instigated by the Federal government have taken effective steps to reduce aircraft noise on a national level. The Airport Noise and Abatement Act of 1990 requires that all aircraft meet stage III criteria by the year 2000 with interim compliance dates. The next compliance date is December 31, 1996, by which time all individual operators must either operate a fleet that is sixty-five percent quieter stage III aircraft of retire at least fifty percent of their noisier stage II aircraft. This will have some positive impact at DLH, however noise contours will not be reduced significantly as the Act only applies to civilian jets, over 75,000 pounds, and not to military aircraft.
Table 2-1  Matrix of Noise Control Actions

<table>
<thead>
<tr>
<th>1</th>
<th>IF YOU HAVE NOISE FROM THIS PROBLEM... ▲</th>
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<tbody>
<tr>
<td>2</td>
<td>...CONSIDER THESE ACTIONS ▼</td>
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</tbody>
</table>

| AIRPORT PLAN | Changes in Runway Location, Length or Strength | ● ● ● ● ● |
|              | Displaced Thresholds                           | ● ● ● ● ● |
|              | High-Speed Exit Taxways                        | ● ● ● ● ● |
|              | Relocated Terminals                            | ● ● ● ● ● |
|              | Isolating Maintenance Runups or Use of Test Stand Noise Suppressors and Barriers | ● ● ● ● ● |
| AIRPORT AN AIRSPACE USE | Preferential or Rotational Runway Use * | ● ● ● ● ● |
|                       | Preferential Flight Track Use or Modification to Approach and Departure Procedures * | ● ● ● ● ● |
|                       | Restrictions on Ground Movement of Aircraft * | ● ● ● ● ● |
|                       | Restrictions on Engine Runups or Use of Ground Equipment | ● ● ● ● ● |
|                       | Limitations on Number or Types of Operations or Types of Aircraft | ● ● ● ● ● ● |
|                       | Use Restrictions                               | ● ● ● ● ● ● |
|                       | Rescheduling                                   | ● ● ● ● ● ● |
|                       | Move Flights to Another Airport                | ● ● ● ● ● ● |
|                       | Raise Glide Slope Angle or Intercept *         | ● ● ● ● ● ● |
| AIRCRAFT OPERATION | Power and Flap Management *                    | ● ● ● ● ● |
|                    | Limited Use of Reverse Thrust *                | ● ● ● ● ● |
| LAND USE | Land or Easement Acquisition                     | ● ● ● ● ● ● |
|                       | Joint Development of Airport Property           | ● ● ● ● ● ● |
|                       | Compatible Use of Zoning                       | ● ● ● ● ● ● |
|                       | Building Code Provisions and Sound Insulation of Buildings | ● ● ● ● ● ● |
|                       | Real Property Noise Notices                     | ● ● ● ● ● ● |
|                       | Purchase Assurance                              | ● ● ● ● ● ● |
| NOISE PROGRAM MANAGEMENT | Noise-Related Landing Fees                      | ● ● ● ● ● ● |
|                          | Noise Monitoring                                | ● ● ● ● ● ● |
|                          | Establish Citizen Complaint Mechanism           | ● ● ● ● ● ● |
|                          | Establish Community Participation Program        | ● ● ● ● ● ● |

* These are examples of restrictions that involve FAA's responsibility for safe implementation. They should not be accomplished unilaterally by the airport operator.

Source: FAA Advisory Circular 150/5020-1
<table>
<thead>
<tr>
<th>ALTERNATIVES</th>
<th>POTENTIAL</th>
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<td></td>
<td>Viable</td>
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<td>Noise Abatement Options</td>
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<td>Adjusted Climb Power</td>
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<td>Adjusted Climb Angle</td>
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Source: ACSG, Inc., 1996
SECTION 3

Evaluation of Noise Abatement Alternatives

Noise abatement proposals contemplated in this study are those procedures which meet comprehensive operational criteria while still being adequate to reduce aircraft noise around DLH and its neighbors. The following are possible alternatives that were analyzed, in accordance with FAR Part 150. The regulatory and operational noise abatement preferences, elaborated on in the following pages, fall into four categories. They are Runway Use and Flight Routing, Airport Regulations and Facility Restrictions, Aircraft Operating Procedures, and Airport Facilities. Additionally, added as an integral component to a balanced approach to airport instituted systems, are options which appraise indirect methods of supporting noise abatement. This section will also review systems which may be employed by DAA to manage noise issues as they arise within the community.

Measures in the first three categories generally may be implemented in the short term, while modifications to Airport Facilities require a longer period of time because of environmental assessment or EIS, design, and construction requirements.

As a means of addressing noise impact, operating restrictions may be imposed by the airport sponsor, with the approval of FAA. The courts have recognized the right of airport sponsors to reduce their liability for aircraft noise by imposing restrictions which are reasonable, non-discriminatory, and do not interfere with interstate commerce nor violate any contractual agreements entered into with the FAA as a condition of receiving Federal aid.

The following potential alternatives are regulatory, operational, or on-airport
managerial procedures which seek to immediately reduce aircraft noise affecting outlying communities, while maintaining a competitive and safe operating environment at DLH. Each option will be assessed to determine its possible applicability to DLH as well as the results it is expected to yield.

A synopsis of the results of these analyses can be found in Table 3-1 at the end of this Section.

3.1 - AIRCRAFT OPERATIONAL NOISE ABATEMENT ALTERNATIVES

- Adjusted Climb Power
- Adjusted Climb Angle
- Adjusted Climb Track
- Adjusted Angle of Bank
- Tailwind and Crosswind Limitations

These alternatives relate to the manner in which pilots operate and maneuver their aircraft. High performance aircraft, especially military and air carrier, have very specific operational procedures which optimize economy and maximize safety. Mitigation measures which affect aircraft operation are typically used as “last resort” measures. Any action which serves to alter the safety of aircraft operations from optimal to acceptable must be approached with the greatest caution.

Conclusion: With the exception of Adjusted Climb Track the alternatives do not merit further consideration. During the TAC process, the MnANG indicated that departure tracks could be further modified to avoid particularly noise sensitive areas. In particular, avoidance of flights over Pike Lake. Although outside of the 65 DNL, this area is especially sensitive due to the extremely low background or ambient noise level. This area is also an area where noise complaints have occurred.

Implementation of this measure will require approval of local ATC through an amendment to the existing Letter of Agreement with the MnANG.
3.2 - AIRPORT NOISE ABATEMENT OPTIONS

3.2.1 - NOISE MANAGEMENT LEVELS

- **Noise Abatement/Community Relations Office**
  A community relations office at an airport many times is the only way by which surrounding communities may become familiar with airport issues and requirements and therefore understand its position. Strong community relations regarding noise and abatement issues are highly recommended. A formal program to respond to questions and/or complaints and develop community relations greatly enhances public opinion and understanding towards an airport and its concerns. Community relations should entail an active response to community issues and a general interaction with public activities and/or community groups. However, due to the number of operations at DLH, the level of impact, and the minimal number of complaints received, a full time dedicated noise office is not warranted. It is likely that this responsibility could be handled by a single individual at DAA, with great benefit to the airport and its neighbors.

  **Conclusion:** Due to manpower requirements, and cost this alternative is not viable or cost effective.

- **Noise Monitoring Systems**
  Permanent noise monitoring systems provide noise level data on individual aircraft arrivals and departures. It is utilized on a daily basis to track and identify noisier aircraft. Noise impact at DLH is fairly limited and NEM forecasts regarding an increase in aircraft operations are minimal. Permanent noise monitoring systems are expensive to acquire and maintain. Furthermore, DLH does not currently have ARTS III radar systems to tie a monitoring system into. Therefore, permanent noise monitoring systems cannot be justified.

  FAR Part 150 stipulates that an update in noise contour development should occur every five years or sooner if the airport experiences significant changes. This should be sufficient to monitor changes at DLH.

  **Conclusion:** This measure is not justified for DLH and is not recommended for implementation.
Community Complaint System
An avenue by which airport neighbors can voice their concerns will be well received by the public and is recommended. Currently, DAA exercises an informal program which records all written and oral complaints received at DAA. As complaints dictate, calls and/or correspondence are then forwarded to the Executive Director, the DLH FAA ATCT or MnANG.

Conclusion: This practice should be continued, formally adopted and expanded as part of community relations responsibilities. Community relations at DLH should continue to track complaints with existing logs, follow-up complaints, and record actions taken.

An individual designated from MnANG, ATCT or DAA, familiar with airport operations should field calls received, document them and any action taken, as well as provide information to the public regarding pertinent issues. He or she should become a point of reference at the airport for neighboring communities. This person should also be able to coordinate concerns between the general public, DAA, the DLH ATCT and MnANG, as necessary.

Community Noise Abatement Committee
Often upon the dissemination of information, a community noise abatement committee becomes a tremendous asset to an airport by educating those it represents on the limitations an airport may have regarding aircraft noise. Although this education does not affect noise abatement, it creates a better understanding among airport neighbors as to what can and cannot be done to remediate noise. As the public has already developed committees to address aircraft noise, it is recommended that a Community Noise Abatement Committee be established.

Community involvement in the Public Advisory Committee (PAC) during the development of the NEM and NCP provided the opportunity for the open discussion of concerns and the manner in which they might be addressed. It also furnished a forum by which perspectives were exchanged and explored.

Conclusion: A permanent committee could be developed as a community liaison to a DAA representative. This is a viable option which could be initiated within the communities adjacent to DLH. Such a committee will also be of assistance in the participation of the public in the Noise Compatibility Program and its initiatives. If necessary, a DAA representative could assist in the committee's development.
3.2.2 - NOISE REDUCTION MEASURES

Tailored Flight Tracks

Land use in the vicinity of the airport provides clues to the design of arrival and departure patterns for noise abatement. By re-directing air traffic over compatible land use corridors, noise impacts may often be significantly reduced. As such, tailored flight tracks are effective, when possible, to develop flight corridors which avoid residential areas thereby reducing noise impact.

Measures that could be implemented include:

- Rotational runway use programs.
- Straight-out departures.
- Specific departure turns.

Rotational Runway Use. Rotational runway use is intended to distribute aircraft noise equally among the residents of areas off runway ends. At best, a rotational runway use program can only provide temporary relief for one group at the expense of another. However, it does provide a method of alleviating the severity of noise impact in given areas adjacent to an airport. At DLH, Runway 09-27 is utilized as the primary runway by air carriers, air cargo, and the military due to its 10,152 foot length, as well as its convenience to airport structures, which minimize taxiing distances.

Currently, due to the terminal and MnANG hangars location in the east and southeastern quadrants of the airport, departures predominately occur from Runway 27, or to the west, and arrivals primarily occur on Runway 09, to the east, to minimize taxiing time. There is also activity from arrivals of some commuter turboprop aircraft on Runway 21, to the south. If the crosswind runway, 03-21, were extended a rotational runway use program could be highly effective in relieving aircraft operations from Runway 09-27, thus reducing aircraft noise in that area.

Runway 03-21 is 5,699 feet in length. If it were extended to the FAA recommended eighty percent of the primary runway length, or 8,122 feet, this option might be viable as a means of abatement at DLH. It should be noted however, that potential residential areas to the north east end of Runway 03-21 could be impacted. Additionally, due to existing noise sensitive areas
southwest of Runway 03-21, this corridor should not be utilized as part of the rotational system. This consideration could limit the effectiveness of rotational runway usage.

**Straight-Out Departures.** In situations where noise-sensitive development occurs around the airport and along the sides of the extended runway centerline, aircraft are often directed to maintain the runway heading until reaching a given altitude or distance from the airport. One complaint received from area residents is early turns by departing aircraft. This requirement, which stipulates aircraft must climb to a higher altitude before turning to course headings, would delay turns and keep aircraft concentrated along the extended centerline further from the airport. As various residential areas develop along the sides of runway ends, the effectiveness of straight-out departures is somewhat limited.

**Departure Turns.** The turning of departing aircraft to avoid populated areas is an accepted method of noise abatement which has been initiated at numerous airports.

Presently, the DLH ATCT actively seeks to disperse flight tracks as much as possible to minimize the severity of impact in any one area around DLH. Dispersion may be the only flight track abatement action producing measurable results.

As noted in Section 3.1, an amendment to the current Letter of Agreement between MANG and ATCT could significantly reduce the impact on one particularly noise sensitive area.

**Conclusion:** The implementation of a rotational runway use plan at DLH, provided an extension of Runway 03-21 is accomplished, could yield some noise reduction benefits. In any event, this is a measure that could not be implemented in the near future, and therefore remains a long term planning option. Extending straight-out departures does not appear to be the most efficient method of minimizing the number of persons within the noise contours. Corridors to effectively utilize specific departure turns are so small, that the feasibility of such an procedure and its validity are nominal. The DLH ATCT should continue its practice of flight track dispersion to alleviate noise impact from any one community adjacent to the airport and amend the current Letter of Agreement with MnANG to avoid Pike Lake whenever possible.
Tailored Flight Procedures
Discussed on preceding page.

Changes in Runway Length and Location
Discussed on preceding page.

Preferential Runway Use
The objective of a preferential runway use system is to take advantage of uneven population distribution around an airport to reduce the overall amount of incompatible land use. Runway use systems which give preference to a particular runway for noise abatement refer, for the purposes of this study, to the use of selected runways by turbojet and large propeller aircraft. Preferential runway use programs are intended to direct as much noise as possible over the least noise-sensitive areas. They do not necessarily apply to light general aviation aircraft since they have virtually no effect on noise patterns. This traffic should continue to be routed by ATCT in the most efficient method available.

As in the rotational runway use alternative, described previously, this option is only viable if it is determined that a runway 03-21 extension project can be accomplished to allow for the utilization of that runway to alleviate traffic from Runway 09-27.

FAA Order 8400.9, issued in 1981, describes national safety and operational criteria for establishing runway use systems. It classifies two forms of systems; formal and informal. A formal system must be defined and acknowledged in a Letter of Understanding between the FAA’s Flight Standards Division and Air Traffic Service, the airport sponsor, and airport users. Once in place, participation by aircraft operators is mandatory. Formal programs can be difficult to establish, especially at airport with many different users.

Conversely, an informal system is an approved runway use system which does not require a Letter of Understanding. Typically, informal systems are conceived through a memorandum of agreement between the FAA ATCT and the airport sponsor, a tower order, and publication of the procedure in the Airport Facilities Directory. Participation in this type of program is voluntary.

Conclusion: Provided the crosswind runway can be extended in a timely fashion, and provide for a diversion of air traffic from Runway 09-27, the noise abatement potential to residential areas west of the primary runway could
be significant. Due to the volume and nature of aircraft activity, military and non-military, an informal program could be viable.

Preferential runway use is predicated upon the extension of Runway 09-27. The viability of this extension can only be determined through an Environmental Assessment (EA) or possibly an Environmental Impact Statement (EIS). It is recommended that an EA be undertaken to establish the viability of this runway extension option.

Displaced or Relocated Runway Thresholds
A displaced threshold involves shifting the area marked for aircraft touchdown further down the runway. This, in effect, raises the altitude of approaching aircraft, slightly reducing noise levels. Another potential benefit of displaced thresholds is shifting the location where reverse thrust is applied, moving it further down the runway and further from residential areas. The determination as to the degree of displacement must weigh the required runway lengths for landing as well as the amount of noise reduction associated with that degree of displacement.

A relocated threshold involves a shift in both the location of the touchdown zone and the point at which take-off rolls may be begun. Simply, it entails the complete closure of that end of the runway, except for taxiing. A relocated threshold could offer some additional noise reduction by shifting noise associated with the start of the take-off roll further away from the runway end and possibly noise sensitive areas.

Threshold displacement, or relocation, offers only small noise reduction benefits to areas very close to runway ends. To illustrate, if the threshold of a runway were displaced 1000 feet, the altitude of an aircraft along the approach path would be increased by only 50 feet. The single event noise levels would decrease slightly along the flight track, but only incrementally, no more than two to three decibels over the area directly beneath the approach track. Most importantly, noise impacted areas at runway ends are more impacted by departure rather than arrival noise and could actually experience an increase in noise levels.

In determining whether threshold displacement or relocation for noise abatement is of benefit, the costs of such displacement or relocation and their effect on airfield operations and safety must be compared to the minimal noise abatement benefits which might be realized. Costs to be considered in displacement or relocation are the potential for new taxiway construction,
relocation of Instrument Landing Systems (ILS), and the relocation of lighting systems. This is no small endeavor for a procedure that would yield marginal results.

A displaced threshold on runway 09-27, for noise purposes, would be ineffective at DLH. However, there is a displaced threshold active for Runway 27 to provide obstruction clearance over Haines Road. By far, the greatest area of impact is west of DLH extending off runway 27. To realize a reduction in noise in this area, a displaced threshold would need to occur on approach to runway 09. Due to runway utilization and the fact that approach and departure flight tracks overlap at the runway end, any decreases in noise due to arrival operations, are more than offset by increased noise generated by departures. Departure noise is considerably louder than approach noise and completely dominates the noise contours off runway 27.

Another consideration is the aircraft braking distance required under less than ideal weather conditions, no small factor at DLH.

**Conclusion:** Due to cost of implementation, existing runway utilization, and the extremely limited benefits offered, displaced or relocated thresholds are not warranted at DLH for noise abatement purposes.

- **Relocate Terminal**
  
  The relocation of an airport terminal is an enormous undertaking and rarely involved in addressing noise issues. Generally, terminal relocations are designed, as part of a master plan, when an airport is running at full capacity or there are significant changes required to the runway configuration.

  The current terminal was constructed and opened in 1974. It is more than adequate in design, infrastructure, and circulation to contend with existing operations at DLH. Furthermore, should growth be experienced at DLH in the near future, the existing terminal has the design capacity to incorporate this increase into facility operations. Operations at the terminal do not have an adverse affect on outlying communities and no change in existing runway configuration is currently under consideration.

  **Conclusion:** For the reasons indicated, this alternative is not viable.

- **Relocate Engine Run-up Areas**
  
  There are currently 3 aircraft run-up sites. One on each end of Runway 09-27, used primarily by the MnANG, and one on Taxiway A1, used primarily by
general aviation aircraft.

The sites used by MnANG are of operational necessity and cannot reasonably by relocated. The other site appears to be properly positioned and relocation would not appear to provide any benefit.

The only run-up site used by airlines is located with the Northwest Airbus facility as discussed below.

**Conclusion:** For the reasons indicated, and relevance, this alternative is not considered.

> **Restriction on Engine Run-up Times**
> There have been no reported complaints at DLH relating to aircraft run-ups.

**Conclusion:** No change appears to be warranted, except as noted below in regard to the Airbus facility.

> **Construction of Sound Barriers or Enclosures**
> An acoustical, or sound, barrier may include noise walls, earthen berms, and noise suppression structures, such as blast deflectors, or hush houses, for containing engine run-up, take-off roll, or even taxiing noise. Acoustical barriers are only useful for attenuating noise from aircraft activity on the ground. Sound barriers may only be used under special circumstances where certain conditions are met. They have limited application in that they are only useful over relatively short distances and their benefits are greatly affected by surface topography, wind conditions, reflection off structures, and even temperature. The effectiveness of a barrier is directly related to the distance from the noise source to the noise sensitive area and the distance of the barrier from each as well as the angle of the end of the barrier to the noise sensitive area. Upon aircraft liftoff, the interruptive potential of the barrier is negated.

The Northwest Airlines Airbus (A320) Maintenance Facility is located immediately north of Runway 09-27. This facility has been designed to conduct primarily “C” and “five year” checks, or heavy maintenance, of which engine maintenance is not a component. Therefore extensive, long-term, high power run-ups will not be required. However, as a part of these maintenance checks, engines will have to be run to analyze numerous aircraft systems.

To actively address the issue of noise abatement and to eliminate impact on airport neighbors due to these activities, Northwest Airlines and DAA have
mutually agreed to implement the following measures:

1.) Run-ups will typically be conducted during the first two shifts, in mid to late morning and early evening. Late night run-ups will occur infrequently and only under urgent circumstances. Northwest has indicated that they will notify airport management when this occurs and the circumstances requiring this non-standard procedure. Based upon Northwest’s previous experience, only two or three run-ups will be required per week.

2.) Northwest has constructed a large earthen berm adjacent to the facility to mitigate noise generated by engine run-ups. It is immediately adjacent to the run-up pad and should be a viable means by which noise will be mitigated.

3.) Northwest facility management has agreed to work closely with DAA airport management to provide a means by which on-going noise impact considerations will be addressed.

Although viability is less certain, another area of possible sound barrier usage, are those residential areas immediately south of DLH and north of U.S. Highway 53, abutting airport property. This area consists of a mobile home park, a portion of which is within the 65 DNL contour. As this park immediately neighbours the airport, and mobile homes affected would be immediately adjacent to a potential barrier, noise abatement might be possible. Those single family residences due west of the aforementioned mobile home park, also abutting airport property, and within the 65 and 70 DNL, would not realize any benefit from barrier construction as aircraft have already become airborne this far down runway 27.

Another consideration of sound barrier implementation, is that although berms and walls can attenuate noise, they are often strongly criticized by airport neighbors because they obstruct views. Another occasional complaint by affected residents is that the noise is perceived as actually louder. This is attributed to the possibility that the noise impact is more alarming when it occurs, particularly at unaccustomed times, because individuals are unable to observe the cause of the noise. On the other hand, some residents sense an apparent reduction in noise merely by the presence of the berm, even though scientific measurement indicates that the noise reduction would not be recognizable by the human ear.

These are the only two areas where a noise barrier would have any possibility of being effective as an attenuation measure. The possible effectiveness would
require a detailed scientific analysis by an experienced acoustical engineer.

The MnANG has used a “hush house” for engine run-ups for many years. The original facility could accommodate the engine only, and outside aircraft run-ups were still required. Recently, the MnANG constructed a “hush house” which will accommodate an entire F-16 aircraft, virtually eliminating the need for outside run-ups. These very expensive structures contain virtually all engine noise and one must be standing in the immediate vicinity to determine whether the facility is in use.

**Conclusion:** The Northwest Airbus (A320) Maintenance Center has implemented prudent noise abatement and attenuation measures that should be continued and supported. The MnANG has already taken the most costly and effective avenue to curtail aircraft maintenance related noise. The possibility of a noise berm adjacent to the mobile home park might merit further study; however, at this point it is not considered cost effective or viable.

> **Restriction on Reverse Thrust During Landings**

Constraints on the use of reverse thrust to slow aircraft immediately after touchdown may reduce noise impacts off the sides of the runways involved. However, the imposition of a reverse thrust restriction would not provide a significant contraction in the noise contours, although it may be perceived as such by certain persons immediately adjacent to the airport.

Another factor for consideration is the safety of such a measure. The full enforcement of this restriction is not considered fully safe. The restriction could possibly be implemented, but at the pilots discretion, consistent with the highest degree of safety. This provides a pilot the latitude to respond to specific flight conditions on a daily basis. While yielding negligible results, such as a measure has serious effects on flight safety.

**Conclusion:** Due to the minimal, if any, positive effect and potential safety concerns, this alternative should not be pursued.

> **Restriction on Ground Movements**

Noise monitoring indicated negligible impact from ground movements of aircraft, and there are very few modifications which could take place due to airport layout, traffic flow and operations.

**Conclusion:** This alternative does not merit further consideration.
Noise Limits on Aircraft

Noise limits on aircraft impose outright restrictions on the use of particular aircraft which exceed certain levels. Although in theory, this could reduce cumulative noise exposure at an airport, its implementation could be exceedingly harsh and cause undue burden for air carriers. The ability to induce this measure in a fair and equitable manner is minimal. This method could result in the required exclusion of a particular air carrier which would be discriminatory.

Even partial limits based on a percentage of stage III aircraft flights is unduly restrictive. For example, based upon the market service required at a specific airport, a particular class of aircraft appropriate for that market may only have a small proportion of stage III aircraft.

Conclusion: The initiation of such a measure would severely impede air carrier operations and be an undue burden on interstate commerce. The FAA would be unlikely to support such a restrictive measure. This technique should not be considered further.

Noise Budget

Noise budgets are a very complex and time intensive method by which to address noise abatement. Their purpose is to limit overall aircraft noise by allocating noise amongst airport users. This is no simple task. By design, the intent of such a program is to motivate airport users to shift operations to less noise-sensitive hours or even enhance conversion to quieter stage III aircraft. Many integral steps are required in the development of a noise budget program. For instance:

- The airport must determine a target level for cumulative noise exposure which the airport intends to achieve in a specific time frame. Note: DNL would be an appropriate metric to reflect this noise exposure.

- The airport must decide upon how to develop a system that would permit allocation of the cumulative noise exposure among airport users.

- Then the system must be implemented, allocating such between airport users.

- A system must be created by which airport users may be
monitored to ensure that users are in compliance with allocations.

- In the event that users fail to operate within specified allocations, mandates must be established to provide sanctions against users.

As can be seen, implementation of such an endeavor is difficult at best and may require series of updates and modifications before becoming feasible.

Upon determining this course of action, an airport must determine the goal it wishes to set for itself, the target level. Upon this determination, the airport must choose a metric which is conducive to allocation. DNL is utilized in many instances as it is easily implemented in noise modeling, such as the INM, which can be run for various airport operators and individual aircraft types. Also INM database profiles can be a valuable tool in providing noise levels for singular aircraft which can be used for the basis of noise allocations.

The system by which noise is allocated is crucial and can determine success or failure of a program. The design of a fair and objective system is exceedingly difficult. It would seem that by implementing an auction, or lottery system to allocate noise would be fair and equitable, however this is not the case. Those carriers in a financially stronger position would have an unjust advantage by having the opportunity to acquire extra noise allocations for the purpose of speculation and/or restraint of competition. Also a lottery, being completely unbiased, would not take into account past operating histories. As can be seen, whatever system is chosen, it must have strict controls.

A suggestion might be to base allocation on recent operating histories present at the airport. It could be based upon each air carrier’s contribution to existing noise levels at the airport as well as its past performance in helping to reduce that noise. It is also important that any system adopted allow for the inclusion of new carriers at a future date.

After an equitable system is in place, an airport must develop a time line delineating declining noise allocations for each air carrier the purpose being able to reach the target level, or noise reduction goals of the program. Each air carrier would continue to have freedom in scheduling any aircraft at any time throughout the day as long as the air carriers allocation is not exceeded. Therefore if an air carrier chooses to use quieter aircraft and/or operate during less noise sensitive hours, it would benefit by increased flights per allocation.
With a system designed and operational, a means by which compliance may be monitored is required. This is a very time consuming and costly endeavor for an airport. On the simplest of levels, it requires a full tracking of all air carrier schedules. At the end of any given period, an air carrier's schedule could be totaled, tabulated based upon individual aircraft noise levels, and quantify that carrier's contribution to total noise for the period. This would then be compared against its allocation. In this case, individual aircraft noise levels would be based on certificated noise levels or INM database levels. Although this method would take considerable time to administer, it would be relatively basic to implement and track. It would also be relatively easy to computerize with adequate database and/or spreadsheet software. It would also provide an easy means by which air carriers may adjust their activities, and understand the noise implications of that particular change.

A more complex and precise method to track noise compliance, would be to monitor actual aircraft noise levels rather than using flight schedules and predetermined aircraft noise levels, such as the INM database. This is feasible by affixing a permanent noise monitoring system to an ARTS III radar tracking system. This option will not be explored, as a permanent monitoring system is prohibitively expensive and DLH is equipped with ARTS II radar which does not support a tracking system.

Another factor to consider, is the incentive required to encourage air carriers to convert to stage III aircraft when, as indicated in Section 2.0, air carriers are already actively pursuing compliance with the Airport Noise Abatement Act of 1990. With this in mind, DLH must consider whether the considerable difficulties and costs of implementing, tracking, and enforcing a noise budget are worthwhile and sufficiently beneficial. Although DLH enjoys a steady flow of air carrier operations on a daily basis, jet service is augmented by the use of "commuter" aircraft. Flights affected by a noise budget would be nominal. By and large, the biggest civil contributors to aircraft noise at DLH are Northwest Airlines and Federal Express. For the purposes of noise budget analysis, turboprop aircraft utilized by United Express and Northwest Airlinc are not a factor. Northwest is already taking steps to reach compliance, varying from re-engining and hush kitting its DC-9s to introducing Airbus A320 aircraft to some of its operations in conjunction with the maintenance base. Similarly, Federal Express has developed hush kits for its 727 aircraft.

As MnANG mission profiles are an important part of the national defense, compliance to a restrictive noise budget is not operationally possible.
Conclusion: Due to prohibitive cost, potential impact upon air commerce, limited effectiveness, and potential damaging affects upon the local community, this alternative does not appear to have any practical potential for implementation at DLH and will not be reviewed further.

Nighttime Use Restrictions
Curfews are an option that have been successfully implemented at many airports. However, precaution should be taken on the level of restriction implemented. FAA Advisory Circular 150/5020-1 affirms that curfews are an effective albeit costly approach to controlling airport noise. Since unwanted noise is most pronounced in the late evening or early morning hours, curfews are typically implemented to restrict nighttime operations. (The same logic applies to 10 dB penalties incurred by night flights in constructing noise contours). However, curfews have economic impacts upon airport users, upon those providing airport-related services, and even on the community as a whole. Therefore, curfews should be held as a strategy of last resort, when all other avenues have been exhausted or shown to be clearly inadequate, because of the negative effect upon aviation and the community.

There are essentially three types of curfews. For instance, the airport could be closed to all operations, arrivals and departures, it could be closed to departures only, or it could be closed to arrivals and departures by aircraft exceeding specified noise levels.

Full Curfews
Curbing all traffic during noise-sensitive hours places severe and undue restraints on airport users who are not major contributors to the noise contours. Not only would the noisiest operations be prohibited, but quieter operations by light aircraft would also be banned by a full curfew.

This alternative has the potential to create far more harm to the community by impeding air commerce, than any potential benefit realized from the noise mitigation.

Curfews on Departures
Curfews on departures are designed to allow aircraft to return home, but would prohibit departures, which are generally louder than arrivals. Even though this measure would be less restrictive, a curfew on departures would have a similar impact on DLH as a full curfew. While it would allow air carriers to bank aircraft on the apron for flights the following morning, after curfew hours, it
would prohibit feasible operations at the airport during nighttime hours. This would adversely impact early morning air carrier schedules, air cargo operations, as well as light aircraft whose contribution to aircraft noise is negligible.

**Curfews Based on Aircraft Noise Levels**
A curfew that would allow only aircraft that do not exceed specified noise levels could be developed. While the airport may set any maximum noise level it desires, it must weigh this decision heavily. The airport sponsor must look at possible economic impacts as well as discrimination against a particular airport user. To have an effect, the curfew must address those aircraft which are the worst offenders of aircraft noise. This would include B-727, B-737-200, and the DC-9 as examples. Those operators that predominantly utilize these aircraft could be adversely impacted in an inequitable fashion.

Much of this analysis becomes mute when it is considered that the number of Stage II aircraft in operation are actively decreasing per FAA mandate. As the percentage of Stage III aircraft put into operation increases through incremental compliance dates, the need and efficacy of an aircraft noise based curfew become obsolete. Recent information submitted to Congress states that Stage III aircraft comprise 70.7 percent of the combined domestic and foreign fleets subject to the law. Operators are well ahead of the mandated interim compliance date of December 31, 1996 which requires only 65 percent. The date for complete compliance is December 31, 1999.

**Conclusion:** It is not felt that any of the curfew measures evaluated above could be effectively introduced at DLH especially considering the fact that the MnANG has already adopted a self-imposed restriction on late night operations, unless absolutely necessary to meet training or mission requirements. Furthermore, it is probable that the FAA would reject any significant curfew alternative, as it may constitute an interference with interstate commerce in the area. Even less prohibitive curfew measures would require an argument of extreme local hardship and represent an absolute last resort to acceptable noise mitigation measures. The majority of airports which have imposed, or attempted to impose, curfews have experience lawsuits and/or loss of federal grant assistance.

Due to the potential adverse affect on airport users, the local economy, the debatable effectiveness of the measure, and the position of the FAA, these alternatives are not recommended for further investigation.
Pushbacks at Terminals (Use of Tugs)
Due to the limited number of air carrier jet operations and the location of the terminal building and ramp, no benefit would be realized by implementing this costly procedure.

Conclusion: This alternative is not recommended.

Restrictions on Touch-and-Go or Training Flights
The relatively few training flights, conducted by non-based military aircraft or airlines, have been included in the data input into the INM and reflected in the NEM’s. This activity generally takes place during daytime hours and do not represent a significant addition to noise impacts. Due to this, and the fact that the airport has never received a noise complaint regarding flight training, no restrictions appear to be merited at this time. This issue, however, should be monitored in the event that circumstances or local perception changes.

Conclusion: This alternative may be reviewed further, if warranted, at a later date.

Upon review, several different regulatory and operational measures have been considered for the purpose of providing a fair and complete noise abatement study. The previously reviewed abatement alternatives collectively provide a comprehensive analysis of potential on-airport operational abatement systems, including those put forth by FAR Part 150 and those which had little promise for local application.

Those alternatives which were deemed to be potentially viable for utilization at DLH are discussed further in Section 5.0. Each of the operational initiatives, although discussed individually, will be re-evaluated collectively. The goal of this effort will be to determine potential conflicts between the various alternatives, when looked at collectively.
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| Mitigation Measures: | |
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Source: ACSG, Inc., 1998
Section 4

Evaluation of Land Use Alternatives

Section 3.0 provided for an in depth study of operational noise abatement alternatives that could be implemented on-airport at DLH, most of which in the short term. Additionally, measures must be considered off-airport to mitigate noise impact. Land use compatibility around an airport is imperative not only to mitigate existing noise impacts, but more importantly, to prevent future impacted areas from developing. The Noise Compatibility Program at DLH calls for measures that will not only provide a means by which existing noise impacts may be addressed, but an on-going program that will allow the community to take a pro-active stance towards noise affecting communities adjacent to DLH.

Although the evaluation of noise abatement alternatives in Section 3.0 resulted in specific tentative recommendations which could improve the noise environment around the airport, land around the airport will remain impacted by aircraft noise to varying degrees.

Section 4.0 will examine land use management alternatives intended to reduce and, ultimately, prevent future noise impacts. Noise mitigation proposals assessed in this study will assist operational recommendations in the short term to alleviate noise impact as well as to provide a foundation from which future noise impact may be pre-empted. The viability determination of various land use noise mitigation measures will be based upon compatible land uses within DNL contours prescribed by the FAA in Part 150, as discussed in the NEM portion of the Part 150 text.

This section will identify broad planning issues and the effect of the tentative
operational noise abatement recommendations on those issues. It will then appraise alternative land use management controls and determine each’s potential usefulness in the DLH environs. Subsequently, the controls which best respond to the DLH environment will be discussed to evaluate how the best techniques may be combined to support a comprehensive and long term land use strategy. This strategy will then be applied to various areas stipulated in the NEM as being impacted.

Table 4-1 summarizes specific areas cited in the NEM as impacted around DLH. These include existing residential and noise sensitive areas as well as undeveloped residentially zoned lands. The first six issues listed contend with noise impacts on various existing noise susceptible land uses, while the last two issues address potential future incompatibility by citing areas which although currently undeveloped, could be developed at a later date.

Table 4-2, at the end of this section, summarizes the alternatives which have been analyzed.

| Table 4-1: DLH Land Use Issues  
(per 1996 Revised Existing Noise Contours) |
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<td>1. Single Family Residences to the west of DLH within 75 DNL.</td>
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<td>2. Single Family Residences to the northwest, west, and southwest of DLH within the 70 DNL.</td>
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Source: ACSG, Inc., 1996

Again, in reviewing the following land use alternatives, it should be noted that the criteria used in appraising viability at DLH is two-fold. Firstly, it is understood that the operational noise abatement procedures recommended in Section 3.0 immediately address the purpose of reducing noise impacts on existing residents as much as possible. Secondly, upon the aforementioned implementation, recommended land use alternatives will provide a dual
purpose:

- to address the risk of future development of noise sensitive land uses;
- to identify ways to mitigate the impact of noise where it can not be significantly reduced through operational methods.

4.1 - STATE/LOCAL GOVERNMENT OPTIONS

NCP development requires a balanced review of all options, which includes land use planning, to affirm that the burden of noise mitigation and the benefits of a vital and safe national air transportation system are shared amongst all jurisdictions of a given community as discussed in Section 2.0. As land use controls are typically outside an airport sponsor’s authority to implement, public consensus as well as state/local government action are required to develop workable solutions. The process which has been set up to cultivate a noise compatibility plan for DLH accords an atmosphere where aviation as well as non-aviation interests within a community may be put forth to address the economic and political issues necessary to balance air transportation growth with neighborhood interests.

4.1.1 - MITIGATION MEASURES

Mitigation, or remedial, measures are generally considered as those enacted to mitigate or correct existing land-use compatibility problems. The methods identified for evaluation as part of this study include land acquisition and relocation, purchase assurance/sales assistance, avigation easements, and sound insulation alternatives. Each alternative has been identified for evaluation and is summarized below as to ascertain its potential for appropriate application at DLH.

- **Land Acquisition and Relocation**

  By and far, the most all-encompassing and extreme measure that may be implemented by an airport is a land acquisition and relocation project. The main purpose for a land acquisition project is not only to mitigate existing properties through acquisition and relocation but to prevent the development of incompatible uses by retention of those acquired parcels. Due to the nature of
outright acquisition, this type of program is the most complete way to ensure noise compatibility around an airport.

In an ideal situation, efforts would be made to provide complete land use compatibility down to the 65 DNL contour. This would most likely be achieved through a highly focused land acquisition program closely supported by applicable noise abatement measures. However, reality and mitigating circumstances determine that often this is not possible. Land may be bought for noise compatibility purposes by an airport sponsor under noise funds set aside as part of the Federal Airport Improvement Program. The FAA actively supports airport ownership of land subject to noise in excess of 75 DNL. Land acquisition of noise impacted areas down to 65 DNL may also be justified for land use compatibility and included in a land acquisition program which receives Federal assistance. In many airport communities however, due to political, economical, and logistical reasons, a full scale program of this sort is not possible. In such instances, a limited fashion of land acquisition may be implemented, and augmented by other land use as well as operational alternatives to comprise a complete noise abatement and mitigation program.

A land acquisition program advanced on any scale must conform to The Uniform Relocation Assistance and Real Property Acquisition Regulations for Federal and Federally Assisted Programs, Final Rule and Notice (49 CFR Part 24) issued by the Federal Department of Transportation. Part 24 was established to delineate specific criteria which must be adhered to in providing for land acquisition and relocation of private property and affected owners and/or residents. The cardinal purpose of Part 24 (per 49 CFR Part 24, Subpart A, 24.1) is:

- to ensure that owners of real property to be acquired for federal and federally-assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owners, to minimize litigation and relieve congestion in the courts, and to promote public confidence in federal and federally-assisted land acquisitions programs;

- to ensure that persons displaced as a direct result of federal or federally-assisted projects are treated fairly, consistently, and equitably so that such persons will not suffer disproportionate injuries as a result of projects designed for the benefit of the public as a whole; and
to ensure that agencies implement these regulations in a manner that is efficient and cost effective.

The intent of Part 24 is to clearly delineate a methodology which provides for a program that is equitable and cost-effective, while ensuring that the rights of private individuals involved in such programs are protected. Part 24 even goes so far as to many times ultimately enhance the living situation of those involved in a land acquisition project. For instance, Part 24 actively supports impacted residents general desire to shift from tenant to homeowner status. When possible, Part 24 will provide assistance to make home ownership possible.

Additionally, airport projects administered through AIP funds are further regulated by *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects* (Advisory Circular 5100.17) which clearly delineates systems and controls that are expected by the Federal Aviation Administration. It’s precepts closely coincide with those of Part 24. Various additional publications are released by the Regional Offices of the FAA which suggest program procedures and controls for their particular region.

Acquisition of those parcels slated for inclusion in a land acquisition project is initiated by an appraisal(s) being performed to determine *fair market value* for a particular parcel and/or improvements. Appraisals must be performed to ethical and professional standards. Subsequent to a determination by a review appraiser that a given appraisal(s) is justified and represents *fair market value*, the airport sponsor, or it’s representative, will make an offering of *just compensation*. An airport sponsor can offer no less than *fair market value* in *just compensation*. A homeowner has the right to accept or reject this offering. If rejected, an airport may enter into reasonable negotiation which may result in an *administrative settlement*. If an offer remains rejected, in an involuntary program, an airport sponsor, or associated jurisdiction, may exercise it’s power of *eminent domain* and condemn the property. However, if a program is carried out diligently, responsibly, and within the parameters of Part 24, *condemnation* is an option of last resort and generally not necessary. If the program is voluntary, and an offer is rejected, negotiations desist, and actions buy an airport sponsor are ceased. If an offer is accepted, payment of *just compensation* is made to the homeowner and the relocation process is implemented.
Upon acquisition of a property, the relocation procedure is administered by initial interviews being conducted with homeowners or tenants to determine living conditions, program eligibility, financial means, as well as any other criteria that must be considered in providing for a smooth relocation of impacted residents. Eligibility considerations are as follows for individuals who have been in occupancy for the various time periods prior to acquisition:

- **1 to 89 days prior to acquisition:** All occupants are entitled to moving costs to provide for the move of personal belongings from the premises to a distance up to 50 miles unless otherwise justified.

- **90 to 179 days prior to acquisition:** Owners or tenants are entitled to a relocation payment up to $5,250 (in addition to just compensation paid to homeowner) to rent or purchase decent, safe, and sanitary replacement housing. Moving costs are also provided.

- **180 days or more prior to acquisition:** Owners are entitled to relocation payment of up to $22,500 (in addition to just compensation paid to homeowner), tenants up to $5,250, to purchase, or rent, decent, safe, and sanitary housing. Moving costs are also provided.

After initial interviews are completed, and eligibility has been ascertained, program representatives must confirm that there are comparable replacement dwellings available for displaced residents. Homeowners or tenants may not be asked to vacate premises until comparable dwellings have been established. Upon comparable dwellings being established, a relocation package would be presented to the owner or tenant depicting their individual relocation benefits.

To prevent a financial burden to displaced residents, relocation payments may be furnished based upon the eligibility requirements summarized above. If it has been calculated that costs of comparable replacement housing is in excess of the just compensation provided, payment will be made to alleviate that difference up to the relocation payment figures above, based on eligibility. For homeowners, this payment, if applicable, is referred to as a Homeowners Replacement Housing Payment. This payment is only made if comparable replacement housing can not be purchased by a displaced homeowner with funds provided from acquisition. The maximum payment is $22,500.
Similarly, a tenant may receive a Rental Replacement Housing Payment, or simply, a “rental buydown”, if it is determined that a comparable replacement dwelling requires rental payments that are higher than those of an existing rental. The rental buydown is a lump sum payment based upon the monthly difference between the existing and comparable rentals for a 42 month period up to $5,250. If desired, tenants receiving this payment may utilize such funds as a downpayment for the purchase of a replacement dwelling in lieu of continuing to rent.

However, certain instances of personal or financial hardship may dictate that these limits be surpassed. Such cases are called Housing of Last Resort and require approval from the FAA for completion. Escrow accounts may be used if necessary to distribute funds and ensure financial stability. Under no circumstances may a displaced family or individual be left in a detrimental financial situation subsequent to relocation.

All displaced residents have the unaltered right to be provided means for relocation to decent, safe, and sanitary (DSS) housing regardless of existing living conditions. DSS housing must conform to state and local building codes. It must be structurally sound, have water and sanitary systems, and have adequate utilities to accommodate displaced residents.

Eligible moving costs to facilitate relocations include packing and crating of personal property, shipping, as well as unpacking and uncrating such belongings. Additionally, this includes the transfer of all utilities as required.

Upon review, it is readily apparent that the implementation of a fee simple land acquisition program is both costly and time intensive. Also, due to the volatile nature and regulation required for such a project, thorough expertise in land acquisition and relocation practices are absolutely imperative. Many cities who have competent land management offices who acquire land for the city, still utilize outside consulting services for airport projects. Regardless of an “in-house” or “turn-key” approach to such a program, those delegated to undertake a land acquisition program are responsible to provide complete advisory support and logistical assistance through the entire acquisition/relocation procedure for those affected.

Another component, that has considerable possibility in DLH, is a partial taking of property. Typically, in suburban or urban areas, full acquisition of
land and all improvements is required in sub-divided areas where quarter or half acre lots are common for dwellings. However, in more rural areas where residences occupy larger tracts, up to several acres, it is possible to acquire the dwelling and/or its immediate environs in lieu of the entire acreage. Such a method is known as a partial taking. This is a viable option to minimize the amount of land to be acquired as part of the project. Great care should be taken to affirm that the portion of land that remains has a contingent land-use. Such land that remains that does not have an assertable use is considered an uneconomic remnant and should be acquired. As this applies to DLH, this method provides an avenue to take steps toward land compatibility while curbing associated costs.

Sections 1 through 3 in Table 4-1, DLH Land Use Issues, could be addressed by this measure. Currently, there are 106 single family residences (SFR) within the 65 DNL, 27 within the 70 DNL, and 5 within the 75 DNL. It should be added, that the projected future impact forecasts the number of SFR to increase to 11 within the 75 DNL, per 2001 Future Noise Contours. Mobile homes addressed in sections 4 and 5 of Table 4-1 will be considered in this measure only within a relocation capacity. Since the nature of mobile homes are in fact their mobility, acquisition is not warranted, unless not DSS, and would be moved as part of a relocation package.

**Conclusion:** Due to the scope, both economically and logistically, of an all-encompassing land acquisition program at DLH, as well as the current sentiment within local communities, a full program within the 65 DNL is not recommended. As other less intrusive measures may provide appropriate alternatives, those options should be left open for those impacted areas within the 65 and 70 DNL.

As land acquisition within the 75 DNL is strongly encouraged by regulation as well as critical input from the PAC and TAC committees in Duluth, it is recommended that a voluntary acquisition program be implemented within the 75 DNL, with further emphasis placed upon those parcels not yet developed.

**Purchase Assurance/Sales Assistance**

Purchase assurance and sales assistance programs are effective mitigation measures that may be adopted if land acquisition is not feasible nor warranted. Basically, purchase assurance is a program wherein the airport acts as a buyer
of last resort, thereby guaranteeing fair market value for impacted properties. Sales assistance is a program wherein the airport actively provides assistance to property owners in selling homes. For this assistance, the airport then retains an easement to the property. A further discussion of these two methods follows below.

**Purchase Assurance:** As the name implies, the purpose of a purchase assurance program is to assure homeowners in noise impacted areas that they will be able to sell their property for fair market value. The assurance is that the airport sponsor agrees to acquire the property if the homeowner is unable to sell the property on the open market. Subsequently, the airport could possibly then sell the home after providing for a noise and avigation easement and/or sound insulating the property.

Purchase assurance programs are most effective and appropriate at airports where there is widespread concern amongst the community, that homeowners will have difficulty selling homes because of aircraft noise intrusion. They are also appropriate where noise levels are not so severe as to make it unfeasible to re-introduce individuals to an area. Applications also present themselves in noise impacted areas where acquiring and clearing neighborhoods is not possible.

Purchase assurance is a viable option for airports who do not wish, nor need, to enter into a full land acquisition project. It provides communities, and individual families, the option to decide for themselves how they would like to respond to aircraft noise. It gives those families who do not particularly perceive a problem and do not wish to see action taken, the peace of mind that if in the future they wish to sell their property it will not be adversely affected. Likewise, the program allows the airport sponsor to address the varying concerns of families who are annoyed by aircraft noise, and who do desire to leave a neighborhood, by providing a means to facilitate a move without financial loss.

Because property values generally do not diminish significantly due to aircraft noise, the aforementioned program may be more economical to implement than other options. However, other facets of such a project should be considered. Purchase assurance programs can be fairly complex and time consuming to administer, especially for smaller airports with limited staff. There is the possibility that the airport sponsor would have to become a property manger or landlord if market conditions were such that it becomes difficult to resell homes.

A program of this nature should be strictly staged to phase only a certain number
of homes into the program at one time. This prevents the program from becoming over extended from an airport perspective as well as causing an adverse reaction on the local real estate market. Because purchase assurance programs are generally initiated in less impacted areas, those who participate are commonly those who have a high sensitivity to aircraft noise and feel it is highly intrusive to their daily lives. Care should be taken, not to make this program so attractive that there is a tremendous flood of applicants in an area that is not greatly impacted.

As noise complaints at DLH have historically been minimal, a purchase assurance program is a viable avenue for noise mitigation purposes in lieu of a full land acquisition program. As impacted communities adjacent to DLH appear to have incorporated aircraft operational noise as a part of their daily lives, a purchase assurance program might provide a voluntary means for addressing impacted areas while not afflicting individuals with unwanted mandatory measures. This could have applications within the 65 and 70 DNL for residences, with the exception of mobile homes, in lieu of land acquisition and relocation measures.

If this methodology is pursued, the following guidelines should be adopted:

- Mobile homes should not be included in the program. Participating properties should solely include single- and multi-family housing.

- If a property already has been secured with either noise notices or noise and avigation easements it should not be included in the program.

- Eligible properties need to be appraised by a qualified appraiser to determine fair market value.

- Eligible properties should be in reasonably good repair, decent, safe, and sanitary, meeting local building codes, and FHA lending standards.

- Prior to the airport sponsor acquisition, it should be determined that the homeowner has made a good-faith effort to sell the home, either through the services of a real estate agent or through a by-owner process.
It should also be determined if the home has been listed on the market for an adequate period of time. For instance, at least one peak seasonal sale period.

The purposes for the preceding guidelines are; firstly, that if an airport sponsor is required to purchase a home, that it may be re-sold after either easement or sound insulation procedures have been implemented, and secondly, since this program guarantees homeowners a buyer, that they do not become lax in their efforts to sell their home through normal measures on an open market.

In essence, if the program is not designed and implemented correctly, it could actually instigate incentives for homeowners not to attempt to market and sell their homes, obviously not the intent of implementing a purchase assurance program. For this program to be effective, the tone of the program should be to assist homeowners by assuring last resort measures will be initiated if their home can not be sold on the market. It’s not the programs intent to replace standard real estate marketing and sales procedures already in place.

There are many safeguards that may be imposed to effectively prevent the potential pitfalls described in the paragraphs above. Most real estate markets across the country have an average disparity between list, or ”asking” price, and the sale price, typically ranging from 4-10%. An airport sponsor may decide to offer 90-96% of appraised value, to reflect a sale concluded on the open market. This would prevent the homeowner from preferring to sell to the airport rather than on the open market.

Another preventative measure to ensure market sales are pursued is an offering by an airport sponsor to pay for closing and associated costs that would normally be incurred by the seller in a market sale. In return for such closing costs, etc. being provided, the airport would be granted an avigation easement on the property. This allows the homeowner to sell their house without being subject to costs and fees and provides the airport the security of an noise and avigation easement without the step of purchasing and re-selling the residence.

Predicting the cost of a purchase assurance program is extremely arduous to estimate due to many contributing variables, and a dependancy on local markets for resale. Firstly, the airport must consider the cost of acquisition in the area if required. Subsequently, the airport must determine the form of mitigation to implement prior to resale. This alone can be dependent on many factors including, but not limited to, degree of impact/location, project scope, etc.
Costs must be determined for sound insulation and or noise and avigation easements. Finally, the residence must be marketed for resale adding additional costs.

Another consideration that would affect cost is the number of houses involved. This actually is not as easy to determine as it may seem. If Duluth, at time of implementation, were experiencing a strong housing market, homeowners would be less inclined to participate in a program as houses would be easily sold without airport assistance. Conversely, the opposite effect would take place in a weak market requiring more action by the airport sponsor.

The strengths of a program such as this are its ability to provide a voluntary means by which an airport may begin acquiring noise and avigation easements over noise impacted residences. Also, such a program allows the airport to address community noise issues while not disrupting established neighborhoods. It also provides the opportunity for homes to be sound insulated alleviating the need for further rehabilitation or acquisition.

The weaknesses are administrative support requirements and the potentiality that the airport will become involved in property ownership and management. This may require that an airport sponsor be prepared to handle “landlord” responsibilities as well as security and maintenance obligations.

**Sales Assistance:** By design, sales assistance programs are developed to actively assist homeowners in impacted areas sell their homes. This program is set up very similarly to a purchase assurance program, in fact they may work in tandem, where sales assistance measures operate within a purchase assurance program. The major difference between this program and purchase assurance is that the airport never takes title of the property involved. The airport only provides assistance and works in a coordinating capacity to ensure that homeowners receive appraised value, or an increment thereof, regardless of the final sales value that is negotiated with a given buyer.

Care should be taken by the airport to assure that no collusion exists between buyers and sellers, as this would be detrimental to the airport’s position. To prevent this, a requirement could be established requiring that the airport approve all listing prices, as well as subsequent adjustments, for a property to be included in the program.

For its efforts in facilitating a sales assistance program, an airport sponsor would anticipate that property owners would dedicate a noise and avigation
easement to the airport as part of participation in the program.

**Conclusion:** A purchase assurance and/or a sales assistance program at DLH could be used as a viable mitigating measure at DLH, in areas that do not require fee simple acquisition. These measures may provide a less intrusive and more economic method for the airport to approach aircraft noise issues. Additionally, based upon nominal negative comment from those within impacted areas, those communities involved might prefer this voluntary approach to a more involved and uninvited or aggressive land acquisition and relocation program.

Based upon input from the PAC and TAC, it is not felt that such a program is justifiable at this time and may be considered at a later date as warranted.

**Acquisition of Avigation Easements**

The valuation an avigation easement is recognized as a unique and specialized field presenting problems not usually encountered in other property interest acquisition actions. The unusual qualities of avigation easement valuation require not only a thorough knowledge of the numerous laws, principles, and appraisal techniques governing most government land acquisition appraisal, but also a knowledge of aviation terminology and concepts together with a controlled imagination and sufficient initiative to apply intelligent thought and interpretive analysis to the many and varied conditions to be encountered.

An avigation easement is a property interest in airspace over a particular portion of ground, providing for the right-of-flight of aircraft; the right to cause noise, dust, emissions, etc.; the right to remove all objects protruding into the airspace, together with the right to prohibit future obstructions in the airspace and the right to reenter the land to enforce the rights acquired. The easement may also contain additional restrictions as the airport sponsor may deem necessary.

The right of flight is the essence of the avigation easement. It is imperative that the appraisal reflect the specific easement estate proposed for acquisition. Other types of easements are often confused with avigation easements, with the result that many appraisers and landowners assume all avigation easements are the same. Often there is the assumption that a clearance easement protects the airport from future claims of property owners due to overflights. It is important to understand that a clearance easement provides only for protection from obstruction
and does not include the right-of-flight.

The appraiser's ability to understand terminology and concepts such as primary surface, approach surface, horizontal surface, conical surface, runway protection zone and approach protection area is a requirement to the valuation process on properties which lie in areas affected by varying restrictions.

Basic valuation principles which have been derived from legal decisions include:

- Appraisers may and should take into consideration aircraft activity prior to the taking of the easement,
- Actual proof of damages, that is, a depreciation in the value of the property,
- The mere prospect of potential damage is speculative,
- The easement must damage the land or property right, and
- There must be direct, substantial and immediate interference with the use and enjoyment of the property.

The appraiser must develop the present use and the potential highest and best use of the property as unaffected by the easement. Care must be taken to assemble and analyze all economic data as well as the market transactions that occur, giving consideration to all factors and conditions that will lead to a justified and well thought out opinion of the highest and best use of the property. The appraiser will carefully consider the landowner's vertical area of effective possession, as it relates to highest and best use. This information will be available through coordination of information on the imaginary surfaces from the Airport Layout Plan in the case of avigation easement acquisitions for affected areas. The establishment of highest and best use is essential to the before and after value calculations where it may be concluded that although the highest and best use has not changed, there has been a limitation on the use.

The strengths of avigation easements are that they provide some legal protection for airports and allow for an airport’s desire to provide fair disclosure. An
additional benefit, is that as areas are established, the airport has some piece of
mind from potential recourse from a homeowner, while a homeowner feels
compensated for inconveniences caused by noise. Other than the expertise
required to develop and implement a program of this nature, administrative
requirements are not as taxing as many other programs.

One possible disadvantage of such a program is the fact that the purchase, or
dedication, of an avigation easement is not a mitigation measure but merely
compensates homeowners for impacts from aircraft operational activities.
Depending on market trends in Duluth at the time of implementation, the
initiation of such a measure may be costly as well. It should also be noted, that
the acceptance of avigation easements may not protect an airport from
complaints, community controversy, political pressure, nor even lawsuits as
noise in the airport environs or community attitudes change.

This measure has potential as a stand alone measure as well as an alternative
that may be developed along side other viable measures at DLH. Significant
costs of this measure could be offset if developed and initiated with either a
purchase assurance or sales assistance program.

Conclusion: The potential of this application has merits that should be
reviewed. It is conceivable that expenses associated with purchasing avigation
easements, pending local markets at time of implementation. Easement costs
could reach approximately 20 percent of appraised home value. The benefits
exceeding this cost are debatable. However if this alternative were developed as a
secondary measure in association with either a purchase assurance or sales
assistance program, the benefits yielded may be justified.

Based upon input from the PAC and TAC, it is not felt that such a program is
currently justifiable. The results of the voluntary acquisition program within the
75 DNL may alter this decision, and the option should be held open for possible
consideration in the future.

Sound Insulation

Dependent on the level of impact, dwellings and other noise sensitive
structures may be sound insulated. This alternative seeks to reduce interior
noise levels via various construction methods as a noise mitigation measure.
Measures may include any combination of the following construction methods
such as; additions to existing walls, added insulation, the installation of solid or
foam-core doors, the installation of special acoustic window treatments, baffling and sealing of vents and openings, and/or the installation of a heating, ventilation, air-conditioning (HVAC) or fresh air ventilation system. Different construction methods are employed to respond to the various acoustical characteristics of aircraft noise as well as the sound attenuation characteristics of various building materials. The actual combination of methods is dependent on the level of noise impact, the nature and state of original construction, seasonal conditions, location to the airport, and the individual structure’s layout.

Each home under consideration must be inspected to determine the proper approach for soundproofing the home or noise sensitive building. At that time, sound insulation measures will be developed to determine the level of sound attenuation required as well as the construction methods that would be best suited to provide sound insulation of the structure. Each home must be inspected individually to address specific situations occurring in neighborhoods. For instance, even if all of the construction types are similar in Duluth due to climatic conditions and materials readily available, the direction which a house is facing in comparison to the airport is important. To further elaborate, if a home has its bedrooms facing a runway as opposed to say its garage, it will require more sound insulation methods be implemented. This is due to the fact that if an uninhabited, or even “common” space, is between a noise source and more private areas of a residence, that space acts as a buffer to mitigate noise transmission through the house. This effect is called shielding. The location of one house to another can result in shielding as well.

As can be seen, initiating a sound insulation program is a very complex endeavor. Each measure engaged responds to counteract a specific effect of a noise source. For instance, to sound insulate a wall while not providing for windows and doors would completely negate the sound insulation properties of the walls. For this reason, vents, or other openings to the exterior are baffled, and small cracks around windows and doors are sealed. Fresh air circulation or air conditioning systems are necessary if the full benefits of sound insulation are to be realized. This enables windows and doors to be closed throughout the year, allowing noise attenuation plans to remain effective.

Sound Insulation is generally most effective in colder climates, such as Duluth, where construction methods employed in those regions are typically “heavier” in response to climatic conditions. For example the use of 2x6 studs for walls in lieu of the typical 2x4. In fact, in these regions some, or all, sound reduction can be achieved by default with normal construction methods utilized in colder areas. Also, a program of this nature is more effective due to the shorter period of the year
devoted to outdoor activities. Generally, it is sought to reach a noise reduction level (NLR) of 25-30 Db in sound attenuation dependant on the use of the structure and the level of impact. Often, a 20 Db reduction is reached by standard construction methods resulting in noise insulation programs which discuss attenuation in terms of 5, 10, and 15 Db above typical construction methods. Design of at least a 5 Db reduction is incorporated into programs as this is minimum level that the human ear can perceive change. A reduction of less than 5 Db would not be perceived as any change to the occupants of a sound insulated home. These however are general guidelines. Specific inspections and a pilot program to determine exact measures to be initiated are necessary.

It should also be noted that mobile homes are not conducive to sound insulating measures. Due to the nature and construction methods of mobile homes, it is cost prohibitive to attempt to mitigate noise within a mobile home. If a sound insulation program were initiated, steps should be taken to find alternate means to address noise impact on mobile homes. Generally, due to their mobility, moving of such homes is the most prudent option.

A sound insulation program requires considerable managerial oversight, coordination, and administrative support. Prior to implementation the airport sponsor, or its representatives, must establish program guidelines, coordinate and train technical staff, architects, and contractors to be approved as part of the project. Also a pilot program should be delineated to test design methods and results before full project implementation is undertaken.

As mentioned previously, after the project is underway, each structure must be inspected and evaluated on an individual basis. This portion of the program alone is very time consuming. In order for sound insulation to work effectively, contractors involved must have a scrupulous and methodical attention to detail. One oversight in required construction specifications could render all other measures worthless. Therefore, detailed analysis and capable construction management is critical for each facet of such a project. The program would involve initial noise monitoring in a given dwelling, a report of required mitigating sound attenuation measures required by a qualified technician, presentation to and approval by the homeowner, coordination with a contractor from an approved project list to implement measures, periodic site inspections through the construction process, and a final inspection to assure that requirements have been met.

A sound insulation program can be one of the most cost effective ways in which impacted areas may be addressed when operational noise abatement measures are
unable to completely alleviate noise impact and land acquisition is not desired nor feasible. Additionally, other than residential areas, the sound insulation of noise sensitive buildings, such as religious structures or schools, is a viable alternative when land acquisition is not possible.

**Residential Areas:** A sound insulation program at DLH to mitigate impacted residential areas is a viable alternative to lighten noise impact on airport neighbors. Similar to a purchase assurance program, this alternative may be more readily received by local communities than a land acquisition program. Project acceptance in a community is an important factor in successful project implementation and should be weighed in the analysis and decision making process when possible. A program such as this would help improve noise and land-use compatibility around the airport environs in both the near- and long-term. It would have the potential of adding permanent benefit of improving housing and preserving the cohesion and quality of neighborhoods around the airport.

However, other considerations do exist. Due to the elaborate project management required for such an endeavor, the means by which such a program is to be implemented must be thoroughly explored. Cost of a sound insulation project is also an important consideration to be addressed. Construction costs could typically range from $20,000 to $25,000 per residence. According to the NEM for DLH there are 133 impacted single-family and duplex residences within the 65 and 70 DNL contours. If all these residences were included in a sound insulation program, this equates to approximately $3,325,000. This would be a sizable program and would need to be planned accordingly. Moreover, sound insulation is not recommended for residential dwellings in the 75+ DNL. In the existing condition there are 5 residences impacted, while this is forecasted to grow to 11.

Aside from considerable construction costs, the FAA generally will not participate in sound insulation programs in the 65 DNL if the building does not achieve a NLR of 20 Db or more. Likewise for the 70 and 75 DNL, with 25 and 30 Db NLR respectively. This FAA criteria requires house-by-house noise monitoring to determine eligibility in the program. Those homes above 70 DNL would likely qualify, while most of those between 65 and 70 DNL might not. This could cause problems within adjacent neighborhoods as to which houses may be included.

**Noise Sensitive Buildings:** There are only two noise sensitive buildings affected by noise impact around DLH. This includes the Calvary and Gethsemane Churches.

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located southwesterly of DLH in the City of Hermantown. Both are in the 65 DNL. Although sound insulation of these buildings may be considered, individual analysis would be required to determine the effectiveness of such a measure.

It is especially difficult to estimate construction costs required for sound insulation prior to a determination of what alterations to the structures will be required.

**Conclusion:** Although a program such as sound insulation would seem to be a viable avenue to address aircraft noise, numerous factors require detailed review. Given costs and scale of a likely sound insulation alternative, it might be a prudent course of action to limit the program to a smaller area, rather than an all-inclusive approach. For instance, it is possible that due to construction in the Duluth region that homes will currently have a 20 Db NLR without sound insulation. If so, those homes within the 65 DNL would not be eligible for FAA funding nor would need to be considered for sound attenuation purposes. This would decrease homes required to be insulated from 133 to 27, obviously greatly decreasing the scope of the project. This methodology would also alleviate potential problems occurring between neighborhoods within the 65 DNL related to which residences may or may not be eligible for sound insulation.

Further research would be required to determine the necessity, viability, and cost of sound insulating the two churches in the City of Hermantown. Upon preliminary review, it is apparent that the costs likely incurred to provide sound attenuation of the churches, greatly outweighs the minimal benefits the churches are likely to realize.

Based upon input from the PAC and TAC, it is not felt that such a program is justifiable at this point. The minimal improvements which might be realized, over those now provided by normal heat insulation requirements, would not be cost effective or justifiable.

**4.1.2 - PREVENTATIVE MEASURES**

Preventative measures for airport noise compatibility planning are designed to prevent future noise incompatible lands-uses from developing. This section will look at various methodologies, policies, and regulations designed to provide DLH and adjacent jurisdiction with a pro-active stance to avoid costly remedial measures from being required in the future. The methods identified as part of this study include comprehensive planning, compatible use zoning, noise overlay zoning, avigation easement dedication, re-
development, fair disclosure regulations, and building code modifications. Each alternative has been identified for evaluation as a policy or regulatory measure and is summarized below as to ascertain its potential for appropriate application at DLH.

- **Land Use Zoning and Noise Notices**

  Land use zoning and related endeavors are absolutely critical to the long term success of a Noise Compatibility Program. Those responsible for land use and planning development for a city or community around an airport must take an active and persistent approach to noise compatibility around airports. Long after noise mitigation endeavors have ended, local building and zoning departments will be charged with preserving the compatible areas developed around the airport as well as local communities. Many measures may be implemented to provide a pro-active stance for local jurisdictions to address, and thereby prevent, future noise impact.

  **Compatible Use Zoning:** Of all preventative measures that may be reviewed, the first is compatible use zoning as this shall be the basis for other alternatives. It is also a logical initiation point as it is a method by which residential zoning is eliminated within noise sensitive areas. This is done by changing the aforementioned residentially zoned areas to either commercial/industrial or agricultural zoned areas, as applicable. Although limited, this is a good initial step with definitive benefits.

  As a brief background, there are some inherent problems, regarding compatible use zoning, within ordinances that are cumulative in design. Zoning ordinances may be cumulative in that zoning districts are arranged in a hierarchy from most to least restrictive. The most restrictive zone is generally single-family residential which allows very few kinds of uses. As districts become less restrictive, more kinds of land uses are permitted, until eventually in the least restrictive, typically industrial, all uses are permitted with little restriction. This hierarchy allows residential development in areas zoned for commercial or industrial use. Therefore, with cumulative zoning ordinances, commercial or industrial zoning is no guarantee that noise compatible development will occur in the future, thus rendering the measure ineffective.

  Although atypical for the State of Minnesota, townships in the Duluth area, have exercised the power to zone lands within their jurisdiction. As DLH is bordered by a number of jurisdictions, each area must be reviewed and coordinated with to allow for consistent zoning regulations that address noise compatibility issues.
These areas include Caenosha Township, the City of Hermantown, and the City of Duluth.

Another fallacy of this methodology is its dependance on local markets. Although this aspect is often overlooked, compatible use zoning must balance the supply of industrial and commercial or industrial zoned land with local demand. If, for example, the local market for commercial and/or industrial land is weak, and if property owners perceive that they will be unable to develop or use their land, they may attempt to exert political pressure or, in extreme cases, seek satisfaction in the courts to revert zoning of the land. This is a potential scenario should the supply of commercial and industrial land vastly exceed overall demand, or if land which has been re-zoned for commercial or industrial use is not suited for that purpose because of inadequate infrastructure, access, or location.

Of additional consideration, is the affect of re-zoning on adjacent communities. In making re-zoning decisions, the impact of the proposed zoning change on the neighboring area must be recognized. Problems can occur where land being considered for commercial or industrial re-zoning is adjacent to an established residential area. The residents may strongly object to the intrusion of non-residential uses into their neighborhoods. Although the NCP seeks to address noise compatibility issues from mainly an airport and aviation standpoint, community concerns and issues need to be deliberated.

Another option regarding compatible use zoning which is available to rural airports is agricultural or exclusive farm use zoning. The impacted areas would be zoned for solely agricultural uses with appropriate regulations. Measures permitting limited residential development associated with farm operations could be adopted to prevent hardships and make farm operations viable. If so, measures should be adopted within those residences to acknowledge noise impacts that are present. Disclosure documentation and/or aviation easements might be suitable support measures to protect the airport while allowing adequate farm operations.

The potential of this measure at DLH remains to be seen and requires further research. Most undeveloped land in DLH is closely inter-mixed with various residential areas and therefore not very conducive to agricultural operations. However, some state land, line item 8 in Table 4-1, discussed in the NEM submission, could be receptive to this measure. The areas of state land, typically acquired through foreclosure, consist of generally larger un-subdivided parcels which are closely grouped and thus more conducive to larger farm operations.
Those state lands not abutting commercial corridors, such as Highway 53, may be suitable for agricultural zoning. However, again, this alternative requires further research.

**Residential Density:** If outright re-zoning is not a feasible option, another less drastic posture in utilizing conventional zoning to promote noise compatibility is to reduce the potential number of future residents in high noise areas, rather than impeding residential development altogether. This is an option in areas where development can not be avoided or commercial or industrial re-zoning is not feasible or detrimental to adjacent communities. This alternative can be initiated by reducing the permitted housing densities, and/or increasing the minimum lot sizes, in the noise-impacted areas. Of course, a readily apparent fallacy in this methodology as a preventative measure, is its capability to only reduce the number of future noise impacted residents rather than providing for a true compatible use. However, for some land use areas that have developed around an airport over many years, or even decades, this may be the only viable option as the fabric of the land uses around the airport are not conducive for industrial/commercial or agricultural zoning.

This is an approach similar to large-lot zoning which is occasionally used as a "holding zone" in areas where infrastructure will not adequately support development. This "holding" is intended to keep development at a minimum until such time as public facilities to support quality development are in place.

While it would seem that a simple adjustment in the reduction of residential density would provide obvious benefits by decreasing the potential number of people exposed to aircraft noise, the approach has other considerations that need to be addressed.
As discussed in Section 4.1.1, Sound Insulation, the configuration of houses as well as their location to one another, can provide a buffer or “shielding” effect to the intrusiveness of noise impact. High-density, multi-family structures appear to be less noise sensitive than smaller residential buildings, especially single-family residences (SFR). It would seem that although decreasing residential densities would reduce the number of potential impacted residents, that zoning for increased density could enhance land use compatibility if only the least noise sensitive structures were permitted in the area. Although the number of future residents would increase with the higher density, they would experience less impact. The worst scenario for incompatibility purposes would be a medium density zoning one and two-family development. To elaborate further, to have a low-density zoned area with a few SFR would yield very few people with significant impact. A high-density zoned area with multi-family dwellings would yield many people with nominal impact. Likewise, medium density zoning with one or two-family homes allows significant number of residents with significant noise impact.

Therefore, residential density must either be decreased sufficiently to allow minimal potential resident impacts by number or conversely be dense enough to provide for high-density, multi-family use minimizing the level of impact, each having beneficial aspects to be contemplated.

An approach which combines many of the qualities and benefits of large-lot and multi-family zoning is planned unit development (PUD). It allows the development of land without having to abide by the standard lot layout and siting requirements of the applicable zoning ordinance. Furthermore, a variety of housing types, including townhomes, apartments, and condominiums, are often permitted. PUD zoning involves the clustering of buildings and the reservation of open space, as long as the overall dwelling unit density in the development is basically the same as the density permitted in the underlying zoning district.

This has tremendous potential when other, more compatible, land uses are not possible. The clustering provided in many PUD designs allows for much sound insulating and deflecting qualities. If an impacted area must remain residential in nature, PUD allows for the development of such property that those areas and dwellings which are noise sensitive could be arranged as to benefit as much as possible from the shielding and deflection of public or larger multi-family structures. For example, Those buildings, such as community centers, club houses, etc., and open areas might be situated closer to noise areas in an impacted area while the various residences would remain behind
benefitting from less noise intrusion.

This method allows those areas and structures which are less sensitive to noise to provide a buffer for noise sensitive residential areas. A PUD design might include a graduated system of clustering, such as a layout which may go from public areas, to larger multi-family housing, to two-family, and finally single-family residences. This not only provides a great deal of sound mitigation benefit, but also allows for the development of more responsible noise compatible dwelling types in residential fabrics that are predominantly SFR. PUD designs if done appropriately, can blend into existing communities as well as provide a mitigating measure to aircraft noise.

As many Residentially undeveloped areas, represented as line item 7 in Table 4-1, are inter-mixed within established residential areas around DLH to the northwest and southwest, commercial and industrial re-zoning is not a strong potentiality with the exception of those areas along U.S. Highway 53. The review of various parcels to determine their possible use as agricultural land, although beneficial, may be limited and not viable for long-term farm operation. Thus, due to the existing land use fabric around DLH, PUD development to minimize the impact on future residents might be a succinct possibility. This alternative should be reviewed further, and under greater scrutiny with local planning officials, to ascertain the definite viability of this measure.

Noise Overlay Zoning: Another avenue to prevent future noise impacted areas is the development of a new special zoning district in lieu of attempting to re-zone areas to more compatible existing zoning. Basically, an overlay zone is superimposed on existing zoning districts to regulate the zoning to a specific end, in this case noise. This measure entails the creation of one or more special zoning districts intended to supplement the regulations of the general purpose zoning districts. Restrictions in noise overlay zones can prohibit noise sensitive uses, however, as long as the underlying zone permits enough other, compatible, land uses which provide reasonable development opportunities. Additionally, the regulations also can require sound insulation in the construction of noise sensitive uses and the dedication of avigation easements and non-suit covenants. This can be a very effective means of supplementing existing zoning to meet noise compatibility criteria.

In establishing a noise overlay zone, the boundaries of such a zone are typically based upon the critical noise contour which is generally accepted as the determination of impact; the 65 DNL contour. The boundary may follow the contour itself, but for simplification and ease of implementation, it is

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recommended that the boundary be associated with adjacent streets, abutting property lines and/or natural features.

Noise overlay zoning can be extremely useful in preventing or regulating non-residential, noise sensitive uses being developed in noise impacted areas within the 65 DNL. These may include nursing homes, hospitals, schools, day care centers, churches, amphitheaters, etc. Also, importantly, noise overlay zoning also could be used to prohibit mobile homes. Within the 70 DNL, prohibition of all of these highly noise sensitive uses should be considered. Determinations of prohibition could be based upon the FAA’s land use compatibility guidelines, Table 4-1, as discussed in the NEM.

As decided upon by local jurisdictions and planning departments, it may be elected for an overlay zone to allow for sound insulation within various contours rather than outright prohibition, per the aforementioned FAA guidelines. Care should be taken in reviewing each land use by level of impact in making such a determination. If desired, a noise overlay zone may also be tiered following not only the 65 DNL contour, but the 70 DNL as well. This allows for varying levels of strict regulation as appropriate while allowing certain uses in lower areas of impact. Sound insulation or prohibition action would not be solely based upon land use, but within contour locations.

Although possibly desired, prohibition of residential uses by the implementation of noise overlay zoning within noise impacted areas is not realistic. As residentially zoned areas are already restrictive in terms of allowable use, an overlay zone that prohibits residential use could impose an undue burden on landowners. Such a restriction would be feasible only if the affected land had reasonable alternative development opportunities. It would be necessary to assure that there could be a highest and best use possible and compatible within the parameters of the noise overlay and existing zoning. If landowners were prohibited from residentially developing land outright, it could be construed as unconstitutional, an inverse condemnation, and generate an issue within the courts where the courts could agree with landowner positions. If it becomes apparent that this is a circumstance around airport environs, and future residential development cannot be prevented in undeveloped noise impacted areas, noise overlay zoning could be implemented to require sound insulate new dwelling construction within the overlay zone. This possibility should remain for further review as much noise impacted undeveloped residential land around DLH is closely related to existing homesteads.
The aforementioned approach to noise overlay zoning would be a good restriction to consider in outlying communities, especially Canosia Township and the City of Hermantown, as in-fill housing and re-development projects occur. The required sound insulating standards could be incorporated into the zoning ordinances of the affected jurisdictions or into the local building codes. Additionally, other mitigating measures could also be initiated in the same manner to compliment a complete noise compatibility program. For instance, the above could also be coupled with a requirement that new housing within the noise overlay zone dedicate to the city, an avigation easement as relayed in Section 4.1.1.

An added feature of noise overlay zoning is that it may be designed to ensure that the airport sponsor is notified of any proposed development actions within the overlay zone in the event elects to comment or take other action.

Regardless of other zoning issues entertained for implementation, it is highly recommended that this alternative be coordinated and initiated at DLH as a supplemental measure.

**Environmental Zoning:** Special zoning regulations to preserve environmentally sensitive areas or protect development from environmental hazards also tend, by nature, to promote land use compatibility near airports. Floodplain overlay zoning, which restricts or prohibits development in all or part of a floodplain, is one of the most common forms of environmental zoning. Other environmental zoning regulations may also include wetland preservation zoning limiting densities and the design of drainage facilities or groundwater recharge zones limiting building density and lot coverage. All of these existing zoning provisions can be used to restrict the development of noise sensitive uses in environmentally sensitive areas that are also impacted by aircraft noise.

Most jurisdictions have existing environmental zoning regulations in place to address environmental concerns. DLH should support such zoning where it coincides with noise impacted areas as these provisions tend to promote noise compatibility as well.

**State of Minnesota Airport Protection Zoning:** In addition to Federal regulations which have been established to protect airport environs, the State of Minnesota has further elaborated and developed an airport protection zoning system to ensure flight safety and prevent obstruction of airport operations.
Simply, the land use safety zones, designated as A, B, and C, are specifically defined areas on the ground which are based upon airspace corridors and operating areas above them. These airspace corridors and operating areas are defined by airport imaginary surfaces and zones.

Zones A, B, and C are progressive with A being the most restrictive and C being the least.

Zone A shall contain no buildings nor structures nor provide for any land use that would require a large assembly of persons. Typical uses include agriculture and the grazing of livestock. This zone is primarily a “clear zone” as it basically includes an extended area that covers the runway ends.

Zone B allows limited building, but greatly restricts the density of construction. Parcels may be no smaller than three acres with no more than one building plot. A strict building to site ratio is enforced. Of note, no churches, hospitals, schools, hotels, etc. may be constructed on the site. Zone B is generally located as an extension of Zone A.

Zone C is the least restrictive and only prohibits any construction or lighting that may interfere or disrupt airport operations. Any use that could endanger the take-off, landing, or maneuvering of aircraft is not permitted. Zones C covers a pre-described area around an airport that does not include Zones A and B.

These standards actively promote land use compatibility as directly associated with aircraft operations. The aforementioned zoning should be incorporated into other measures initiated as part of the NCP.

**Conclusion:** As zoning provisions may be the pivotal means by which preventative noise compatibility measures are implemented, the aforementioned zoning alternatives should be pursued aggressively.

It would seem that the re-zoning of undeveloped land along U.S. Highway 53 corridor to commercial zoning would have significant and fruitful application. Similarly, those undeveloped residentially zoned areas currently abutting established residential neighborhoods should be reviewed in regard to residential density. A Noise Overlay Zone could provide an opportunity to avoid incompatible construction in the future as well as to provide that appropriate measures be taken for those uses that are allowed. Such measures
might include sound attenuation or an avigation easement. These considerations should be researched and the implication of land use zoning provisions explored further for application in the airport study area.

Based upon input from the PAC and TAC, the existing Airport Zoning Board should be the instrument through which pre-emptive measures are pursued. This Board is currently made up of members representing all of the impacted jurisdictions.

Subdivision Regulations

Subdivision regulations govern the platting of land by establishing standards for site planning, lot layout, and infrastructure, such as the design of utilities and public improvements. As a regulatory control, they can encourage compatible development around an airport by requiring the consideration of aircraft noise during the review of the plat by public entities. Upon review, this might result in requiring further noise attenuation measures in structure design or a decrease in the density of portions of the particular development.

Subdivision regulations also can be used to inform prospective property owners of the potential of aircraft noise. In some instances, noise levels are shown on the final subdivision plats either by reflecting the noise contours graphically on the plats or by recording noise levels to the individual lots. This makes the noise information a matter of public record and allows for proper disclosure. Another similar approach is to record a note, or disclaimer, on the plat, or record a covenant with the plat, stating that the property is subject to potentially disruptive aircraft noise. It also may advise consultation with local planning departments and/or airport officials to receive current information about the noise impact. Some drawbacks to these alternatives are that although the plat and accompanying noise levels are recorded and a permanent part of the public record, noise levels can change over time and most parties involved in the purchase of property rarely look over plats other than a cursory review. However, the mere fact that the potentiality of noise impact has been disclosed provides some benefit.

These regulatory measures can help protect the airport from the risk of noise damage suits, while providing for notice to potential buyers of property, by requiring, as a condition of subdivision approval, the dedication of avigation easements and even non-suit covenants in high noise impact areas. This may be implemented in similar fashion as conditions for the dedication of street right-
of-way or utility easements typically found in subdivision regulations.

An additional asset of subdivision regulations is that like noise overlay zoning, they may be amended to require that airport management be notified of any proposed subdivisions located within the 65 DNL contour. This would give airport management or associated advisory boards the opportunity to review a proposal and offer comment to a city council or review board which oversees and approves platting.

Subdivision regulations offer only limited preventative benefits for noise compatibility planning, although they, as a minimum, provide a level of awareness and can be useful in supporting a comprehensive program of noise compatibility regulations. For example, subdivision regulations provide for greater efficiency in securing noise and avigation easements than do building or zoning codes. They would permit the easements to be secured for the entire development at the time of plat approval, while the other methods would only allow the easements to be secured on a lot by lot basis as they were developed.

**Conclusion:** This is a measure that may be easily adopted into current subdivision regulations and would yield not only direct benefits, but moreover lends support to a comprehensive planning process to address noise compatibility. As there is a fair amount of undeveloped residentially zoned land in areas within the 65 DNL contour adjacent to the airport and the potentiality exists that the areas could someday be a part of the platting process, initiation of this measure should strongly be considered in Duluth.

Based upon input from the PAC and TAC, the existing Airport Zoning Board should be the instrument through which these measures are pursued. This Board is currently made up of members representing all of the impacted jurisdictions.

**Dedicated Avigation Easements**

As discussed in Section 4.1.1, avigation easements do not mitigate noise impacts but provide disclosure of potential intrusions from noise. As avigation easements may be purchased to included existing residential parcels, they may also dedicated as part of new developments pre-empting the need to remedy a parcel at a later date.

For review, an easement is a limited right to use property owned by another. An
Avigation easement gives the airport sponsor, as owner of the easement, the right to direct aircraft over the property resulting in noise and possible disturbance to the property. These easements serve as notice to interested parties as to these activities.

As a preventative measure, an avigation easement, may be obtained as a condition of development approval similarly to utility easements and rights-of-way. Dedicated avigation easements can be easily implemented when coupled with zoning ordinance, subdivision regulations, or building codes. This would require a property owner or developer within a noise impacted area to dedicate an easement before receiving approval of their development application. Additionally, the avigation easement acts as a notice that promotes fair disclosure. Since the easement becomes a matter of legal record and a permanent deed restriction, prospective buyers of the property can learn of the disclosure and the potential impacts of airport noise before they complete the purchase of the property. This can prevent a new homeowner from having a “revelation” upon occupying the premises and protects the airport from unwarranted complaints from homeowners and having to contend with them after a developer has long since left the project.

With this being said, it should be noted that there are no guarantees that a prospective buyer will even take note or heed the disclosure and refrain from complaining about aircraft noise. Although an avigation is potentially useful, its benefits are limited.

**Conclusion:** The inclusion of dedicated avigation easements in new development within the 65 DNL is encouraged as part of a comprehensive noise compatibility measure at DLH. Although they provide no attenuation qualities, easements will provide DLH the protection of having fairly disclose the potential impacts of aircraft overflight prior to a development project being undertaken. Explicit verbiage should be included to clearly establish the noise levels that may be encountered as well as the potentiality that noise level will be subject to change in the future.

Based upon input from the PAC and TAC, the existing Airport Zoning Board should be the instrument through which this measure is pursued. This Board currently consists of members representing all of the jurisdictions in the study area.
Building Codes

Building codes regulate the construction of buildings, setting standards for materials, and construction techniques. It is initiated for public protection by ensuring the health, welfare, and safety of residents. Building codes mandate a particular standard in construction methods and materials which are enforced through inspection. Some methods that the code addresses, includes structural integrity, ventilation, and insulation each of which are of concern in regards to sound insulation. How each of these methods and materials are implemented, directly affects the noise attenuation of a given structure. Generally, building codes apply to both new construction as well as major additions or alterations.

As building codes already stipulate materials that may be utilized as well as methods that may be employed, addendum to such codes could address sound insulation concerns within a given area, such as the 65 DNL. An addendum could specifically address the construction of noise sensitive buildings in impacted areas subject to high aircraft noise.

Sound insulation of new construction could be required through an amendment to the building code. It could mandate that certain sound attenuating actions be implemented for specific land uses within varying noise contours. This could be initiated similarly to a zoning ordinance amendment as applicable to a noise overlay zone. The code could establish general sound insulating criteria that must be met through various construction methods, simply a performance standard. This would allow contractors or builders the latitude to implement methods and materials as they see fit within a particular construction design to yield the desired sound mitigating results. This latitude would allow for the ability to address noise impact on an individual basis as well as allow such methods to be initiated in a cost-effective and economical manner, thus preventing builders from balking at such restrictions. The performance standard could be set as a specific noise reduction level, typically 20-30 Db, from exterior to interior, or just as a maximum interior DNL.

To meet requirements, a contractor or builder would have plans and specifications prepared and reviewed by an acoustical specialist. The review would be required to determine, and certify, if the design and construction methods employed were capable of meeting the specified performance standard. As in a sound insulation program, inspections would be required to be conducted during the construction phase of the project to assure that plans and specifications were being followed. If not already in place within a local
building department, a specially trained inspector or acoustical engineer would have to be retained for this purpose to see that materials were properly installed.

As an appropriate measure in DLH, it may be prudent to modify building codes for those areas within the 65 DNL or a noise overlay zone if implemented. Adequate modifications to the building code in tandem with zoning measures discussed would begin to formulate a comprehensive noise compatibility plan that would provide assurances against incompatible noise sensitive uses being developed in the future without adequate mitigation.

**Conclusion:** A building code amendment that would require the sound insulation of new construction within noise impacted areas would be a very effective way to enhance land use compatibility in those areas. Although it would be possible to implement noise overlay zoning alone, local building code amendments would make administration and enforcement of sound insulation regulations an easier task. It would be the duty of local building inspectors to ensure that sound attenuation methods are included in building plans and properly installed in the field. As an example, an inspector would review plans and conduct field inspections for fire code criteria, such would be the case for sound attenuation within designated areas. An inspectors job would be made easier if all pertinent regulations they were to govern over were within the building code.

Based upon input from the PAC and TAC, and this options significant potential over the long term, the existing Airport Zoning Board should be the instrument through which the implementation of this measure is pursued. This Board is currently comprised of members representing all local jurisdictions adjacent to DLH.

**Fair Disclosure Regulations**

As an information measure, fair disclosure regulations are intended to ensure that prospective buyers of property are informed that the property in question is, or will be, exposed to potentially disruptive aircraft noise. Fair disclosure may be implemented on many different levels.

As mentioned in previous sections, fair disclosure may be provided for by the recording of a notice with the plats of new subdivisions in a noise impacted area. It would clearly identify the subdivision as potentially impacted by aircraft noise and would advise that local planners and airport personnel be
contacted for the most recent information about noise levels impacting the property.

Another approach is to require that fair disclosure be implemented through regulations requiring the seller, or representative, to provide notice of aircraft noise exposure on the listing sheet and at the time that a sales contract is executed. However, this type of fair disclosure regulation places a serious responsibility on real estate agents and lenders. It is important that they be educated about aircraft noise and land use compatibility. Because of the complexity of these subjects, real estate agents may be concerned about making errors in explaining the aircraft noise situation to clients and subsequently being responsible for it. They may also fear the risk of dampening sales, harming customer relations, or of being sued for failure to adequately carry out such an assignment. These are valid concerns that affect the viability of this option.

Moreover, such regulations also can disturb existing property owners within a noise impacted area. Property owners may fear that the imposed regulations would make it difficult to sell their homes and lower property values by drawing attention to the noise environment. In such an instance, a fair disclosure regulation alternative should be initiated with a purchase assurance, sales assistance, avigation easement, or sound insulation program, if possible. Fair disclosure regulations are also often activated in tandem with noise overlay zoning or subdivision regulation measures, as elaborated on previously.

It is also possible to try to achieve fair disclosure through voluntary programs rather than regulation. Assistance would be required and could be sought from local housing industry groups, such as the Board of Realtors or Homebuilders Association and their ethics committees as well as local lending institutions. Voluntary disclosure programs may also be developed without involving the real estate or home financing agencies. As a less formal measure, the airport sponsor could periodically send out information about noise impacted areas and noise levels through general announcement, posting of public notices, or advertisements in the real estate sections of local newspapers.

It should also be remarked that Federal law prohibits the Veterans Administration (VA) or the Federal Housing Administration (FHA) from financing homes within a designated 65 DNL noise impacted area.

A voluntary, informal program may be problematic in its consistency in providing adequate notice to potential buyers of real estate within an impacted area. The question would recurrently arise as to whether or not an interested party
was made aware of the status of a particular parcel in terms of aircraft noise intrusion. Conversely, a stand alone formal involuntary fair disclosure program could meet with strong resistance from real estate professionals or associations in addition to existing property owners, concerned over the negative impact on real estate within an area from public notice of record regarding noise.

**Conclusion:** Fair disclosure provides definitive benefits and provides a valuable service in ensuring that the public is informed as to the potential noise impacts associated within a given area. If this regulatory alternative were to be implemented in a formal and involuntary manner, consideration might be taken to implement such a measure within other alternatives discussed previously, such as purchase assurance, to alleviate pertinent concerns towards negative perception.

Based upon input from the PAC and TAC, the existing Airport Zoning Board should be the instrument through which the implementation of this measure is pursued. This Board is currently comprised of members representing all local impacted jurisdictions, adjacent to DLH.

TRANSFER OF DEVELOPMENT RIGHTS

Land ownership is multi-faceted. It actually involves the ownership of a package of rights to the use of that parcel. These may include, for example, rights of access, mineral rights, airspace rights, and development rights. The transfer of development right (TDR) is based on the concept that these rights each have a separate and distinct market value which can be separated from one another and sold without selling the entire property.

TDR was developed as a technique to preserve environmentally important areas without having to buy them with public funds. The technique works as follows. The jurisdiction to be utilized is divided in two zones, one being sending and one being receiving. The sending zones are areas where environmental preservation, or other mitigating factor, and minimal development are desired. The receiving zones are areas where additional development is desired. Development rights, measured in terms of development density, are assigned through the zoning ordinance.

If developers in the receiving areas can get additional development rights, they are allowed to build to higher densities than normally allowed by the pertinent zoning
ordinance. Developers would buy these rights from landowners in the sending zones.

The result is that the public may benefit from preserving land either for environmental or other reasons, the owner of the land may be compensated for preserving it, and developers may profit from it.

The earliest TDR programs, developed in the 1970s were not particularly successful. Later programs, refined in the 1980s have yielded better results. Based on these refinements, several conditions must be addressed for the successful implementation of TDR. Firstly, the receiving districts must be capable of immediate development. The regulatory process must have integrity and be trusted by developers. The regulatory agency must be able to provide information and assistance to property owners and developers. Finally, the program must attempt to be as simple as possible and facilitate the interests of all parties concerned.

Another variation of TDR is density transfer zoning. This allows developers of several large tracts of land to move their allotted densities among the tracks to reduce densities in areas worthy of preservation. This differs from TDR because only one owner is involved in the transfer and a system for sale and purchase of development rights is not required. Density transfer zoning often can be achieved through creative use of the planned unit development process as discussed earlier.

In areas that may be described as rapidly growing with large amounts of vacant land, TDR can be an effective measure for airport land use compatibility planning. It can address numerous party interests as well as the predicament as to what should be done with land in high noise impacted areas where there are no feasible alternatives to residential development.

A drawback of such an implementation, in addition to its inherent complexity, is a large area is required to adequately develop a TDR market, or receiving and sending zones. The scope of such a program would most likely need to be larger than just the immediate airport environs and impacted areas. It must be determined that there is adequate vacant land to support the initiation of such a program. Additionally, if the aforementioned were to cross over various jurisdictions, an entity, such as a cooperative zoning administration, would have to be established to coordinate and oversee the program.

**Conclusion:** Following further investigation, it was determined that this alternative is
currently prohibited by Minnesota state law.

4.2 - LAND USE MANAGEMENT STRATEGY

Comprehensive community plans identify the needs of a given community and establish policies for development and improvement of the community to respond to those conditions. In a community where an airport is present, additional conditions should be contemplated and provided for. In terms of a public airport, a comprehensive plan should;

- Support the efficient operation of the airport;
- Identify environmentally sensitive areas and guide development in areas that could be potentially impacted by aircraft operations and;
- Coordinate and encourage development that is compatible with the surrounding areas, from both a community and airport perspective.

A comprehensive plan is critical in the development of the common efforts of an airport’s Noise Compatibility Plan and local community planning. This is even more essential in an area where an airport, such as DLH, is located amidst the boundaries of numerous political jurisdictions. As this is the case in Duluth, alternatives discussed in this study should be reviewed closely for feasibility within each jurisdictional area. Close coordination among each entity is critical in ascertaining the scope of mitigating measures possible. A collective effort is essential for the long term viability of a noise compatibility program in Duluth.

Section 4.0 has compiled and discussed various preliminary land use management actions that could have varying benefit to noise compatible issues in locales around DLH, namely in Canosia Township, the City of Hermantown, and the City of Duluth. Although many alternatives have been identified and discussed, a multi-jurisdictional body will be required to review the alternatives and select a combination of those which best meet the needs of the community. Based upon numerous meetings, all parties involved in the study process felt that the existing Airport Zoning Board was the best forum for conducting this analysis and returning to their individual governments for approval and implementation.
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<td>Transfer of Development Rights</td>
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Source: ACRS, Inc., 1996
SECTION 5

Recommended Measures For Implementation

The object of airport noise compatibility planning is to promote the compatible growth and development of airports and the communities surrounding them. As discussed in Sections 3.0 and 4.0, this initiative can be accomplished by various methods depending upon the type and degree of noise impact. Alternatives include aircraft/airport operational changes, community relations development, increased public awareness, the acquisition of land and improvements, purchase of avigation easements, sound insulation, land-use redevelopment, and prudent land-use planning and controls to name just a few.

As can be seen, the NCP development process requires significant review and comment from the PAC/TAC committees, FAA, MnDOT, MnANG, and DAA to yield effective results and provide measures which are truly viable for implementation specifically at DLH. These considerations must also receive input from the community as a whole. This was accomplished through a series of Public Workshops.

A detailed and comprehensive discussion and evaluation of the possible options was presented in the two previous chapters and is summarized in Table 4-2, at the end of this Section 4. The selected alternatives will now collectively define the Noise Compatibility Program at DLH.
5.1 - RECOMMENDED NOISE ABATEMENT PROCEDURES

5.1.1 Community Relations

5.1.1.1 An individual within ATC, MnANG or airport management should continue to be designated with the responsibility for documenting and responding to all noise complaints. Quick response to public concerns may prevent future problems through the simple application of open communications. The current procedure should be reviewed, modified if necessary, and be continued.

There are insignificant associated costs and minimal staffing requirements associated with the implementation of this measure.

If circumstances create a significant number of noise complaints, as identified by keeping appropriate logs of complaints and the areas from which they are received, the following recommendation (5.1.1.2) should be implemented as soon as practicable.

5.1.1.2 The airport should develop a contingency plan for the rapid creation of a Community Noise Abatement Committee. Representation should include, but not necessarily be limited to; Airport Management, Air Traffic Control Tower, Minnesota Air National Guard, airlines (including cargo operators), FBO, officials of neighboring governmental entities, and representatives from impacted neighborhoods. Meeting place, frequency of meetings and meeting format should be established pending possible modifications as meetings actually begin.

The committee should actually be organized when conditions warrant, as described in 5.1.1.1 above. Establishment of open lines of communication can frequently prevent concerns, especially those of perception, from developing into significant problems. Often the airport operator is not aware of noise problems until they become a significant public issue. At the same time, the airport’s neighbors are often not aware of the airport’s concern and effort in this regard, without some form of open exchange. This type of interchange was initiated through the Public Information Process of the Part 150 Study and should continue, although due to a lack of current interest in this regard, a formal committee would result in little, if any participation at this time.

Associated costs of such a committee are insignificant.
5.1.2 Noise Reduction Measures

5.1.2.1 The existing Letter of Agreement between ATC and MnANG should be amended to preclude overflights of Pike Lake, whenever feasible. Although this area is outside of the 65 DNL contour, it is a particularly noise sensitive area and source of noise complaints.

There is no cost associated with this item.

5.1.2.2 The existing policy of the local ATC personnel to disburse traffic to various areas should continue. The continuation of 5.1.1.1 will allow ATC to keep up to date on possible new areas of noise sensitivity.

There is no cost associated with this item.

5.1.2.3 An Environmental Assessment should be commissioned as soon a possible to explore the feasibility of extending Runway 03-21 to a length adequate to accommodate F-16 operations. The final Runway length is anticipated to be 8,000 feet, plus a possible paved or stabilized overrun. The MnANG has indicated their support in pursuing this approach as it may possible to accomplish significant noise reductions.

The anticipated cost of this study is $150,000.00.

5.2 - RECOMMENDED LAND USE ALTERNATIVES

5.2.1 Noise Mitigation Measures

5.2.1.1 A voluntary land acquisition/relocation program should be implemented within the 75 DNL, with emphasis placed upon parcels which are currently undeveloped. Per table 11-1 of the NEM, this would include 5 single family residences and 1 undeveloped residentially zoned property.

75 DNL
The anticipated parcel cost of this program is approximately $277,400.00 (plus administrative costs), provided all land owners elect to participate. This represents an estimated parcel cost for the aforementioned 6 parcels for land acquisition and relocation.
benefits as necessary. Based upon Table 11-3 of the NEM submittal and the U.S. Bureau of Census information, the implementation of this measure could result in the relocation of 12 residents. This cost was based upon a parcel review shown as Table 5-1 on page 5-6. Table 5-1 compiles a parcel specific inventory of all impacted parcels within the 65 DNL with parcels within the 75 DNL, shown in gray. This table cross-references each parcel depicted in the NEM with data provided by the St. Louis County Assessor’s Office. Land Acquisition costs are based on Estimated Market Value for 1996. They include assessed values for both land and improvements as applicable. Relocation costs are estimated to be generally $25,000.00 (including moving costs) per residence. This is an approximate estimate. Please refer to “Land Acquisition and Relocation”, pp. 4-3 to 4-8, for a discussion of the specific individual cost that may be applicable on a parcel by parcel basis.

If this land acquisition/relocation program were expanded to extend outside the 75 DNL to

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<th>TABLE 5-2: VOLUNTARY LAND ACQUISITION / RELOCATION PROGRAM</th>
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<tr>
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<td>65</td>
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</table>

* plus administrative costs

Source: ACSG, 1997

Notes: 1. Relocated residents assuming full-participation in program

2. Land improvement values derived from estimated market values as provided by St. Louis County Assessor’s Office.

3. Relocation costs based upon $25,000.00 per residence for benefits and moving costs. Exact cost to be determined on a parcel by parcel basis.

include the 70 and 65 DNL, the associated projected costs would be as follows (Table 5-2 provides a synopsis of each level of acquisition and relocation);

70 DNL
The anticipated parcel cost of this program is approximately $2,671,000.00 (plus administrative cost), provided all land owners elect to participate. This represents an
estimated parcel cost for the 24 parcels in this DNL area for land acquisition and relocation benefits as necessary. The implementation of this measure could result in the relocation of 67 residents, who would benefit from such a program. As discussed previously, entitlements would be determined on an individual basis. The impacted parcels in the 70 DNL are shown in yellow.

65 DNL
The anticipated parcel cost of this program is approximately $12,142,900.00 (plus administrative costs), provided all land owners elect to participate. This represents an estimated parcel cost for the 112 parcels in this DNL area for land acquisition and relocation benefits as necessary. The implementation of this measure could result in the relocation of 316 residents who would benefit from such a program. As discussed previously, entitlements would be determined on an individual basis. The impacted parcels in the 65 DNL are shown in white.

All Impacted Areas
The anticipated parcel cost of this program is approximately $15,091,300.00 (plus administrative costs), provided all land owners elect to participate. This represents an estimated parcel cost for the all parcels within the noise study for land acquisition and relocation benefits as necessary. The implementation of this measure could result in the relocation of 395 residents who would benefit from such a program. As discussed previously, entitlements would be determined on an individual basis.

5.2.2 Preventative Measures

All those involved in the public information process felt that a strong proactive position should be taken to prevent future non-compatible land use around DLH. It was also unanimously felt that the proper forum for such an effort is the current multi-jurisdictional Airport Zoning Board. This committee will probably require additional technical assistance as they begin to develop a comprehensive compatible land use plan or Airport Noise Overlay Zone.

The Airport Zoning Board, which consists of representatives of all impacted local governmental entities, should consider all of the alternatives described in Section 4 for applicability, affect, and viability for implementation within the jurisdictions. In all probability, a mix of multiple zoning and land use controls should be adopted based upon specific circumstances in the various noise impacted areas.

At this point it is not possible to anticipate the level, or cost, of outside support which might be required by this currently active Board, in accomplishing the stated goals.
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Source: ASCG, Inc. 1997

Note: Land and improvement values based upon estimated market value (EMV) in 1996 Assessor's records provided by St. Louis County.
All addresses, except where noted, are in Duluth, MN 55811

Key:
SFR - Single family residence.
MH - Mobile home on private land.
CHCH - Religious building
MHP - Mobile home park
CRES - Commercial with residence
URES - Undeveloped residential property
MFH - Multi-Family Home

- Properties within 75 DNL contour
- Properties within 70 DNL contour
Public Information Process

NOTE: This section to be finalized subsequent to final public meetings for FAR Part 150 - NCP process

The public information process is an essential application in an adequately developed NEM process. The Technical Advisory Committee (TAC), Public Advisory Committee (PAC), and pertinent agencies provided critical insight and input into the Part 150 process and complemented the consultant team in developing the Noise Exposure Maps for DLH. Public Workshops were also held relative to TAC and PAC meetings to apprise the public of ongoing developments as well as allow the opportunity for citizens to have their questions and concerns addressed.

Table 6-1 on page 6-2 represents a brief chronology of the meetings and workshops held at DLH. Sections 6.1 to 6.4 will discuss each facet of the public information process individually and in greater detail.

6.1 Outside Agencies

Various outside agencies are crucial to the Part 150 process. In the case of Duluth International Airport, the following played a key role: the FAA Airports District Office, FAA control tower, MnDOT Office of Aeronautics, the Minnesota Air National Guard, and St. Louis County Assessor’s Department. These agencies were consulted extensively throughout the development of the NEM’s and their input was integral to the process. Extensive coordination between these agencies and the consulting team was a necessity throughout NEM development and yielding much benefit in that endeavour.
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<td>PAC; Kickoff, Introduction similar to TAC.</td>
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<td>11/16/94</td>
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<td>6/22/95</td>
<td>TAC; Part 150 checklist, airport inventory, land use compatibility, noise monitoring results, flight tracks, land use and zoning</td>
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<td>TAC; (This meeting was canceled upon notification of an imminent change in MnANG operations. Project was delayed while consultants coordinated with Guard Bureau and Department of the Air Force).</td>
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<td>PAC; Potential changes in MnANG operations, presentation of Preliminary NEM's.</td>
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### 6.2 Technical Advisory Committee (TAC)

Every effort was made to ensure participation by local individuals representing every facet of the Part 150 process. In addition to the outside agencies identified in Section 6.1, the TAC included local planning and zoning officials, airport management, key members of the consulting team, fixed base operator, general aviation users, corporate aviation users, and representative airlines.
Detailed information was provided to all TAC members in advance of being discussed at meetings. In some instances, information was distributed and explained during a TAC meeting, for discussion at subsequent meetings. Attendance at TAC meetings were fair to good, with a great amount of crucial input provided to the members of the consulting team. In addition, numerous discussions took place between key members of the TAC and members of the consulting team regarding different specific issues.

The first meeting of the TAC was held on November 15, 1994. As the first meeting, this meeting introduced committee members, elaborated extensively on the Part 150 process, and the contributions that would be asked of each committee member. General issues were also raised and discussed concerning the ramifications of initiating a Part 150 Study at DLH. Following the general meeting, key members informally formed in small groups to coordinate in the upcoming effort.

The second meeting was held on June 22, 1995 and reviewed items that had been previously distributed for the TAC workbook. Items included noise monitoring results compiled, flight track tracking, airport inventory, and land use issues among other things. Initial contour development was also reviewed and discussed.

The third TAC meeting scheduled for July 10, 1995 was cancelled due to pending changes in MN ANG operations which would significantly affect the study. NEM development and respective meetings were suspended until such time the pertinent information was declassified and accurate determinations could be made.

The fourth meeting was held on December 15, 1995 to discuss developments regarding MN ANG and its reflection in the development of the NEM. The pertinent data and resultant preliminary NEM’s were presented and discussed.

The fifth, and final TAC meeting was held on November 21, 1996 to discuss events and delays over the course of the last year in terms of the NEM submission to the FAA. NEM’s were presented depicting impacted areas and discussed at length, including possible mitigation measures as part of the NCP draft. Also discussed, and compared, were all-inclusive and non-military contours which had been developed for both the existing and future conditions at FAA request. The implications of the varying degrees of noise impact based upon respective contours were discussed at length among committee members including representatives of both the FAA and MN ANG. Also discussed individually were the possible avenues that may be pursued to mediate noise impacted areas as well as the prevention of future impact per the NCP.

Membership lists, meeting notices, sign up sheets, meeting minutes, and various correspondence are included in the Appendix.
6.3 Public Advisory Committee (PAC)

Similar to the TAC, members of the PAC provided important input into the development of the NEM. The members of the PAC primarily included elected officials from the city, county and surrounding communities. In addition, interested citizens, airport management and key members of the consulting team served on the PAC. Although members of the PAC were provided the same information as the TAC, including input received from TAC members, only three PAC meetings were held during the development of the NEM.

The first meeting was held on November 16, 1994, the evening following the first TAC meeting. The same agenda was followed including introduction of participants and discussion of the overall FAR Part 150 process.

The second meeting was held on the evening of December 14, 1995. Due to inclement weather, attendance was not as good as hoped for. Fortunately, the representatives from Hermantown and Canosia were present, because the vast majority of the noise impacted areas fall within these two neighboring communities. The NEM was presented and discussed at length. Very preliminary discussions took place regarding potential mitigation options within these communities.

Due to the extended period of time elapsed due to various issues raised, a final PAC meeting was held on the evening of November 21, 1996. Unfortunately this meeting was canceled to a lack of attendance by committee members. Representatives of both the FAA and MnDOT were on hand to respond to questions raised by the PAC.

It is anticipated that the PAC will play a far more crucial role in the development of the Noise Compatibility Program (NCP). Prior to beginning the NCP, PAC representation will be reviewed to ensure that the surrounding communities are well represented by current and appropriate elected officials. Citizens participation is hoped to continue and at least one former elected official will continue to serve as a private citizen. All PAC members will be notified of the status of the NEM and their participation in the NCP will be strongly encouraged.

Membership list, meeting notices, sign in sheets, and meeting minutes are included in the Appendix.
6.4 Public Information Workshops

To ensure full public participation, a series of public workshops were scheduled for key points during the development of the Noise Exposure Map (NEM). FAA concurred that the “workshop” format afforded individuals a better opportunity to gain information regarding the NEM and express any concerns they might have. The workshops were scheduled for a period of several hours and during convenient times of day to ensure maximum involvement. Several members of the consulting team, as well as, airport management were available to answer questions and solicit input.

The first workshop was held, following legal notice in the local paper, on November 16, 1994, a copy of this notice is located in the Appendix. Although the workshop lasted for several hours, only two individuals attended. As both of these individuals had previously been in contact with the airport regarding noise issues, and because they live different potential impact areas, both were invited and agreed to serve on the Public Advisory Committee.

The next public meeting was held on Saturday, December 16, 1995, also following legal notice in the local paper. The purpose of this workshop was to present and discuss the NEM. The workshop was held for a four hour period on that Saturday, in an effort to attract more public involvement. In spite of this, only three individuals attended the workshop.

One gentleman lived well outside the noise impact areas and attended due to general curiosity about the process. A husband and wife, who live in an impacted area, attended to gain information about the process and make verbal comment that they did not have any problem with airport noise and hoped that no mitigation program would be implemented which might affect their day to day lives or home environment.

A third Public Workshop was held on November 21, 1996, again following legal notice in the local paper. The purpose of this workshop was to again provide an opportunity for public input as well as update concerned individuals as to developments that had occurred over the last year. Additionally, representatives of the FAA, MnDOT, DAA, and MN ANG were present to address any citizen question or comment. There was no public attendance during the hours set up for the workshop.

Documentation regarding the Public Workshop process can be found in the Appendix.

No written comments were received throughout the NEM development and only limited, informal, verbal comments were offered.
APPENDIX

A

Glossary of Terms

A

AAAE - American Association of Executives

AC - Advisory Circular

ACI-NA - Airlines Council International-North America

AFB - Air Force Base

AGL - Above Ground Level

AIA - Annual Instruments Approach

AICUZ - Air Installation Compatible Use Zone Study

AIP - Airport Improvement Program

AIR CARRIER - Aircraft operating under certificates of public convenience and necessity issued by the CAB authorizing the performance of scheduled air transportation over specified routes and a limited amount of non-scheduled operations.

AIR TAXIS - Planes that (1) perform at least five round trips per week between two or more points according to flight schedules that specify the times, days of the week, and places between which such flights are performed or (2) transport mail pursuant to a current contract with the U.S. Postal Service.
AIRCRAFT TYPES - An classification system which identifies and groups aircraft having similar operational characteristics for the purpose of computing runway capacity.

AIR NAVIGATIONAL FACILITY - Any facility used for guiding or controlling flight in the air or during the landing or takeoff of aircraft.

AIR ROUTE SURVEILLANCE RADAR (ARSR) - Long-range radar which increases the capability of air traffic control for handling heavy enroute traffic. An ARSR site is usually located at some distance from the ARTCC it serves. It’s range is approximately 200 nautical miles. Also called ATC Center Radar.

AIRPORT SURVEILLANCE RADAR (ASR) - Radar providing position of aircraft by azimuth and range data without elevation data. It is designed for a range of 50 miles. Also called ATC Terminal Radar.

AIRPORT TRAFFIC AREA - Unless otherwise specifically designated, that airspace within a horizontal radius of five statute miles from the geographical center of any airport at which a control tower is operating, extending from the surface up to but not including 3,000 feet above the surface.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC) - A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

AIRSPACE - The space lying above the earth or above a certain area of land or water which is necessary to conduct aerodynamic operations.

ALP - Airport Layout Plan

ALS - Approach Light System

ALSFI - Approach Lighting System With Sequenced Flashing Lights

AMBIENT AIR - Any unconfirmed portion of the atmosphere: open air, surrounding air.

ANAP - Aviation Noise Abatement Policy

ANCLUC - Airport Noise Control and Land Use Compatibility Study
ACI - Airport Council International

APPROACH FIX - The point from or over which final approach (IFR) to an airport is expected.

ARFF - Airport Rescue and Firefighting Forces

ARTS - Automated Radar Terminal Station

ASNA - Aviation Safety and Noise Abatement Act of 1979

ASR - Airport Surveillance Radar

ATA - Air Transport Association

ATTAINMENT AREA - An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others. See also non-attainment area

ATC - Air Traffic Control

ATCT - Air Traffic Control Tower

AVIGATION EASEMENT - An easement that stipulates that a person’s property is exposed to aircraft noise, and usually provides legal protection to the airport against noise lawsuits.

B

BASED AIRCRAFT - An aircraft permanently stationed at an airport, usually by some form of agreement between the aircraft owner and airport management or the Fixed Base Operator.

BASIC TRANSPORT AIRPORT - An airport designed to serve operations by business jet aircraft.
BIOCHEMICAL OXYGEN DEMAND (BOD) - A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. The greater the BOD, the greater the degree of pollution. BOD5 (amount of oxygen consumed in five days).

BIT - Bituminous Asphalt Pavement

BRL - Building Restriction Line. The closest point to a runway or taxiway at which a structure may be erected.

C

CAT II - Category II Instrument Landing System

CBD - Central Business District

CHEMICAL OXYGEN DEMAND (COD) - A measure of the oxygen required to oxidize all compounds in water, both organic and inorganic.

CIRCLING APPROACH - A descent in an approved procedure to an airport, followed by a circle-to-land maneuver.

CL - Centerline, or Centerline Lighting

CLEAR ZONE - Inner portion of runway approach zone.

COMMERCIAL AIRCRAFT - The sum total of air carrier and air taxi fights.

COMMUNITY NOISE EQUIVALENT LEVEL (CNEL) - Same as "day-night sound level" (see below), except that it includes a 5 decibel penalty during the hours of 7:00 p.m. to 10:00 p.m. in addition to the 10 decibel nighttime penalty.

COMMUTER AIRCRAFT - Smaller commercial aircraft the carry 60 or fewer passengers.

COMMUTER AIRLINE - Aircraft operated by an airline that performs scheduled air transportation service over specified routes using light aircraft in accordance with FAR Parts 121 and or 135. Light aircraft means an aircraft having 30 seats or less and a maximum payload capacity of 7,500 pounds or less.
CONC - Portland Cements Concrete Pavement

CONTINENTAL CONTROL AREA - This includes the airspace at and above 14,500 feet msl of the 48 contiguous states, the District of Columbia, and Alaska, excluding the Alaskan peninsula west of longitude 160 degrees west. It does not include the airspace less than 1,500 feet above the surface of the earth nor most prohibited or restricted areas.

CONTROL AREAS - These consist of the airspace designated as VOR Federal Airways, additional Control Areas, and Control Areas Extensions but do not include the Continental Control Area. Control zones that do not underlie the Continental Control Areas have no upper limit. A control zone may include one or more airports and is normally a circular area with a radius of 5 statute miles and any extensions necessary to include instruments departure and arrival paths.

CONTROL TOWER - A central operations facility in the terminal air traffic control system consisting of a tower cab structure (including an associated IFR room if radar-equipped) using air/ground communications and/or radar, visual signaling, and other devices to provide safe and expeditious movement of terminal air traffic.

CONTROL ZONES - These are areas of controlled airspace which extend upward from the surface and terminate at the base of the Continental Control Area. Control zones that do not underlie the Continental Control Area have no upper limit. A control zone may include one or more airports and is normally a circular area with a radius of five statute miles and any extensions necessary to include instruments departure and arrival paths.

CONTROLLED AIRSPACE - Airspace designated as Continental Control Area, control area, control zone, or transition area within which some or all aircraft may be subjected to air traffic control.

D

db - Decibel - A unit of sound measurement. A sound doubles in loudness for every increase of ten decibels.

dBA - A-weighted Decibel

DECISION HEIGHT (DH) - With respect to the operation of aircraft, this means the height at which a decision must be made, using an ILS or PAR instrument approach.

to either continue the approach or to execute a missed approach.

**DEICING** - A procedure that removes the ice and snow from aircraft and runways that can contribute to accidents, delays, diversions, and flight cancellations. The process for deicing aircraft usually involves glycols, which are mixed with hot water and sprayed on aircraft. Runway deicing may involve liquids, either glycol-based fluids or potassium acetate-based fluids; in addition, solids can be used, typically urea and sand.

**DISTANCE MEASURING EQUIPMENT (DME)** - An electronic installation established with either a VOR or ILS to provide distance information from the facility to pilots by reception of electronic signals. It measures, in nautical miles, the distance of an aircraft from a NAVAID.

**DLH** - The three letter identifier for Duluth International Airport.

**DNL** (day-night sound level) - A level of noise derived by measuring average sound levels in a 24-hour day, in decibels. Nighttime noise, between the hours of 10:00 p.m. and 7:00 a.m. is “weighed”; that is, given an additional 10 decibel to compensate for sleep interference and other disruptions caused by loud nighttime noise. For airport noise exposure purposes, an annual average of the daily day-night average sound levels is used. 65 dB DNL is the noise threshold at which the FAA defines area as “compatible” with residential use; areas at or above 65 dB DNL are designated as “incompatible” with residential use.

**DOD** - Department of Defense

**DTW** - Dual Tandem Wheel

**E**

**EBI** - Effective Buying Income; a bulk measurement of market potential of people in an area that indicates the general ability to buy products.

**EMISSION** - Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residual chimneys; and from motor vehicles, locomotive, or aircraft exhaust.

**ENROUTE** - The route of flight from the point of departure to point of destination, including intermediate stops (excludes local operations).
ENROUTE AIRSPACE - Controlled airspace above and/or adjacent to terminal airspace.

EPA - Environmental Protection Agency

ENVIRONMENTAL IMPACT STATEMENT (EIS) - A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and lists alternative actions.

ETHYLENE GLYCOL (EG) - A commonly-used aircraft and runway deicer. A clear, colorless liquid that may exist in vapor form, which can cause respiratory irritation. Ingestion can cause kidney failure, and can also be fatal.

F

FAA - Federal Aviation Administration

FAR - Federal Aviation Regulation

FBO - Fixed Base Operator

FINAL APPROACH IFR - The flight path of an aircraft which is inbound to the airport on an approved final instrument approach course, beginning at the point of interception of that course and extending to the airport or the point where circling for landing or missed approach is executed.

FINAL APPROACH VFR - A flight path of landing aircraft in the direction of landing along the extended runway centerline from the base leg to the runway.

FLEET MIX - The proportion of aircraft types or models expected to operate at an airport.

FREEDOM OF INFORMATION ACT (FOIA) - A request filed under the Freedom of Information Act, 5 U.S.C. 522, or any relevant state law.

FSDO - Flight Standards District Office, FAA
FY - Fiscal Year

G

GENERAL AVIATION (GA) - Refers to all civil aircraft and operations which are not classified as air carrier.

GENERAL UTILITY (GU) - An airport which is designed to accommodate substantially all propeller-driven aircraft of less than 12,500 pounds.

GENERAL TRANSPORT (GT) AIRPORT - This airport designation is used when an airport is forecast to support general aviation transport aircraft between 60,000 and 175,000 pounds MGW.

GLIDE SLOPE (GS) - The vertical guidance component of an ILS.

GPS - Global Positioning System. An enroute and approach navigation system providing horizontal and vertical information from a constellation of satellites in geosynchronous orbit.

H

HGRS - Hangers

HIGH ALTITUDE AIRWAYS - Air routes above 18,000 feet MSL. These are referred to as Jet Routes.

HIRL - High Intensity Runway Lighting

HOLDING - A pre-determined maneuver which keeps an aircraft within a specified airspace while awaiting further clearance.

HUD - Department of Housing and Urban Development

I

IMC - Instrument Meteorological Conditions
INSTRUMENT APPROACH - An approach conducted while the final approach fix is below VFR minimums.

IFR - Instrument Flight Rules that govern flight procedures under IFR conditions (limited visibility or other operational constraints).

INM 4.1 - Integrated Noise Model Version 4.1

INSTRUMENT LANDING SYSTEM (ILS) - A precision landing aid consisting of localizer (azimuth guidance), glide slope (vertical guidance), outer marker (final approach fix), and approach light system.

INSTRUMENT OPERATION - A landing or takeoff conducted while operating on an instrument flight plan.

ITINERANT OPERATION - All aircraft arrivals and departures other than local operations.

J

JET ROUTES - See High Altitude Airways

L

LANDING AND TAKEOFF CYCLE (LTO) - The basis of ground-level aircraft emissions calculations. The components of an LTO are approach, taxi/idle-in, taxi/idle-out, takeoff, and climbout. LTO cycle calculations include only the emissions plane create within 3,000 feet of the earth’s surface, all of which affect ground-level air quality.

LANDING DIRECTION INDICATOR - A device which visually indicates the direction in which landings and takeoffs should be made.

LANDING MINIMUMS/IFR LANDING MINIMUMS - The minimum visibility and cloud ceiling prescribed for landing while using an instrument approach procedure.

LAT - Latitude
LDA - Localizer Type Directional Aid - A NAVAID used for non-precision instrument approaches with utility and accuracy comparable to a localizer but which is not a part of a complete ILS and is not aligned with the runway.

Ldn - Day-Night Average Sound Level (see Section 2.1.2)

Leq - Equivalent Sound Level (see Section 2.1.4)

Lmax - Maximum A-weighted Sound Level

LOC - Localizer - Part of ILS that provides course guidance to the runway.

LOM - Compass locator at an outer marker (part of an ILS). Also called COMLO.

LOCAL OPERATION - Operations performed by aircraft which: (a) operate in the local traffic pattern or within sight of the tower; (b) are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the control tower; or (c) execute simulated instrument approaches or low passes at the airport.

LOW ALTITUDE AIRWAYS - Air routes below 18,000 feet msl. These are referred to as Victor Airways.

LONG - Longitude

M

MALS - Medium (intensity) Approach Light System

MALSF - MALS with sequenced flashing lights

MALSR - MALS with runway alignment indicator lights (RAILS).

MARKER BEACON - A VFR navigational aid which transmits a narrow beam. It is associated with an airway or an instrument approach.

MASTER PLAN - Long-range plan of airport development requirements.

MGW - Maximum Gross Weight
MICROWAVE LANDING SYSTEM (MLS) - An instrument system operating in the microwave spectrum which provides lateral and vertical guidance to aircraft having compatible avionics equipment.

MILITARY OPERATIONS - An operation by military aircraft.

MINIMUM DESCENT ALTITUDE (MDA) - The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circling-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glide is provided.

MIRL - Medium Intensity Runway Lighting

MISSED APPROACH - A prescribed procedure to be followed by aircraft that cannot complete an attempted landing at an airport.

MITL - Medium Intensity Taxiway Lighting

MM - Middle Marker - Part of an ILS that defines a point along the glide slope normally located at or near the point of decision height (DH).

MOA - Military Operating Area

MOVEMENT - Synonymous with the term operation, i.e., a takeoff.

MSL - mean sea level

NAAQS - NATIONAL AMBIENT AIR QUALITY STANDARDS - Air quality standards established by EPA that apply to outside air throughout the country.

NAS - NATIONAL AIRSPACE SYSTEM - The common system of air navigation and air traffic control encompassing communications facilities, air navigation facilities, airways, controlled airspace, special use airspace, and flight procedures authorized by Federal Aviation Regulations for domestic and international aviation.

NAVAID - Navigational aid (see Air Navigation Facility).
NCP - see Noise Compatibility Program

**NDB - NON-DIRECTIONAL BEACON** - An electronic ground station transmitting in all directions in the L/MF frequency spectrum; provides azimuth guidance to aircraft equipped with direction finder receivers. These facilities are often established with ILS outer markers to provide transition guidance to the ILS system.

**NEM** - see Noise Exposure Map

**NEPA** - National Environmental Policy Act

**NLR** - Noise Level Reduction

**NM** - Nautical Mile

**NOISE ABATEMENT** - A procedure for the operation of aircraft at an airport which minimizes the impact of noise on the environs of the airport.

**NOISE COMPATIBILITY PROGRAM (NCP)** - List of actions the airport proprietor proposes to undertake to minimize noise/land use incompatibilities.

**NOISE EXPOSURE MAP (NEM)** - Graphic depiction of both existing and future noise exposure resulting from aircraft operations and land uses in the airport environs.

**NON-ATTAINMENT AREA** - Geographic area that does not meet one or more of the National Ambient Air Quality Standards for ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen dioxide.

**NON-PRECISION APPROACH PROCEDURE/NON-PRECISION APPROACH** - A standard instrument approach procedure in which no electronic glide slope is provided.

**NOTICE TO AIRMEN/NOTAM** - A notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment of, conditions of, or change in any component (facility, service, or procedure or hazard on the National Airspace System) the timely knowledge of which is essential to personnel concerned with flight operations.

**NPDES - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM** - A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a permit is issued, usually by EPA or a state (SPDES).
NPI - Non-precision Instrument runway marking

NPIAS - National Plan of Integrated Airport Systems

O

OBSTRUCTION - Any object/obstacle exceeding the obstruction standards specified by FAR Part 77.

OBSTRUCTION LIGHT - A light, or one of a group of lights, usually red or white, frequently mounted on a surface structure or natural terrain to warn pilots of the presence of an obstruction.

OM - Outer Marker - A marker beacon, which is part of an ILS, located at or near the glide slope intercept altitude of an ILS approach.

OPERATION - An aircraft arrival at (landing) or departure from (takeoff) an airport.

OPNS - Operations

OUTER FIX - A point in the destination terminal area from which aircraft are cleared to the approach fix or final approach course.

P

PAC - Public Advisory Committee

PAPI - Precision Approach Path Indicator, providing visual vertical guidance information.

PAR - Precision Approach Radar

PART 150 - A voluntary program established under the Aviation Safety and Noise Abatement Act of 1979. Part 150 allows airports to apply for federal funding to important noise mitigation measures including residential soundproofing and acquisition
of noise-sensitive land around airports. A Part 150 plan can also include recommendations for development near airports.

PI - Precision Instrument runway marking

POSITIVE CONTROL AREAS - Airspace wherein aircraft are required to be operated under Instrument Flight Rules, and in contact with Air Traffic Control.

PRECISION APPROACH - A standard instrument approach in which an electronic glide slope is provided.

PREFERENTIAL RUNWAY USE - Taking off or landing on specified runways during certain hours to avoid residential areas.

PROHIBITED AREA - Airspace of defined dimensions identified by an area on the surface of the earth within which flight is prohibited.

PROPYLENE GLYCOL (PG) - Used as a deicer on aircraft. Propylene glycol is less toxic than ethylene glycol, and is sometimes used in food and cosmetics for its water-absorbing properties.

PU - Publicly owned airport

PVT - Privately owned airport

R

RAIL - Runway Alignment Indicator Lights

RAPCON - Radar Approach Control Center

RASP - Regional Airport System Plan

REIL - Runway End Identifier Lights

RELIEVER AIRPORT - An airport which, when certain criteria are met, relieves the aeronautical demand on a high density air carrier airport.

RESTRICTED AREAS - Airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is
subjected to restrictions.

**ROTATING BEACON** - A visual NAVAID displaying flashes of white and/or colored light used to indicate location of an airport.

**RUNOFF** - Precipitation that the ground does not absorb and that ultimately reaches rivers, lakes, oceans or other water bodies. Runoff can carry pollutants from the air and land into these receiving waters.

**RUN-UPS** - An aircraft maintenance procedure; a “gunning” of the engine.

**RUNWAY PROTECTION ZONE (RPZ)** - The inner portion of the runway approach zone.

**RUNWAY SAFETY AREA** - An area symmetrical about the runway centerline and extending beyond the ends of the runway which shall be free of obstacles as specified.

**RVR** - Runway Visual Range

**RW and R/W** - Runway

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**S**

**SALS** - Short Approach Light System

**SDF** - Simplified Directional Facility landing aid providing pattern direction.

**SEGMENTED CIRCLE** - An airport aid identifying the traffic pattern direction.

**SEL** - Sound Exposure Level (see Section 2.1.3)

**SEPARATION MINIMA** - The minimum longitudinal, lateral, or vertical distances by which aircraft are spaced through the application of air traffic control procedures.

**SIP - STATE IMPLEMENTATION PLAN** - EPA-approved state plans for the establishment, regulation, and enforcement of air pollution standards. States that violate federal air quality standards for carbon monoxide, nitrogen dioxide, ozone, PM10 (particulate matter smaller than 10 microns), lead or sulfur dioxide must prepare SIPs.
SLANT DISTANCE - The distance from the measurement location to the aircraft at the point of closest approach.

SLUCM - Standard Land Use Coding Manual

(S)SALS - Simplified Short Approach Light System

SMSA - Standard Metropolitan Statistical Area

SOP - Standard Operating Procedures

SSALF - Simplified Short Approach Light System with Sequence Flashing lights.

STAGE 2 AND STAGE 3 AIRCRAFT - Commercial jet engines currently meet either Stage 2 or Stage 3 noise standards. Stage 2 engines are older and noisier than Stage 3 engines. By the year 2000, most jet engines used in the United States will meet Stage 3 noise standards. In general, Stage 3 airport are 10 dB quieter than Stage 2 aircraft, which represents a halving of perceived noise. However, actual noise reduction varies by aircraft.

STOL - Short Takeoff and Landing

STRAIGHT-IN APPROACH - A descent in an approved procedure in which the final approach course alignment and descent gradient permit authorization of straight-in landing minimums.

SYSTEM PLAN - A representation of the aviation facilities required to meet the immediate and future air transportation needs and to achieve the overall goals.

T

TAC - Technical Advisory Committee

TAF - FAA's Terminal Area Forecast

TACAN - Tactical Air Navigation

TDZ - Touchdown Zone Lights

TERMINAL AIRSPACE - The controlled airspace normally associated with aircraft
departure and arrival patterns to/from airports within a terminal system and between adjacent terminal systems in which tower enroute air traffic control service is provided.

**TERMINAL CONTROL AREA (TCA)** - This consists of controlled airspace extending upward from the surface to specified altitudes within which all aircraft are subject to positive air traffic control procedures.

**TERMINAL RADAR SERVICE AREA (TRSA)** - This area identifies the airspace wherein Air Traffic Control provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. Although pilot participation is urged, it is not mandatory as within a TCA.

**TERPS** - Terminal Instrument Procedures

**T-HANGER** - A T-shaped aircraft hangar which provides shelter for a single airplane.

**THRESHOLD** - The physical end of runway pavement, useable for aircraft takeoffs and landings.

**TOUCH-AND-GO-OPERATION** - An operation in which the aircraft lands and begins takeoff roll without stopping.

**TRACON** - Terminal Radar Approach Control

**TRAFFIC PATTERN** - The traffic flow that is prescribed for aircraft landing at, taxiing on, and taking off from an airport. The usual components of a traffic pattern are upwind leg, crosswind leg, downwind leg, and final approach.

**TRANSIENT OPERATION** - An operation performed at an airport by an aircraft that is based at another airport.

**TVOR** - Terminal Very Frequency Omirange Radio Station

**TW and T/W** - Taxiway

**U**

**UHF** - Ultra High Frequency

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*F.A.R. Part 150 - Noise Compatibility Program  A-17*
UNCONTROLLED AIRSPACE - That portion of the airspace that has not been designated as Continental Control Area, control area, control zone, terminal control area, or transition area and within which ATC has neither the authority nor the responsibility for exercising control over air traffic.

UNICOM - Radio communications station which provides pilots with pertinent airport information (winds, weather, etc.) at specific airports. Frequently operated by the FBO.

UREA - A widely-used runway deicer. Essentially a fertilizer, urea can load receiving waters with nitrogen. Urea also biodegrades to ammonia-nitrogen, which, at high levels, is toxic to aquatic life.

USGS - United States Geological Survey

USWB - United States Weather Bureau

V

VASI - Visual Approach Slope Indicator (providing visual glide path).

VASI-2 - Two-Box Visual Approach Slope Indicator

VASI-4 - Four-Box Visual Approach Slope Indicator

VASI-12 - Twelve-Box Visual Approach Slope Indicator

VECTOR - A heading issued to an aircraft to provide navigational guidance by radar.

VFR - Visual flight Rules that govern flight procedures in good weather.

VFR AIRCRAFT - An aircraft conducting flight in accordance with Visual Flight Rules.

VHF - Very High Frequency

VICTOR AIRWAYS - See Low Altitude Airways

VOR - Very High Frequency Omni-directional Radio Station, the primary facilities for aircraft navigation and establishment of airways.
V/STOL - Vertical/Short Takeoff and Landing

VTOL - Vertical Takeoff and Landing (includes, but is not limited to, helicopters).

W

WARNING AREA - Airspace which may contain hazards to non-participating aircraft

WIND-CONE (WIND SOCK) - Conical wind direction indicator.

WIND TEE - A visual device used to advise pilots about wind direction at an airport.