Airport Noise Management Benchmarking Study

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Prepared For:

Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN 55450

Prepared By:
Mary Ellen Eagan
Katherine Preston
Julia Nagy

HMMH
77 South Bedford Street
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.c

Executive Summary

The Metropolitan Airports Commission (MAC), which operates Minneapolis-St. Paul International Airport (MSP), intends to identify best practices in airport noise management in North America through a comprehensive benchmarking study of airport noise management practices. The benchmarking study included a survey of peer airports across North America and the results are summarized in this report.

The objectives of this study are to: (1) detail the constraints imposed on U.S. airport noise programs due to the highly-regulated environment in contrast with airports in other countries; (2) provide an independent and transparent review of the MAC Noise Program Office and related noise abatement activities as compared with peer airports in the U.S. and Canada; and (3) identify improvement opportunities for the MAC Noise Program Office and MSP Noise Oversight Committee (NOC).

The motivation for this study stems from the need, identified by the NOC, for an independent and transparent review of airport noise programs in order to identify best practices in the industry. In response to increasing community concern about airport noise in many communities across the U.S., results of the study provide valuable data for airports to identify opportunities, assess progress, and address challenges related to airport noise.

This report provides an overview of the airport noise regulatory environment in the U.S. and key international noise management programs. It provides an overview of each of the five categories of noise management that were assessed through the benchmarking study, including:

- Program Management and Innovative Use of Technology;
- Stakeholder Engagement;
- Operational Measures;
- Mitigation and Land Use Measures, and;
- Research and Policy Measures.

The methodology for the benchmarking study included identification of twenty-eight relevant noise management measures across the five categories, the creation of an online survey to collect data on the implementation of the identified measures, and analysis of airport responses.

The survey was sent to 72 airports in both the U.S. and Canada, with 54 airports responding, resulting in a response rate of seventy-five percent. Although a majority of respondents were U.S. airports, 6 were Canadian airports. Of the 48 U.S. airport respondents, approximately forty-eight percent are large hub, twenty-nine percent medium hub, eight percent small hub, thirteen percent non-hub, and two percent other.

The benchmarking survey results show that MSP performs well amongst airport respondents for many of the 28 measures, across each category of noise management:

- In the area of Program Management and Innovative Use of Technology, MSP has one of the largest noise offices in North America. MSP also has the most permanently installed noise monitors (39) of all surveyed airports. MSP's Noise and Operations Monitoring System (MACNOMS) is accessible to the public, including a public portal that allows users to customize reports for a wide range of analyses, and to report complaints. MSP might consider allowing noise complaints from non-residential addresses.
- In the area of Stakeholder Engagement, survey results show that MSP has one of the most comprehensive programs; including the NOC, quarterly Listening Sessions, an airport noise website, newsletter, and video series. MSP might consider livestreaming NOC meetings as an opportunity to provide greater access for stakeholders who cannot attend in person. Regarding pilots and users, MSP has an extensive pilot education program and noise abatement sensitivity training. Although this is not organized as a formal Fly Quiet Program, MSP does track compliance.
- In the area of Operational Measures, MSP has a number of measures that have been developed to address noise from aircraft operations, including a preferential runway use program and 11 Noise Abatement Procedures (NAPs). MSP has both suggested and required NAPs, and is among forty-seven percent of responding airports that track compliance with NAPs. MSP is among the more than two thirds of airports that report collaborating with FAA and other stakeholders to consider airspace design for noise abatement purposes. These include flight tracks to avoid noise-sensitive areas and Performance Based Navigation (PBN).
- In the area of Mitigation and Land Use Measures, MSP is the only airport among all respondents to report providing sound insulation to DNL 60, and reported the highest program cost at approximately $483M. MSP is among the one third of respondents that reported having a land/property acquisition program or residential relocation program; twenty-eight percent of respondents have disposed of previously acquired noise land, including MSP. Eighty-nine percent of respondents, including MSP, reported partnering with local jurisdictions concerning noise mitigation and land use control, using a wide range of measures.
- In the area of Policy and Research Measures, MSP is among the seventy-two percent of respondents that report having an FAA-accepted Noise Exposure Map and FAA-approved Noise Compatibility Program under FAR Part 150 or similar federally-approved program. More than three quarters of respondents, including MSP, indicate that they participate in at least one local or national airport noise research group or national aviation trade association.

Contents

List of Figures

1 Airport Noise Background

The Metropolitan Airports Commission (MAC) is a public corporation that operates the Twin Cities metropolitan airport system, including Minneapolis-St. Paul International Airport (MSP) and six general aviation (GA) airports. The MAC is conducting this benchmarking study to identify best practices in airport noise management in North America. The benchmarking study includes a survey of peer airports across North America, the results of which are summarized in this report.

The objectives of this study are to: (1) detail the constraints imposed on U.S. airport noise programs due to the highly-regulated environment in contrast with airports in other countries; (2) provide an independent and transparent review of the MAC Noise Program Office and related noise abatement activities as compared with peer airports in the U.S.; and (3) identify improvement opportunities for the MAC Noise Program Office and MSP Noise Oversight Committee (NOC).

1.1 Motivation for Study

Motivation for this study stems from the need, identified by the NOC, for an independent and transparent review of airport noise programs in order to identify best practices in the industry. In the face of concern about airport noise in many communities across the United States, results of the study provide valuable data for airports to identify opportunities, assess progress, and address challenges related to airport noise. Some results provide information on the collective progress of peer airport noise management programs and progression of programs over time.

1.2 Regulatory Environment

Over the last 45 years, the number of people exposed to the current federally-defined threshold for significant aircraft noise in the United States (U.S.) has decreased from approximately 7 million to less than 350,000 today (as depicted in Figure 1) according to the Federal Aviation Administration (FAA)[1]. This progress was achieved largely through the transition of aircraft fleets from older, noisier aircraft to newer quieter aircraft through both technological advances, fleet renewal and a phase out of all Stage 2 aircraft by 1999[2]. Despite these improvements, noise remains a significant concern for communities surrounding airports.

Airports, the FAA, and local governments (often the airport sponsor also represents local government) jointly share responsibility for regulating airport noise and aircraft. The FAA owns and controls the airspace, and controls the operation of aircraft on the airport and in the air. The agency certifies aircraft, issues Airport Improvement Program (AIP) grant funding, complies with the National Environmental Policy Act (NEPA), reviews requests for airport access restrictions for noise reduction purposes and approves airport noise compatibility program elements.

Airports maintain the authority to plan and construct runways, taxiways, hangars, terminals, etc. Airport planning and development processes vary from airport to airport, and can be dependent upon the specific ownership model of the airport. Airports in the U.S. can be owned and operated by a state, city, county, and/or an airport authority. Airport authorities are public entities formed to manage and conduct oversight of an airport or group of airports. Airport authorities, or commissions, are comprised

[1] Federal Aviation Administration (FAA) Office of Policy, International Affairs and Environment. "Aircraft Noise Issues". Accessed at https://www.faa.gov/about/office_org/headquarters_offices/apl/noise_emissions/airport_aircraft_noise_issues/

[2] U.S. Public Law No: 101-508. Airport Noise and Capacity Act of 1990. 5 November 1990. Accessed at https://www.congress.gov/bill/101st-congress/house-bill/5835/text

of individual commissioners of a board of directors. Commissioners or board members are typically appointed by an elected official. In contrast for example, the Baltimore-Washington International Airport (BWI) in Maryland is owned and operated by a state agency, the Maryland Aviation Administration.

Regardless of the ownership structure, airports can voluntarily undertake a Part 150 study to develop Noise Exposure Maps (NEM) and Noise Compatibility Programs (NCP) (Refer to Section 1.2.1).

Local governments are responsible for land use planning and zoning in the vicinity of the airport, and can control siting and expansion of airports[3].

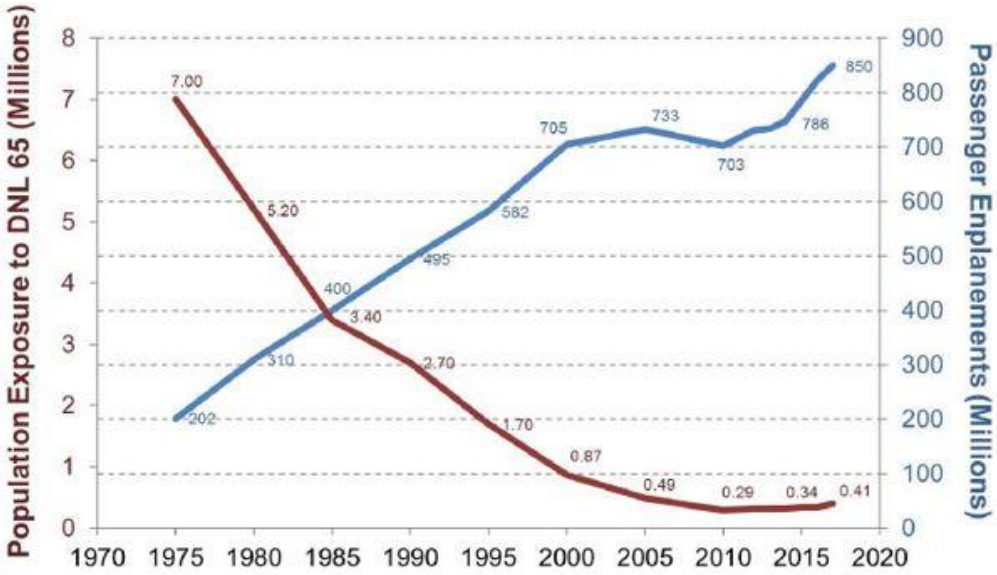

Figure 1 FAA chart "Historical Order of Magnitude Noise Exposure Reduction vs. Traffic Growth"[4]

Airports in the U.S. are subject to a number of rules and regulations governing the assignation of responsibility and the management of aviation noise. Airports' ability to reduce noise through the implementation of aircraft operating restrictions is severely limited by federal law, but airports do have a range of options to mitigate noise through land use, implementation and operational measures. Airframe and engine manufacturers are also subject to noise regulations with regards to the production and certification of aircraft, however this section will focus only on the federal laws and regulations governing airports' ability to manage and mitigate noise. Over the last several decades, investments by the FAA and airframe/engine manufacturers have driven the technology that has enabled reduction in aircraft noise, especially through consortiums like the FAA's Continuous Lower Energy, Emissions, and Noise (CLEEN) Program.

1.2.1 Noise Compatibility Planning and Part 150

One of the first laws to address airport noise measurement and planning was the Aviation Safety and

[3] Kaplan Kirsch & Rockwell LLP and Harris Miller Miller & Hanson Inc. "Guide to Airport Noise Rules and Use Restrictions". 2004. Accessed at https://www.kaplankirsch.com/portalresource/Guide-to-Airport-Noise-Rules.pdf

[4] Source: FAA, 2018. Accessed at https://www.faa.gov/about/office_org/headquarters_offices/apl/noise_emissions/airport_aircraft_noise_issues/

Noise Abatement Act (ANSA), passed by Congress in 1979. The FAA developed implementing regulations in the Federal Aviation Regulations (FAR) Part 150, or the Code of Federal Regulations (CFR) 14 CFR Part 150, Airport Noise Compatibility Planning[5] ("Part 150"). Part 150 accomplished two main things. First, it set a noise metric for measuring noise exposure, the Day-Night Average Sound Level, of DNL. This is a cumulative measurement, with a penalty for nighttime noise that represents an average annual day.

Second, Part 150 outlined a voluntary program governing the development of NEMs and NCPs. Once an airport completes a Part 150 study and the FAA has accepted the resulting NEM and approved specific measures in the NCP, the airport is then able to apply for federal grants to implement the approved NCP measures under the AIP[6]. Federal funding is also available for noise mitigation measures required as a result of an airport project under the National Environmental Policy Act (NEPA).

The Part 150 regulation[7] describes the procedures and requirements for developing, submitting and approving or disapproving NEMs and NCPs. NEMs depict present and future cumulative noise exposure and land use compatibility. The main goals of NCPs are to reduce existing incompatible land uses[8] around airports and to prevent the introduction of additional incompatible land uses. For purposes of designating compatible and noncompatible land uses, the FAA set a noise level of DNL 65 dB[9] as significant noise exposure.

In addition, Part 150[5] states that the primary purpose of an NCP is:

> "(1) To promote a planning process through which the airport operator can examine and analyze the noise impact created by the operation of an airport, as well as the costs and benefits associated with various alternative noise reduction techniques, and the responsible impacted land use control jurisdictions can examine existing and forecast areas of noncompatibility and consider actions to reduce noncompatible uses.
>
> (2) To bring together through public participation, agency coordination, and overall cooperation, all interested parties with their respective authorities and obligations, thereby facilitating the creation of an agreed upon noise abatement plan especially suited to the individual airport location while at the same time not unduly affecting the national air transportation system.
>
> (3) To develop comprehensive and implementable noise reduction techniques and land use controls which, to the maximum extent feasible, will confine severe aircraft YDNL values of Ldn 75 dB or greater to areas included within the airport boundary and will establish and maintain compatible land uses in the areas affected by noise between the Ldn 65 and 75 dB contours."

Stakeholder coordination and public participation are key features of Part 150 programs and resulting

[5] U.S. Government Publishing Office (GPO). Electronic Code of Federal Regulations, Title 14 CFR Part 150 – Airport Noise Compatibility Planning. Accessed at https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title14/14cfr150_main_02.tpl

[6] U.S. Department of Transportation (DOT). Federal Aviation Administration (FAA) Order 5100.38D, Airport Improvement Program Handbook. September 30, 2014. Accessed at https://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D.pdf

[7] Also codified in Title 49 U.S. Code § 47501-47504. Accessed at https://www.gpo.gov/fdsys/pkg/USCODE-2011-title49/html/USCODE-2011-title49-subtitleVII-partB-chap475-subchapI.htm

[8] Noncompatible land use is defined in 14 CFR Part 150, Appendix A, but generally includes any residential use, places of worship, hospitals and schools within the 65 DNL contour

[9] A-weighted sound level, or dB, measures sound consistent with human hearing

NCPs. NCPs may include general types of measures for consideration to meet the goals of mitigating noise and minimizing incompatible land uses, including:

- Land use measures;
- Noise abatement/operational measures; and
- Program management or implementation measures.

Mandatory airport access restriction measures for noise purposes, such as curfews, are governed by the requirements set forth in the 1990 Airport Noise and Access Restrictions (ANCA), described in 14 CFR Part 161, with the exception of measures that were in place prior to 1990 and were allowed to remain in effect[10]. More information concerning Part 161 is provided in Section 1.2.2.

Part 150 studies and the development of NCPs provide a process for airports and their communities to examine noise exposure and noise issues and consider potential mitigation measures, and is a necessary step for securing federal funding for the NCP measures. Examples of acceptable NCP measures are listed in Table 1 below (many of which were included in the benchmarking survey):

Table 1 Examples of NCP Measures

Operational Measures	Land Use Measures	Program Management Measures	Stakeholder Engagement Measures	Policy / research Measures
Preferential runway use program	Acquiring noncompatible properties	Notifying pilots of voluntary/ recommended flight procedures	Community advisory committees	Engagement with FAA in NextGen implementation plans / schedule
Ground run-up enclosures	Acquiring "avigation easements"	Establishing a noise office and permanent noise staff	Periodic noise reporting	Participation in national noise research programs (i.e. ACRP)[11]
Noise abatement flight tracks	Sound insulation of incompatible properties	Online flight tracking	Websites	NEM updates
Noise abatement departure procedures	Construction of noise berms	Noise monitors	Public meetings	Benchmarking study

Once an airport has developed an FAA-approved NEM, the list of proposed NCP measures and the justification for each is submitted for FAA review and approval. Measures must be reasonable, non-discriminatory, and non-arbitrary to be approved. Airports are not able to consider measures specifically to address noise outside the DNL 65 dB contour for purposes of the Part 150 program unless the airport

[10] Proposed Airport Noise and Access Restrictions may be included in an NCP, but are subject to completion of a Part 161 Study and subsequent FAA approval and in accordance with U.S. GPO, Electronic Code of Federal Regulations, Title 14 CFR Part 161 – Notice and Approval of Airport Noise and Access Restrictions. Accessed at https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&SID=243d803bf33a2f497a575740f07a2010&ty=HTML&h=L&mc=true&r=PART&n=pt14.3.161

[11] Airport Cooperative Research Program (ACRP), a program of the Transportation Research Board sponsored by the FAA

can demonstrate that the lower threshold has been adopted by local land use jurisdictions. The collection of approved measures can be finalized by the airport as part of its formal NCP and the airport may apply for federal AIP grants to fund implementation.

1.2.2 Airport Access Restrictions and Part 161

Some airports have examined employing mandatory noise and access restrictions as a means for reducing aircraft noise. Congress created a formal process with the passage of the Airport Noise and Capacity Act in 1990. ANCA required the FAA to phase out Stage 2 aircraft over 75,000 pounds, and to develop regulations regarding the analysis, notice and approval of airport access restrictions. FAA in turn developed ANCA implementing regulations with 14 CFR Part 161 (Part 161).

Mandatory airport operating and access restrictions are in place at a few airports in the country, all but one of which were in place prior to the passage of ANCA and were therefore grandfathered in (i.e. those airports did not did need to go through the Part 161 process). The one remaining use restriction was a Stage 2 ban, which did not require FAA approval; that restriction was made moot with FAA's nationwide Stage 2 phase out.

Some examples of mandatory noise rules include the following:

- Restricting certain aircraft types or stage certifications;
- Restricting operations to certain hours of the day;
- Limiting total number of operations or limiting number of operations by aircraft type;
- Imposing fees based on noise or other noise-related considerations.

Part 161 regulations are very strict and airports must demonstrate that they meet all the requirements before FAA can approve a proposed mandatory noise rule. While Part 161 does not include a list of every type of measure that is subject to the requirements of that program, it does apply to any "noise or access restriction" that limits the operation of Stage 2 or Stage 3 aircraft[12]. This has been interpreted rather broadly.

Part 161 does *not* apply to the following types of measures:

- Operational procedures controlled by the FAA such as noise abatement approach and departure procedures;
- Taxiing and aircraft engine run-up restrictions that do *not* limit the number of Stage 2 or Stage 3 aircraft that are allowed to use the airport or limit operating hours;
- Voluntary measures;
- Operations restrictions based on pavement weight-bearing capacity; and
- Any restriction on Stage 2 or Stage 3 aircraft in place before 1990.

Airports that do not comply with Part 161 and attempt to impose a restriction subject to this regulation without FAA approval risk losing AIP funding and ability to charge Passenger Facility Charges (PFCs).[13]

In order to propose an access restriction under Part 161, an airport must perform a detailed analysis of the measure, including providing evidence of a noise problem, impact analysis, alternatives review, and

[12] The FAA develops certification requirements for all newly certificated aircraft, including noise standards. Each "stage" has a noise limit, with each stage having lower noise levels than prior stages. Stages are set at the International Civil Aviation Organization (the UN body overseeing international civil aviation) and then implementing regulations are developed by each participating State.

[13] Kaplan Kirsch & Rockwell LLP and Harris Miller Miller & Hanson Inc. "Guide to Airport Noise Rules and Use Restrictions". 2004. Accessed at https://www.kaplankirsch.com/portalresource/Guide-to-Airport-Noise-Rules.pdf

a benefit-cost analysis. The cost-benefit analysis must demonstrate that the benefits of the proposed restriction exceed the costs. The airport must also provide opportunity for public comment. The airport must develop noise contours as required for Part 150 studies, defining the "airport noise study area" (i.e. outside the DNL 65 dB). Other statutory conditions for the approval of access restrictions include:

- The measure must be reasonable, non-arbitrary and non-discriminatory;
- It must not place undue burden on interstate commerce or foreign commerce;
- It must maintain safe and efficient use of navigable airspace;
- It cannot conflict with existing law;
- The airport must provide adequate opportunity for public review and comment, and;
- It cannot result in undue burden on the national aviation system.

These statutory conditions are extensive and are intended to approve access restrictions only in the most extreme circumstances. The FAA has stated its preference for voluntary measures. Only a handful of Part 161 studies have been submitted, and with the exception of the Stage 2 restriction described above, the FAA has never approved the implementation of an access restriction under this regulation.

1.2.3 Grant Assurances

When airports accept federal funding from the FAA's AIP, they agree to certain conditions and obligations known as grant assurances. Grant assurances are in effect for twenty years following the receipt of the grant (each year the airport receives a grant the general twenty year timeframe starts anew). There are several grant assurances an airport must comply with as outlined in the AIP Handbook[14]. Two particularly relevant ones that pertain to an airport's noise management activities require that any airport that has accepted federal grant funding remain "available for public use on reasonable conditions and without unjust discrimination", and does not engage in discriminatory conduct. The FAA will accept informal complaints about violations of grant assurances from any source, and the FAA will investigate the claim (usually requiring a response from the airport). There is a formal complaint process outlined in 14 CFR Part 16 for any entity that is "directly and substantially affected by the alleged noncompliance". The FAA Office of Chief Council will investigate the claim and if a violation is found the FAA can impose penalties, including terminating the airports grant eligibility.

1.2.4 FAA NEPA Implementing Orders

FAA Order 1050.1F, "Environmental Impacts: Policies and Procedures" and the accompanying Desk Reference comprise the agency's overarching implementing order for the National Environmental Policy Act (NEPA). FAA Order 5050.1B is the specific guidance for airports, titled "National Environmental Policy Act Implementing Instructions for Airport Actions". These documents describe what the FAA and airports' obligations are with respect to assessing the noise impacts of various federal actions, which projects require noise analysis as part of the environmental review, the acceptable models and methodologies and processes for assessing noise.

1.2.5 Overview of Key International Noise Management Programs

The International Civil Aviation Organization (ICAO) recommends a Balanced Approach to noise management, which includes four elements: (1) reducing aircraft noise at the source, (2) land use

[14] Grant assurances listed in Title 49 U.S. Code § 47107 - Project grant application approval conditioned on assurances about airport operations, as well as the most recent version of the AIP Handbook, or Order 5100.38D. Accessed at https://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D.pdf .

planning and management, (3) noise abatement operational procedures, and (4) operating restrictions[15]. This is illustrated in Figure 2.

This general approach is similar to the U.S. focus and strategies for noise management, with a few key differences:

- Land use compatibility criteria and noise impact thresholds vary considerably around the world. The European Union's (EU) Environmental Noise Directive[16] is the main EU instrument to identify noise pollution levels and to trigger the necessary action both at Member State and at EU level. The directive requires member states to evaluate airport noise using Lden, the Day Evening Night Noise Indicator, as well as "Lday" (day-noise indicator), "Levening" (evening-noise indicator) and "Lnight" (night-time noise indicator). Lden is analogous to DNL (though it also includes a weighting for evening activity – similar to the Community Noise Equivalent Level in California). All EU countries use Lden, but individual states define nighttime period differently, and identify individual thresholds of land use compatibility. They often also have separate thresholds for day and nighttime noise.
- As discussed in Section 1.2.2, FAR Part 161 has effectively prevented U.S. airports from implementing a noise or access (operating) restriction since 1990. This has not been the case in Europe and parts of Asia, where use restrictions – particularly curfews and differential landing fees – have proliferated in the last several years.
- Most airports outside of the U.S. are either privately owned or privately managed. This allows airport operators to enter into agreements with communities and other stakeholders that would not be permitted in the U.S., and generally provides more flexibility to airport operators, since they are not constrained by federal funding requirements, grant assurances, etc.

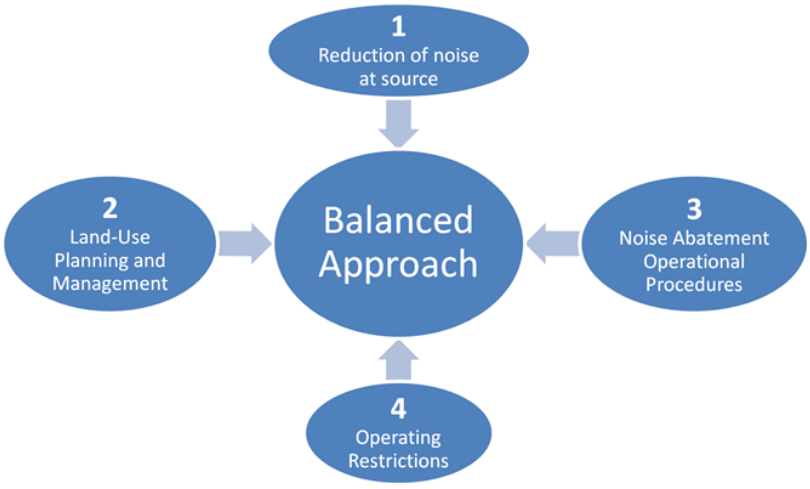

Figure 2 Principal elements of ICAO balanced approach to noise[17]

[15] International Civil Aviation Organization (ICAO). "Guidance on the Balanced Approach to Aircraft Noise Management" (Doc 9829). 2004 (First Edition).

[16] Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise.

[17] International Civil Aviation Organization (ICAO). "The four principal elements of the Balanced Approach to Aircraft Noise Management". 2018. Accessed at https://www.icao.int/environmental-protection/Pages/noise.aspx

2 Overview of Noise Management Categories

HMMH, in consultation with the MSP Noise Oversight Committee (NOC), developed a list of noise program office components and related noise program activities for benchmarking. These components provide a comprehensive overview of measures in the following categories: Program Management and Innovative Use of Technology, Stakeholder Engagement, Operational, Mitigation and Land Use, and Research and Policy.

Section 2 provides an overview of each of the following categories of noise management components included in the benchmarking survey. Specific measures and results are included in Section 3, Benchmarking Study Methodology and Results.

2.1 Program Management and Innovative Use of Technology Measures

Program management measures support the implementation, monitoring, and reporting of noise management programs at airports. In order to effectively manage and implement the airport's noise program and community relations related to noise, airports often establish a noise office or employ a specified noise program manager. Airport noise offices or personnel administer all aspects of noise management programs, many of which include: noise and operations monitoring systems, flight track monitoring systems, and complaint tracking systems, among other components.

Noise monitoring systems are an integral component of many noise management programs. Noise monitoring towers are placed strategically in communities surrounding the airport in order to collect noise data. These systems provide the airport sponsor with objective and accurate noise data as a foundation for implementing noise program elements, monitoring the effectiveness of the program, and responding to community inquiries. Data from noise monitoring towers is often used in an airport's Noise and Operations Monitoring Systems (NOMS). NOMS also provide real-time or delayed flight track monitoring information.

Flight track monitoring systems allow the airport to monitor the implementation of voluntary or mandatory noise abatement measures. Monitoring systems are also an effective tool for airports to educate pilots on proper noise abatement procedures. These systems enable airports to correlate noise complaints to flights tracks, in order to increase responsiveness to community concern. Some airports have the ability to provide flight track and noise monitoring system data online through their noise office website.

Many airports have instituted complaint tracking and monitoring systems to help staff log and analyze incoming aircraft noise complaints. Airports use noise complaint hotlines, web-based forms, and direct communication as methods for collecting complaint data. These systems provide information on airport operations and allow the complainant to record a noise comment or complaint. Airports that track complaints enter the data into a noise complaint database.

As described, airport noise offices often have access to a large amount of data from a variety of monitoring systems. This data often provides the foundation for airport personnel to respond to noise complaints, prepare noise reports, prepare stakeholder reports, inform decision-making, prepare noise contours, and conduct noise research.

2.2 Stakeholder Engagement Measures

Stakeholder engagement measures facilitate communication between the airport and its surrounding community. These measures provide the means for airport sponsors to disseminate information about

the airport's noise management program, and to provide forums for receiving input from the community and other interested parties. The measures provide resources for community members in order to increase knowledge and awareness of noise related materials. Airports often share information with stakeholders through an airport noise office website, printed or electronic newsletters, and reports pertaining to noise at the airport.

Depending on the size and resources of the airport, noise offices may employ a community relations professional to serve as a community liaison and central point of contact regarding noise issues, collection of and response to noise complaints, implementation of noise program components, and ongoing noise compatibility planning efforts. Having a dedicated position allows the staff person in this role to build key relationships in the community and become familiar with the neighboring communities' specific concerns and characteristics.

Airport noise advisory committee or roundtables have often proven to be an effective communication forum for bringing stakeholders together to discuss the noise environment of the airport and related noise management measures. They provide space for conversations between airport sponsors and local communities, stakeholders, airport staff, the FAA and operators. The groups can provide recommendations to the airport sponsor regarding noise related issues, community outreach, noise management measures etc., but ultimately the airport has sole authority to determine its actions.

The groups can be facilitated by airport sponsor staff, airport contractors, third party meeting facilitators or some combination. Membership criteria varies by airport but often includes individuals from neighboring communities, local /state/ Federal elected officials or their representatives, planning councils or boards, zoning agencies, the FAA, airline representatives, professional associations, aviation noise experts, etc. Meetings are often open to the public (especially if the state or local jurisdiction has open public meeting laws), and are sometimes recorded (audio), or a record is provided through written meeting minutes.

"Fly Quiet" programs are another stakeholder engagement measure intended to encourage aircraft operators to operate as quietly as possible when departing and/or arriving at the airport. Often, these programs involve acknowledging those operators with a good record of following the noise abatement goals and procedures published for the airport. These programs are voluntary and collaborative. The airport sponsor, airport users, the FAA and the community work together to reduce noise by tracking the operators' performance against the metrics of the specific program. This information is then regularly provided to the public – typically in a quarterly report. In this way the public is made aware of the voluntary actions taken by the airport and the operators to reduce noise impacts to the communities.

Air Traffic Control Tower at MSP

Source: MAC

2.3 Operational Measures

MSP operations from above

Source: MAC

Noise Abatement Procedures (NAPs) are operational measures intended to decrease noise impact of arriving and departing aircraft on surrounding communities. Implementation of NAPs requires coordination between Air Traffic Control (ATC), airport staff, Air Navigation Service Providers (ANSP), airlines and other airport users[18].

The International Civil Aviation Organization (ICAO) separates NAPs into three categories: noise abatement flight procedures, spatial management, and ground management. Examples of noise abatement flight procedures are Continuous Descent Arrival (CDA), Noise Abatement Departure Procedures (NADP), and modified approach angles. Examples of spatial management include noise preferred arrival and departure routes, flight track dispersion or concentration, and preferential runway use. Ground management measures may include engine run-up rules or restrictions and barriers or enclosures[18].

2.4 Mitigation and Land Use Measures

Mitigation and land use measures are intended to reduce existing incompatible land uses and prevent additional incompatible land uses surrounding an airport. Examples include sound insulation programs, land/property acquisition programs, and residential relocation programs. Airports often partner with local jurisdictions to administer these programs and informally advise on land use planning initiatives. Some examples of these partnerships may include compatible/comprehensive land use plans, airport noise overlay zones, cooperative land use agreements, revised building codes, avigation easements, noise disclosures for real estate transactions, and transfer/purchase of development rights.

2.5 Policy and Research Measures

Policy and research related measures include actions such as noise compatibility planning under Part 150, including a periodic review of the airport's NEM and NCP, and the consideration of revisions and refinements as necessary. Current FAA guidance requires NEMs be updated every five years or sooner if changes warrant. NCP updates do not have such a timeline associated as many of the measures can often take years and, in some cases decades to implement. NCP updates typically occur when there is a need to implement new measures or modify existing measures in order to obtain compatible land use. An NCP update is not required to remove a measure since all NCP measures are voluntary and implemented when funding is available. However, some airports have updated NCPs to document the cancellation of particular NCP measures.

[18] International Civil Aviation Organization (ICAO). "Review of Noise Abatement Procedure Research & Development and Implementation Results". 2007. Accessed at https://www.icao.int/environmental-protection/Documents/ReviewNADRD.pdf

3 Benchmarking Study Methodology and Results

HMMH developed an online survey to collect data on specified airport noise program office components and related noise program activities identified for benchmarking. Survey questions were separated into five sections in order to capture information within each of the five noise management categories described in Section 2. Within each of the five categories, questions were intended to capture results and responses concerning 28 measures of noise management.

HMMH worked with staff from Airports Council International-North America (ACI-NA) and the American Association of Airport Executives (AAAE) to develop a list of contacts from their respective Environmental Committees, especially those active in noise subcommittees. The survey list focused primarily on contacts representing large and medium hub airports from around the U.S., and some key Canadian airports. Noise compatibility measures vary from airport to airport due to their individual local conditions and operating environments. Individual airport codes were omitted and responses have been scrubbed and/or aggregated to maintain confidentiality. The full survey instrument is included in Appendix A.

This section describes respondent demographics and high level study results broken down into the five noise management categories. Within each category, specific measures are listed and subsequently, high level summary results related to that measure.

3.1 Respondent Demographics

The survey was sent to 72 airports in the U.S. and Canada. The research team received 54 complete responses, resulting in a response rate of 75%. Although a majority of respondents were U.S. airports, six Canadian airports completed the survey. Of the 48 U.S. airport respondents, approximately 48% are large hub, 29% medium hub, 13% non-hub, 8% small hub, and 2% other, as shown in Figure 3. Canadian airports account for approximately 11% of respondents. The remaining respondents represent each of the FAA regions, excluding Alaskan, as follows: 19% Southern, 15% Eastern, 15% Great Lakes (including MSP), 15% Western Pacific, 11% Northwest Mountain, 9% Southwest, 4% New England, and 2% Central.

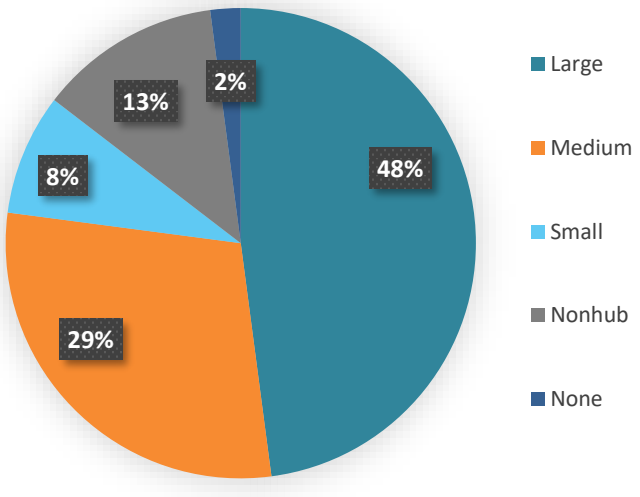

Figure 3 U.S. Airport respondents by hub size

3.2 Noise Management Category 1: Program Management and Innovative Use of Technology Measures

3.2.1 Measures and Results

Measure 1: Airport noise office

- 74% of respondent airports have an established noise office, including MSP.
- Noise offices were established throughout a range of years from 1960 – 2016. See Figure 4 for the number of offices established in each decade from the 1960s to the present.
- Noise offices range from 0 – 7 Full Time Employees (FTEs). Approximately 56% of respondent airports have 1 or fewer FTEs working on noise (see Figure 5). **MSP has 5 noise FTEs.**

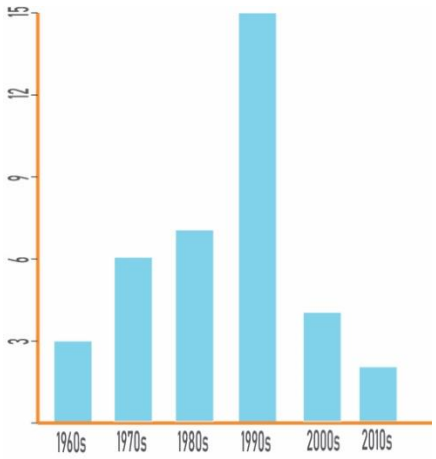

Figure 4 Decade that respondents' noise offices were established

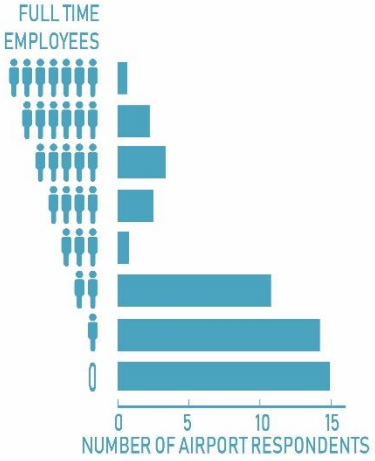

Figure 5 Number of full-time noise office employees reported

Measure 2: Permanent noise monitoring system

- 56% of participating airports report having permanently-installed noise monitoring system in place, including MSP.
- The number of permanently-installed monitoring towers reported range from 2 – 39, with an average of approximately 15 towers (see Figure 6). Of the 11 airports that have 20 towers or more, 82% are large hub U.S. airports and 18% are Canadian airports. **MSP has the most towers with 39 installed.**
- Out of 29 respondents: 52% handle monitor maintenance externally, 24% handle it internally, and 24% utilize a combination of both internal and external maintenance. MSP handles maintenance internally.

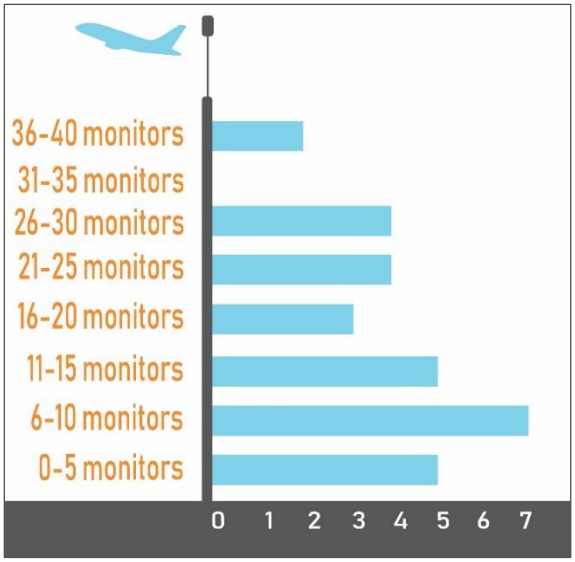

Figure 6 Count of respondents that have each range of permanently-installed monitoring towers

Measure 3: Complaints

- MSP is one of the 78% of airport respondents that have an online complaint portal. Refer to Figure 7.
- 91% of airport respondents have a telephone complaint/information hotline, including MSP Refer to Figure 8.

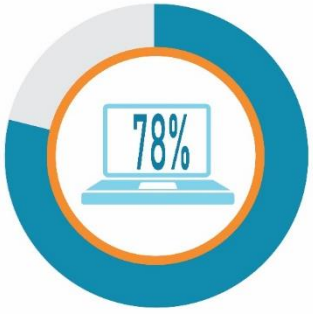

Figure 7 Percentage of respondents with an online complaint portal

Figure 8 Percentage of respondents with a telephone complaint hotline

- Figure 9 shows a graphic summary of total noise complaint statistics for airport respondents in 2017. In order to allow for analysis and comparison of noise complaints, the research team combined the values provided by respondents for both online and telephone complaints, since many airports were not able to provide complaint data separated by source. All complaint data provided reflects 2017 data, other than two data points from 2016 and one data point that includes data from 2018, which were included in the analysis. **MSP reported the second highest number of overall complaints out of all airport respondents at 149,054.**

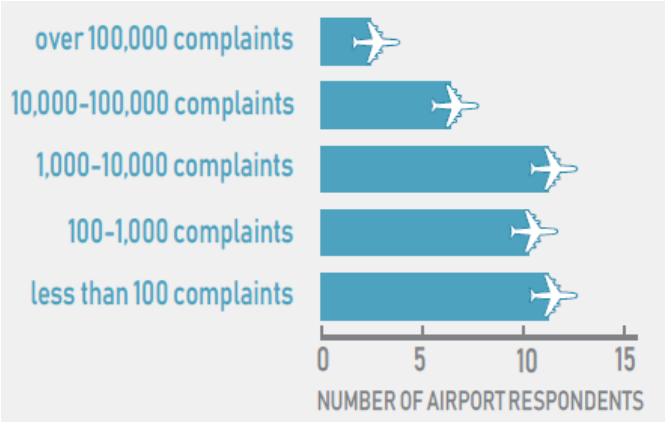

Figure 9 Total noise complaints reported by airport respondents for 2017

- **MSP does not accept noise complaints from non-residential addresses/locations,** whereas 73% of airport respondents report that they do (out of 48 responses).
- 62% of airport respondents publicly report on **both** the number of noise complaints and the number of complaint locations, including MSP.
- Out of 52 airport respondents, MSP is included in the 75% of which correlate noise complaints to flight tracks.
- 47% of airport noise offices respond to each noise complaint (out of 53 responses). While MSP does not respond to each noise complaint, airport staff commits to respond to complainants within three business days if the complainant requests a response.

Measure 4: Online flight track and noise monitoring system

- MSP is included in the 48% of airport respondents that provide flight track and noise monitoring data online (See Figure 10).
- Of 31 responses, 84% of airports display this data in an interactive application, including MSP.
- 91% of online airport Noise and Operations Management Systems (NOMS) applications show near real-time data (out of 32 responses). This includes MSP's internally-developed NOMS, known as MACNOMS.
- Airport respondents to this item (44 respondents) were evenly split on whether their online application has the

Figure 10 Percentage of respondents that provide flight track/noise monitoring data online

ability to accept complaints, with 50% responding "yes" and 50% responding "no".

- MSP is the only airport respondent reporting an internally-developed NOMS. A majority of respondents to this question (42 respondents) report utilizing Harris Corporation systems (48%) or EMS Bruel & Kjaer systems (43%).

- Figure 11 presents the percentage of airport respondent noise offices that use data from their operations and monitoring systems for each listed purpose. Respondents were able to check all uses that applied.

- Respondents report leveraging existing datasets to better engage and communicate with stakeholders through a variety of techniques. Examples include the use of Tableau software to create data visualizations and partnering with the National Aeronautics and Space Administration (NASA) Airspace Technology Demonstrations (ATD) project to allow for advanced reporting.

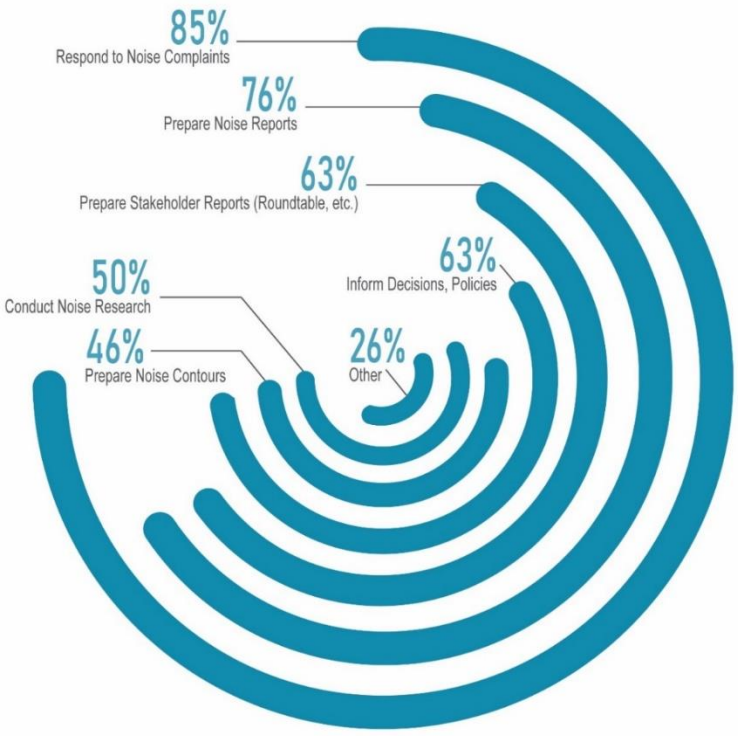

Figure 11 Percentage of respondent noise offices that use data from their operations and monitoring systems for each listed purpose

Measure 5: Pilot education program or noise sensitivity training

- 17% of airport respondents, including MSP, have a pilot education program or noise sensitivity training available but the majority do not (83%).

- No airport respondents report tracking the number of pilots that have completed noise education/training and therefore none reported a specific number of pilots whom have completed the program.

3.3 Noise Management Category 2: Stakeholder Engagement Measures

3.3.1 Measures and Results

Measure 6: Noise advisory committee/roundtable

- 54% of airport respondents report sponsoring a standing noise advisory committee or roundtable, including MSP.
- Figure 12 presents a graphical representation of the stakeholder groups that are represented on the formal advisory committees or roundtables of airport respondents, including community/neighborhood representatives, local/state/federal elected officials or their representatives, planning boards or councils, zoning agencies, FAA, airline representatives/airport users, professional associations, and aviation noise experts. 31 airports responded to this question, with 87% of respondents reporting that their noise committee includes community or neighborhood representatives and 77% reporting that their noise committees include elected officials or their representatives. Respondents were able to check all stakeholder groups represented on their advisory committees or roundtables.

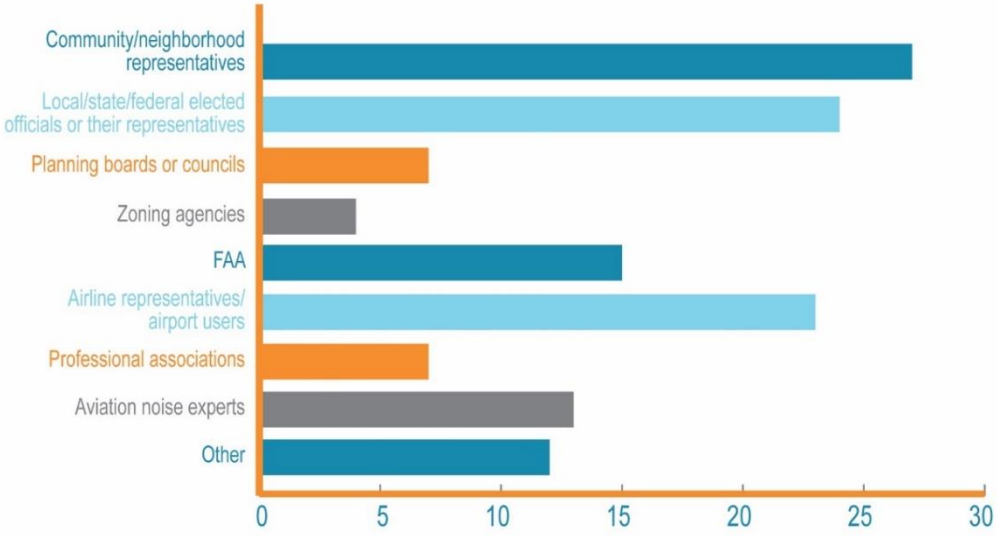

Figure 12 Count of airport respondents that report each stakeholder group represented on their advisory committees or roundtables

- Membership criteria for the standing noise committees varied greatly. Example responses include appointment by roundtable Executive Committees, elected officials, community leaders, and airport sponsors.
- 80% of airport respondents report that their standing noise committee does not have established/stated goals or inapplicability due to lack of a committee or roundtable. The MSP Noise Oversight Committee is one of the 20% of respondents whom report that they do have established/stated goals.
- Respondents who stated that they do have goals aligned more closely with creating and following defined work plans or mission statements. More specific goals listed by respondents

include: limiting and reducing the impact of aircraft noise related to the airport, increasing the community's understanding of aviation noise, and finding practical solutions and recommendations for the FAA to consider when determining aircraft operating procedures at the airport.

- Airport respondents that report existence of established/stated goals included a variety of goal metrics and methods for tracking, enforcing, and reporting on their goals.

Measure 7: Dedicated position for communicating with stakeholders concerning noise

- 63% of airport respondents report having a dedicated position for communicating with stakeholders concerning noise, including MSP.

Measure 8: Airport sponsorship of public meetings beyond formal committee/roundtable

- Half of airport respondents, including MSP, report sponsoring meetings, briefings, or listening sessions **external** to the formal noise advisory committee/roundtable to communicate with members of the community, elected officials, public representatives and/or other groups regarding noise.
- Figure 13 presents a summary of the additional groups that airport respondents meet with regularly (at least once annually). Respondents were able to check all groups that applied.
- Data related to the reported frequency of these meetings varies by respondent airport and responses are shown graphically in Figure 14.

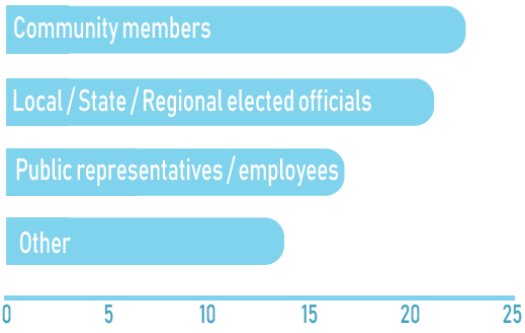

Figure 13 Number of airports that sponsor regular meetings with each external group

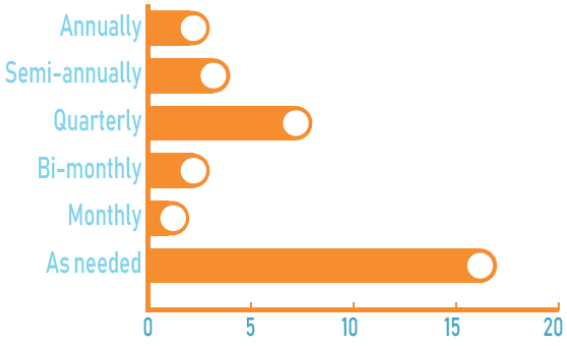

Figure 14 Number of respondents reporting regular external meetings at each frequency

Measure 9: Public noise website

- 76% of airport respondents report maintaining a public airport noise website, including MSP.
- Website traffic data was inconclusive as it was only provided by 3 airports including MSP.

Measure 10: Noise newsletter

- MSP is one of only 26% of respondent airports that distribute a printed or electronic noise newsletter.
- Only 5% of airports reported newsletter subscription data, one of which was MSP.

Measure 11: Mobile/temporary noise monitoring

- Only 35% of airport respondents report offering mobile/temporary noise monitoring for community members/neighborhoods by request. Of the airports that offer it, 63% are large hub (including MSP).
- 31% of airport respondents provided details concerning criteria required by the airport for community members/neighborhoods to obtain noise monitoring. Data concerning the number of mobile noise monitoring requests or activities completed in 2017 varied by respondent.

Measure 12: DNL noise contours

- Out of all respondents, 28% report developing and/or updating DNL noise contours in conjunction with airport development of construction projects. 24% report updating contours every 5 years. 11% report updating contours annually, including MSP. Figure 15 summarizes responses to this item.
- Of 43 respondents, 49% use **both** forecast and actual flight operations to create DNL contours. MSP uses actual flight operations for its Annual Contour Report and forecast and actual flight operations for long range planning efforts.

- Of 43 respondents, 65% report at DNL 65 dB and up. MSP is one of six airport respondents that report at DNL 60 dB and up. The number of airport respondents that report at each DNL level are included in Figure 16.

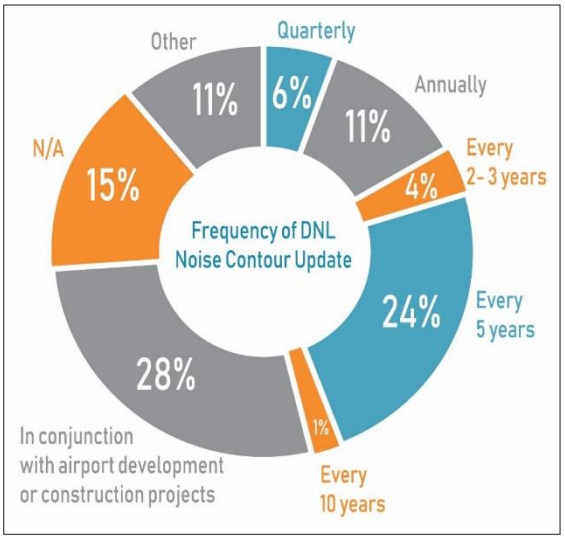

Figure 15 Percentage of respondents that update DNL contours at each frequency

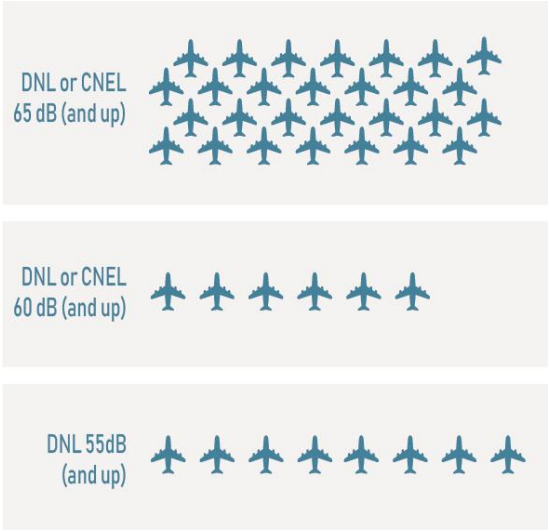

Figure 16 Number of airport respondents that report at each DNL level

Measure 13: Noise reporting

- 56% of airport respondents report that they publish reports pertaining to noise at the airport, while 44% responded that they do not publish any noise reports. Figure 17 includes the percentage of airport respondents' who produce annual, quarterly, or monthly reports. Respondents were able to choose all that applied.
- MSP is included in the 11% of airport respondents that provide the ability for users to create custom electronic/online noise reports based on user inputs.

Figure 17 Percentage of respondents that provide noise report at each frequency

Measure 14: Fly Quiet Program

- 39% of airport respondents report having a Fly Quiet Program. **MSP is included in the 61% of respondents that do not have a Fly Quiet Program.**
- Information concerning the components and/or metrics that individual airport respondents' Fly Quiet Programs track vary by respondent.
- Out of 18 airport respondents, 67% reported that their Fly Quiet Program has been successful in changing airline/airport user behavior.

3.4 Noise Management Category 3: Operational Measures

3.4.1 Measures and Results

Measure 15: Preferential runway use program

- 74% of airport respondents report that they have a preferential runway program in effect, including MSP. See Figure 18.

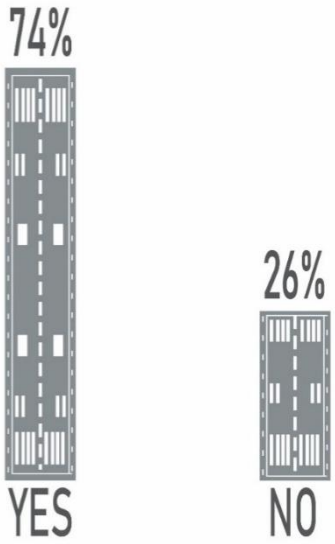

Figure 18 Percentage of airport respondents with a preferential runway program in effect

Measure 16: Noise Abatement Procedures (NAPs)

- 56% of airport respondents report that they have suggested/voluntary NAPs in place at their airport, while only 20% report that they have required NAPs. The remaining 24% of respondents report that they do not have NAPs. MSP reports that they have both suggested/voluntary and required NAPs in place.
- The number of NAPs that airport respondents have in place vary based on respondent.
- Of 43 airport respondents, 47% report tracking and reporting compliance with NAPs, including MSP. Information regarding how airport respondents track, report, and enforce compliance with NAPs varied by respondent.
- Only 2 out of 47 airport respondents report that they have instituted greater than 3-degree glide slopes purely for noise reduction purposes. **MSP has not instituted greater than 3-degree glide slopes for noise reduction purposes.**

Measure 17: Operational use restrictions

- Of all airport respondents, 52% reported that no operational use restrictions are in place at their airport, or the question was not applicable to their airport. 24% of respondents reported nighttime restrictions/curfews, 15% reported field rules or ground run-up rules, 9% reported quiet hours, 6% reported fines, 2% reported landing fees, and 13% reported other restrictions. Respondents were able to check all operational use restrictions that applied. This information is shown graphically in Figure 19. Note that out of these responses, all of the enforceable restrictions were in place prior to 1990 when Congress created a formal and extensive process for approving airport access restrictions. Refer to Section 1.2.2 for additional details.

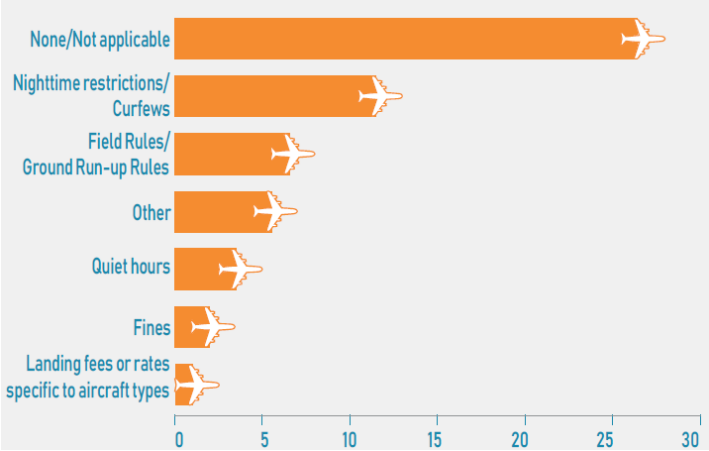

Figure 19 Number of respondents reporting the use of each operational use restriction

Measure 18: Ground noise mitigation measures

- Of all airport respondents, 44% reported that they do not utilize ground noise mitigation measures at their airport or the question was not applicable to their airport. 24% of respondents reported utilizing enclosures, 22% utilize barriers, 17% utilize restrictions/rules, 11% utilize designated run-up areas, and 7% utilize airport layout modifications. This information is shown graphically in Figure 20. Respondents were able to check all ground noise mitigation measures that applied at their airport.

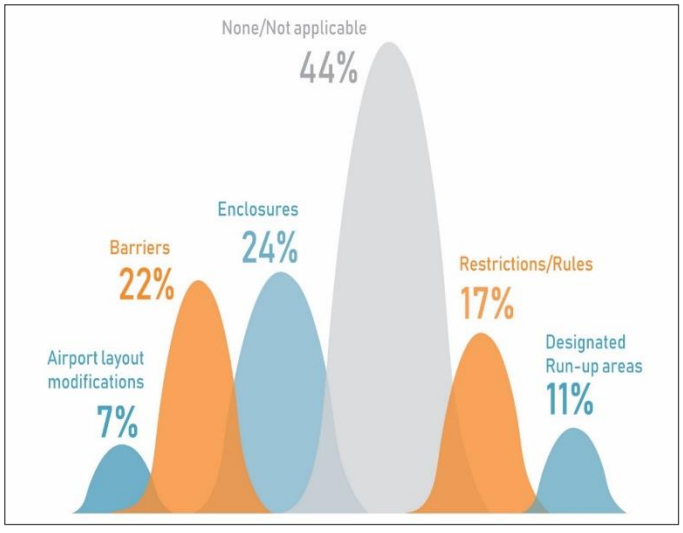

Figure 20 Percentage of respondents that report utilizing each ground noise mitigation measure

Measure 19: Airspace design for noise mitigation

- MSP is included in the 69% of airport respondents that report collaborating with FAA and/or other stakeholders to consider airspace design as a component of noise mitigation.
- 65% of airport respondents included descriptions concerning items considered during collaboration with these groups. Examples of collaboration topics include flight tracks designed to avoid noise sensitive areas and Performance Based Navigation (PBN) procedures.

3.5 Noise Management Category 4: Mitigation and Land Use Measures

3.5.1 Measures and Results

Measure 20: Sound insulation/Residential Noise Mitigation Program

- MSP is included in the 56% of airport respondents that report existence of a current or previously completed sound insulation or residential noise mitigation program. MSP was the only airport respondent to report providing sound insulation to residential homes outside the 65 DNL contour.
- The level of sound insulation provided, eligibility requirements and the number of parcel units/types mitigated through individual programs varied based on respondent.
- 24% of respondents included a total cost estimate for their respective programs, MSP reported the highest cost at $482,900,000. Figure 21 includes graphical representation of each cost estimate provided by airport respondents, excluding one valued at $126,500 which is not shown due to scale.

Figure 21 Cost estimates of current or historic sound insulation or residential noise mitigation reported by respondents

- Beyond the survey data, the NOC requested additional analysis comparing the reported cost of sound insulation/residential noise mitigation programs (for respondents that provided it) with publicly accessible population data. The NOC was interested in determining if a larger population surrounding an airport is correlated with higher program cost. Population data was mapped using Geographic Information Systems (GIS) software and obtained from the 2010 U.S. Census. Data was scrubbed of any airport identifiers. Results of the additional analysis do not show a strong correlation between program cost and population surrounding airports. For example, MSP reported the highest program cost but has the 7th largest population within a 1 mile radius of the airport, the 6th largest population within 3 miles of the airport, and the 3rd largest population within 5 miles of the airport.

Measure 21: Land/property acquisition and/or residential relocation program

- 33% of airport respondents report existence of a land/property acquisition or residential relocation program, including MSP.

- Limited data was reported concerning the parcel units/types acquired through individual airport programs, total land area purchased, and total cost of the individual programs.

Measure 22: Disposal of previously acquired noise land

- 28% of airport respondents have disposed of previously acquired noise land, including MSP.
- Limited data was provided by respondents concerning the volume of land area disposed of and the units of measurement.

Measure 23: Partnerships with local jurisdictions concerning noise mitigation and land use control

- 89% of airport respondents reported partnering with local jurisdictions concerning noise mitigation and land use control on at least one of the following:
  - Compatible/comprehensive land use plan;
  - Established airport noise overlay zones;
  - Cooperative land use agreements;
  - Revised building codes;
  - Avigation easements;
  - Noise disclosures for real estate transaction;
  - Transfer/purchase of development rights;
  - Airport informally advises surrounding jurisdictions on land use planning;
  - Other initiative.
- Only 11% of respondents answered that they did none of the above or that the question was not applicable.
- Figure 22 shows the number of respondents that report partnering on each item. Respondents were able to check all items that apply to their airport.

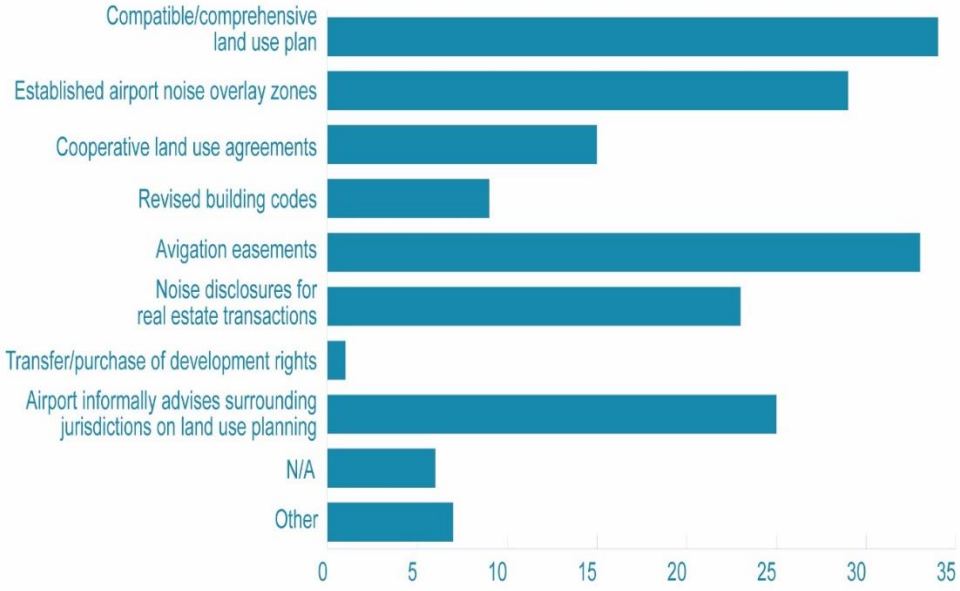

Figure 22 Number of respondents that report partnering with local jurisdictions concerning each noise mitigation/land use item

3.6 Noise Management Category 5: Policy and Research Measures

3.6.1 Measures and Results

Measure 24: 14 CFR Part 150 Study

- MSP is included in the 57% of respondents that report that their airport has completed a Part 150 study[19]. The first Part 150 study at MSP was submitted to FAA in October 1987 and updated in 1993. A 2001 Part 150 Update was withdrawn prior to FAA action due to the changes in aviation following September 11, 2001. In November 2004, the Part 150 study was updated with several land use measures around MSP and provisions for a number of operational noise abatement measures. The operational noise abatement measures contained in the 2004 Part 150 study were implemented; however, the land use measures, specifically MSP's residential sound insulation program, is prescribed by a court decree settling litigation and not the 2004 Part 150 study.

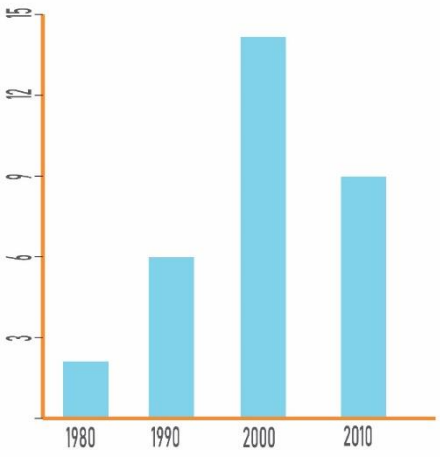

Figure 23 Number of respondents that reported their latest year of FAA Part 150 approval by decade

- 57% of airport respondents reported the latest year of FAA approval of their Part 150 study, and the years range from 1983 – 2016. See Figure 23 for graphical representation of the latest year of FAA Part 150 approval in each decade as reported by respondents.

Measure 25: Noise abatement plan

- Limited data was provided concerning noise abatement plans outside of the Part 150 process.

Measure 26: Noise Exposure Map (NEM) and Noise Compatibility Program (NCP)

- 72% of airport respondents report having an FAA-accepted Noise Exposure Map (NEM) and FAA-approved Noise Compatibility Program (NCP), including MSP[19].

[19] Note that these two items were separate questions on the survey and the data represents survey responses, refer to Appendix A for survey instrument text. The discrepancies between these ratios may be the result of an FAA-approved NEM outside of the Part 150 process for mitigation funding purposes or because the Part 150 study is currently ongoing but the NEM has been accepted.

Measure 27: Engagement with FAA concerning NextGen implementation/policy plans

- MSP is included in the 65% of airport respondents that report engaging with FAA regarding NextGen implementation and policy plans. The reported frequency of meetings varied by respondent.

Measure 28: Airport participation in national/local research concerning airport noise, aviation trade associations, etc.

- 80% of airport respondents, including MSP, report participation in at least one of the following, or some other noise related group: national research programs/studies (e.g., ACRP, ASCENT[20]) concerning airport noise, local research programs/studies concerning airport noise, or national aviation trade associations that conduct research on or advocate for noise issues (e.g., ACI, AAAE). Refer to Figure 24 for the percentage of respondents that participate in each of the listed categories. Respondents were able to check all categories that applied to their airport.

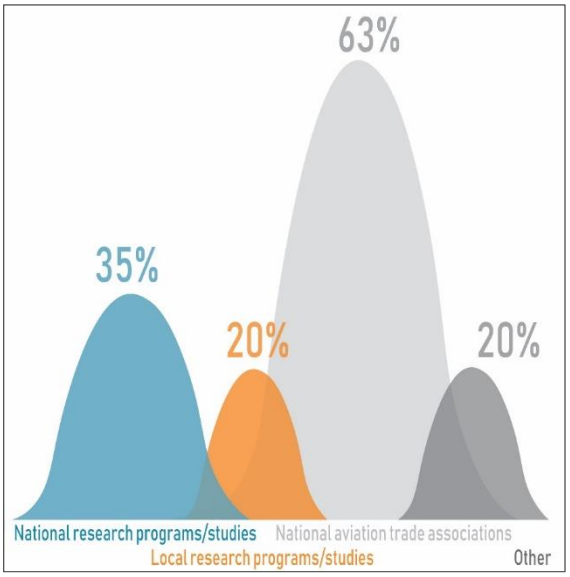

Figure 24 Percentage of respondents that participate in each of the listed categories

[20] FAA Center of Excellence for Alternative Jet Fuels and Environment, https://ascent.aero/.

4 Conclusion and Findings

4.1 Conclusion Overview

As described in Section 3, MSP performs well amongst airport respondents concerning many of the 28 measures included in the benchmarking study. The following sections include findings for each of the noise management categories as well as considerations of future decisions concerning noise mitigation efforts at MSP.

4.2 Program Management and Innovative Use of Technology Measures

As described in Section 3.2, MSP is among the 74% of airports with dedicated noise office; with five full-time equivalent staff members, MSP represents one of the largest noise groups out of surveyed airports in North America.

MSP has the most permanently installed noise monitors of all surveyed airports (39), while the average number of permanent noise monitors in place at respondent airports is 15. MSP's NOMS is accessible to the public, including a public portal that allows users to customize reports for a wide range of analyses. MSP has a public complaint portal, which also has customizable reporting capabilities. MSP reported the second highest number of overall complaints out of all airport respondents at 149,054. This is notable since MSP does not accept noise complaints from non-residential addresses/locations, whereas 73% of airport respondents report that they do. MSP might consider accepting noise complaints from non-residential addresses/locations. We note that this might also present additional challenges, since MSP reports the ability to respond to each noise complainant who requests it within three business days.

4.3 Stakeholder Engagement Measures

MSP utilizes a wide range of stakeholder engagement measures to respond to and communicate with its very engaged community, and compares favorably against respondent airports. Some examples are provided below:

- More than half of survey respondents indicate that they have a standing noise committee. The MSP Noise Oversight Committee (NOC) was established in August 2002 as an advisory board to bring industry and community representatives together to address aircraft noise issues associated with MSP. The NOC has an established charter and work plan, including goals, which is relatively uncommon (only 20% of respondents reported that their noise committee has established goals); and an extensive list of accomplishments, which are reported on the MSP website. The NOC meets six times per year (with additional special meetings as needed).

- Half of respondent airports report holding meetings, briefings, or listening sessions in addition to the formal noise advisory committee/roundtable. The MAC Noise Program Office sponsors quarterly "Listening Sessions" for residents to receive updates on the MSP Noise Oversight Committee (NOC) and its activities, to be briefed on MSP operational levels and procedures, and to have an opportunity to provide comments and voice concerns on aircraft noise issues.

- MSP is among the approximately three quarters of respondents with an airport noise website, and one of the 26% that distributes a printed or electronic newsletter. More than half of respondents report that they prepare some type of regular noise reports (i.e. quarterly, annual, monthly); MSP is one of these, and also allows users to create custom electronic reports.

- MSP has prepared a Noise Basics video series for interested stakeholders. A possible improvement to this measure would be to live stream NOC meetings, which several airports already do. This would allow community members who cannot attend meetings in person the opportunity to observe proceedings remotely.

One of the questions of greatest interest to the NOC is the level at which noise contours (and other data) are reported. About two thirds of survey respondents indicated that they report noise levels of DNL or CNEL 65 or 65 and up; MSP is one of six airport respondents that reports noise levels of DNL/CNEL 60 and above.

Thirty-nine percent of respondents indicated that they have a Fly Quiet Program to encourage pilots to adhere to noise abatement procedures; only two of these airports report that they have award programs. A majority of airports that provided data on this measure report that the Fly Quiet Program has been successful in changing pilot/user behavior. While MSP does not have a formal 'Fly Quiet Program', it does have an extensive pilot education program and noise abatement sensitivity training, and as described below, tracks compliance with noise abatement measures.

4.4 Operational Measures

MSP has a number of measures that have been developed to address noise from aircraft operations, including: a preferential runway use program, and 11 Noise Abatement Procedures (NAPs). MSP has both suggested/voluntary and required NAPs, and is among 47% of responding airports that track and report compliance with NAPs. MSP prepares monthly reports for the public and the FAA on operational measure compliance. The MAC might consider using real-time alerts to Air Traffic Control (ATC) for non-compliant flights to enhance awareness and compliance further.

MSP is among the more than two thirds of airports that report collaborating with FAA and/or other stakeholders to consider airspace design for noise abatement purposes. These include flight tracks to avoid noise-sensitive areas and Performance Based Navigation (PBN) procedures. Ongoing engagement and communication with the FAA's NextGen Office is recommended to track the agency's planning for RNAV departure implementation at MSP.

4.5 Mitigation and Land Use Measures

Fifty-six percent of airports reported that they have an active or completed sound insulation program. MSP is the only airport among all respondents to report providing sound insulation to residential homes outside the 65 DNL contour, and reported the highest cost at approximately $483M.

One third of respondents reported having a land/property acquisition program or residential relocation program, including MSP. Twenty-eight percent of respondents have disposed of previously acquired noise land, including MSP.

Eighty-nine percent of respondents, including MSP, reported partnering with local jurisdictions concerning noise mitigation and land use control, using a wide range of measures.

4.6 Policy and Research Measures

Seventy-two percent of respondents, including MSP, report having an FAA-accepted Noise Exposure Map and FAA-approved Noise Compatibility Program under FAR Part 150.

More than three quarters of respondents indicate that they participate in at least one national or local airport noise research group (e.g., Airport Cooperative Research Program or ASCENT) or national

aviation trade association (e.g., ACI-NA or AAAE). MSP staff are active in both trade associations, in particular their respective environment committees and noise working groups. The trade associations provide the opportunity to share best practices amongst airport peers, and one recommendation is for MSP staff to consider taking a leadership role within these groups.

Appendix A – Survey Instrument

1. Introduction

The Metropolitan Airport Commission (MAC) is a public corporation that operates the Twin Cities metropolitan airport system, including Minneapolis-St. Paul International Airport (MSP) and six general aviation airports. MAC is conducting a benchmarking study* to identify best practices in airport noise management in North America. A component of the benchmarking study is this survey, which is being disseminated to peer airports across North America.

The survey is intended to collect information about noise program components and related noise program activities. Survey questions fall into the following categories of airport noise management: program management/innovative use of technology measures, stakeholder engagement measures, operational measures, mitigation and land use measures, and research/policy measures. All required questions are marked with an asterisks. Individual airport responses will be aggregated to maintain confidentiality and contribute to a final benchmarking report. The research team will not share individual airport responses.

Once complete, the study will provide an independent and transparent review of current best practices in the industry. Results will also provide valuable data for airports to identify improvement opportunities, and assess their progress compared to peer airports. Ultimately, results are intended to provide an overview of the collective progress of airport noise management programs in the face of increasing community concern over airport noise in 2018. In exchange for participating in the survey, MAC will share final research results in report format with all survey respondents.

***Note: Harris Miller Miller & Hanson, Inc. (HMMH) has been retained by the MAC as an independent research consultant responsible for collecting survey responses and compiling a final report based on survey results. The HMMH research team will only contact survey respondents in the event that they require clarification concerning survey responses.**

2. Required Airport Information

* 1. Airport Code

* 2. Respondent information

Name	
Job Title	
Email Address	
Phone Number	

* 3. May the research team contact you with questions concerning the survey?

- ◯ Yes
- ◯ No

3. Program Management and Innovative Use of Technology Measures

* 1. Does your airport have an established Noise Office?

- ◯ Yes
- ◯ No

2. If yes, specify the year that the Noise Office was established:

3. How many full-time employees work in the airport Noise Office?

* 4. Does your airport have a permanent noise monitoring system in place?

- ◯ Yes
- ◯ No

5. If yes, specify the number of permanently-installed monitoring towers:

6. Specify how monitor tower maintenance is handled:

- ◯ Internally
- ◯ Externally
- ◯ Not applicable
- ◯ Other (please specify)

* 7. Does your airport have an online complaint portal?

- ◯ Yes
- ◯ No

8. If yes, please specify the number of complaints received in 2017 through the portal (or any available year):

Number:

Year:

* 9. Does your airport have a telephone complaint/information hotline available?

- ◯ Yes
- ◯ No

10. If yes, please specify the number of complaints received in 2017 through the hotline (or any available year):

Number:

Year:

11. Does your airport take noise complaints from non-residential addresses/locations?

- ◯ Yes
- ◯ No

12. Please specify which of the following your airport publicly reports:

- ◯ Number of noise complaints
- ◯ Number of complaint locations
- ◯ Neither
- ◯ Both

13. Does your airport correlate noise complaints to flight tracks?

- ◯ Yes
- ◯ No

14. Does your airport noise office respond to each noise complaint?

- ◯ Yes
- ◯ No

* 15. Does your airport provide flight track and noise monitoring system data online?

- ◯ Yes
- ◯ No

16. If yes, is the data displayed in an interactive application?

- ◯ Yes
- ◯ No

17. If applicable, what type of flight track information does your airport's online NOMS application show?

- ◯ Real-time
- ◯ Near real-time
- ◯ Not applicable
- ◯ Other (please specify)

18. Does your airport allow complaints to be entered through the online flight track application?

- ◯ No
- ◯ Yes (please explain)

19. Which NOMS vendor do you use?

* 20. How does your noise office use data from your operations and monitoring system or other data sets? Check all that apply.

- [ ] Respond to noise complaints
- [ ] Prepare noise reports
- [ ] Prepare stakeholder reports (Roundtable, etc.)
- [ ] Inform decisions/policies
- [ ] Prepare noise contours
- [ ] Conduct noise research
- [ ] Other (please specify)

21. Does your office collect data outside of a NOMS system that you feel is critical to your success? If so, what and why?

* 22. Explain how you apply creative strategies and/or perform analyses to leverage existing data sets to: inform decision makers, engage stakeholders, and/or improve reporting. Please include any innovative/customized tools developed and/or used by the airport noise office to allow for increased responsiveness.

* 23. Does your airport have a pilot education program or noise sensitivity training available for pilots?

- ◯ Yes
- ◯ No

24. Does the airport track the number of pilots that have completed noise education/training program?

- ◯ Yes
- ◯ No

25. If yes, specify the total number of pilots that have attended the training program:

4. Stakeholder Engagement Measures

* 1. Does your airport have a standing noise advisory committee or roundtable?

- ◯ Yes
- ◯ No

2. If yes, please identify all stakeholders that are represented on the committee/roundtable:

- ☐ Community/neighborhood representatives
- ☐ Local/state/federal elected officials or their representatives
- ☐ Planning boards or councils
- ☐ Zoning agencies
- ☐ FAA
- ☐ Airline representatives/ airport users
- ☐ Professional associations
- ☐ Aviation noise experts
- ☐ Other (please specify)

3. Explain how committee/roundtable membership is determined (if applicable):

* 4. Does your airport standing noise advisory committee or roundtable have established/stated goals?

- ◯ Yes
- ◯ No
- ◯ Not applicable/no standing noise advisory committee/roundtable

5. If yes, specify goal content and how goals are tracked, enforced, and reported:

* 6. Does your airport have a dedicated position responsible for communicating with stakeholders concerning the airport's noise management activities/program?

- ◯ Yes
- ◯ No

* 7. Does your airport sponsor public meetings, briefings, or listening sessions (external to the formal noise advisory committee or roundtable) to communicate with members of the community, elected officials, public representatives and/or other groups in a formal setting?

- ◯ Yes
- ◯ No

8. If yes, identify the groups that you meet with regularly (at least once annually):

- ☐ Community members
- ☐ Local/State/Regional elected officials
- ☐ Public representatives/employees
- ☐ Other (please specify)

9. Please specify the frequency of the meetings (e.g. Monthly/Quarterly/Annually or varies as needed):

* 10. Does your airport maintain a public airport noise website?

- ◯ Yes
- ◯ No

11. Please specify airport noise website URL (if applicable):

12. Please include any data concerning website traffic in 2017 or any available year, if possible:

* 13. Does your airport distribute a printed or electronic noise newsletter for interested community members?

- ◯ Yes
- ◯ No

14. If yes, please indicate the number of newsletter subscribers, if available.

* 15. Does your airport offer mobile/temporary noise monitoring for community members/neighborhoods who request it?

- ◯ Yes
- ◯ No

16. If yes, please specify any criteria required to obtain noise monitoring:

17. Please indicate the number of mobile noise monitoring requests or the number of noise monitoring activities completed in 2017 (or any available year).

Number

Year

* 18. How often does your airport develop and/or update DNL noise contours?

- ◯ Not applicable
- ◯ Annually
- ◯ Every 5 years
- ◯ In conjunction with airport development or construction projects
- ◯ Other (please specify)

19. Are DNL contours based on forecast or actual flight operations?

20. What DNL level is reported (i.e. DNL 65 dB and up, or lower levels such as 55 or 60 DNL)?

* 21. Does your airport publish annual, quarterly, or monthly reports pertaining to noise at the airport? Check all that apply:

- [ ] No
- [ ] Annual
- [ ] Quarterly
- [ ] Monthly
- [ ] Other (please specify)

* 22. Does your airport provide the public the ability to create custom electronic/online noise reports (i.e. complaint, operations, sound monitoring reports) based on user inputs (i.e. customized for date range or location)?

- ◯ Yes
- ◯ No

* 23. Does your airport have a Fly Quiet Program?

- ◯ Yes
- ◯ No

24. If yes, include any information concerning the components and/or metrics that the Fly Quiet program tracks:

25. Has the Fly Quiet program been successful in changing airline/airport user behaviors?

- ☐ Yes
- ☐ No
- ☐ Explain:

5. Operational Measures

* 1. Does your airport have a preferential runway use program in effect?

- ◯ Yes
- ◯ No

* 2. Are there any Noise Abatement Procedures (NAPs) in place at your airport?

- ☐ Yes, required
- ☐ Yes, suggested/voluntary
- ☐ No

3. If applicable, please specify the number of NAPs:

4. Does your airport track and report compliance with NAPs?

- ◯ Yes
- ◯ No

5. Please specify how NAP compliance is tracked and reported:

6. Please specify how NAP compliance is enforced:

7. Has the airport instituted greater than 3-degree glide slopes purely for noise reduction purposes?

- ◯ Yes
- ◯ No

* 8. Please specify all of the operational use restrictions that are in place at your airport:

- [ ] Nighttime restrictions/Curfews
- [ ] Quiet hours
- [ ] Landing fees or rates specific to aircraft types
- [ ] Field Rules
- [ ] Fines
- [ ] None/Not applicable
- [ ] Other (please specify)

* 9. Please specify all of the ground noise mitigation measures utilized at your airport:

- [ ] Airport layout modifications
- [ ] Barriers
- [ ] Enclosures
- [ ] None/Not applicable
- [ ] Other (please specify)

* 10. Has your airport collaborated with the FAA and/or other stakeholders to consider airspace design as a component of noise mitigation?

- ◯ Yes
- ◯ No

11. If yes, please describe what was considered, for example, flight tracks designed to avoid noise sensitive areas, Performance Based Navigation (PBN), etc.

6. Mitigation and Land Use Measure

* 1. Does your airport have a sound insulation or residential noise mitigation program in place or completed in the past?

- ◯ Yes
- ◯ No

2. If yes, what level of sound insulation was provided?

3. How was eligibility determined?

4. If applicable, specify how many of each of the following parcel units/types have been mitigated through the program:

Single-family homes	
Multi-family units	
Schools, places of worship, and/or other public use buildings	

5. If the total cost of the program has been quantified, please provide a cost estimate:

* 6. Does your airport have a program for land/property acquisition and/or residential relocation?

- ◯ Yes
- ◯ No

7. If yes, specify how many of each of the following parcel units/types have been acquired through the program:

Single-family homes	
Multi-family units	
Schools, places of worship, and/or other public use buildings	

8. Has the total land area purchased been quantified? If so, please provide the amount of land acquired and specify unit of measurement (i.e. acres, square miles, square kilometers, etc.)

9. If the total cost of the program or value of acquired properties been quantified, please provide a total cost/value estimate:

* 10. Has your airport disposed of previously acquired noise land?

- ◯ Yes
- ◯ No
- ◯ Not applicable

11. If yes, please provide the land area disposed of and units of measurement (i.e. acres, square miles, etc.) and rationale for disposal:

* 12. Please specify how your airport partners with local jurisdictions concerning noise mitigation and land use control. Check all that apply:

- [ ] Compatible/comprehensive land use plan
- [ ] Established airport noise overlay zones
- [ ] Cooperative land use agreements
- [ ] Revised building co¬des
- [ ] Avigation easements
- [ ] Noise disclosures for real estate transactions
- [ ] Transfer/purchase of development rights
- [ ] Airport informally advises surrounding jurisdictions on land use planning
- [ ] None/ Not applicable
- [ ] Other (please specify)

7. Policy and Research Measures

* 1. Has your airport completed a 14 CFR Part 150, Airport Noise Compatibility Planning (Part 150) study?

- ◯ Yes
- ◯ No

2. If yes, please indicate the latest year of FAA approval:

3. If no, does the airport have a noise abatement plan that is outside the Part 150 process? Please describe

* 4. Does your airport have an FAA-accepted Noise Exposure Map (NEM) and FAA-approved Noise Compatibility Program (NCP)?

- ◯ Yes
- ◯ No

5. Please indicate year of FAA Acceptance of NEM:

6. Please indicate year of FAA Approval of NCP:

* 7. Does your airport engage with FAA regarding NextGen implementation and policy plans?

- ☐ Yes
- ☐ No
- ☐ Specify frequency of meetings:

* 8. Please identify if your airport participates in any of the following:

- [ ] National research programs/studies (e.g., ACRP, ASCENT) concerning airport noise
- [ ] Local research programs/studies concerning airport noise
- [ ] National aviation trade associations that conduct research on or advocate for noise issues (e.g., ACI, AAAE)
- [ ] Other: Please Specify. Also, provide details for all selected options.

8.

Thank you for your participation! We are grateful for your time.