Aircraft Noise

Background

Aircraft noise is commonly defined as unwanted sound resulting from aircraft operations. Aircraft noise is considered to be one of the most harmful environmental impacts from aviation and can disrupt sleep, cause community annoyance and increase the risk of cardiovascular disease for people living near an airport.[1] As aircraft operations increase, and airport expansion occurs aircraft noise is often the main contributing factor of a negative community reaction to the operation and expansion of airports.[2]

Aircraft noise impacts to the Twin Cities Metropolitan Area began as a result of military jet-fighter training operations originating from the Fort Snelling air base during the Korean Conflict. Aircraft noise has continued to be an issue at MSP with the inception of passenger jet airline service in 1961.[3]

The rapid increase in passenger jet airline service since 1961 resulting in increased aircraft noise impacts on communities led congress to implement the Aviation Safety and Noise Abatement Act of 1979.[4] This bill directed the secretary of transportation to establish a single system of measuring noise and the resulting impacts on individuals.[5] The purpose of these measurements was to measure noise at and around airports with the goal of establishing land uses which are compatible with the associated noise levels. This bill also authorizes the secretary of transportation to make grants to qualified airports for noise compatibility planning.[5] In addition, the bill directed the secretary to commence rulemaking to require all air carriers, both domestic and foreign, to comply with noise standards.[5]

As a result of the Aviation Safety and Noise Abatement Act of 1979, the FAA implemented the Noise Control and Compatibility Planning for Airports Advisory Circular (AC) AC 150/5020-1 on August 5, 1983.[6] The purpose of this AC is to provide guidance for Noise Control and Compatibility Planning for airports under Federal Aviation Regulation (FAR) Part 150 and the Aviation Safety and Noise Abatement Act of 1979. This AC establishes a single system for the measurement of airport noise, a single system for determining the exposure of individuals to airport noise, and a standardized airport noise compatibility planning program. The overall goal of the planning program is for the airport sponsor, in consultation with state/local planners, local aviation groups and interested citizens, to develop a balanced and cost-effective program to minimize and/or mitigate the airports noise impact on local communities.[7]

AC 150/5020-1, published in 1983, is the current published FAA guidance on noise control and compatibility planning for airports. However, the FAA has recently released a draft update AC 150/5020-1A with the comment period end date of March 11, 2022. The draft AC provides updated information on preparing Noise Exposure Maps (NEMs) and Noise Compatibility Programs (NCPs). NEMs and NCPs are the two core components of the Part 150 study.[7] The

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[1] Basner M, Clark C, Hansell A, et al. Aviation Noise Impacts: State of the Science. Noise Health. 2017;19(87):41-50. doi:10.4103/nah.NAH_104_16
[2] ICAO Aircraft Noise *ICAO.* Retrieved July 20, 2024
[3] Metropolitan Council Builders Guide 2006 *Metropolitan Council.* Retrieved July 10, 2024
[4] FAA History of Noise *Federal Aviation Administration*. Retrieved July 18, 2024
[5] "H.R. 2440 — 96th Congress: Aviation Safety and Noise Abatement Act of 1979." www.GovTrack.us. 1979. July 18, 2024 <https://www.govtrack.us/congress/bills/96/hr2440>
[6] FAA AC 150/5020-1 *Federal Aviation Administration*. Retrieved July 10, 2024
[7] FAA AC 150/5020-1A *Federal Aviation Administration*. Retrieved July 10, 2024

NEM's are used by the FAA and the airport sponsor to identify incompatible land uses and noise impacts to communities. Based on the NEM analysis, NCPs are developed to identify solutions that will mitigate the incompatible land uses and noise impacts from aircraft.[8]

NEMs used in the Part 150 study are developed from the FAA's DNL metric. The DNL metric is used to identify the cumulative exposure to sound over a 24-hour period. DNL uses the total amount of noise from an individual aircraft operation along with the number of operations. Nighttime flights between 10 p.m. and 7 a.m. are given an additional 10dB weighting.[4]

The FAA has recently initiated a review of the Civil Aviation Noise Policy and is currently reviewing comments received. Some areas of review and potential update to this policy include the following:

- FAA is investigating the use of Day-Night Average Sound Level (DNL) as the sole metric for determining the cumulative aircraft noise exposure over a 24-hour period. Possibility of additional metrics combined with DNL or the replacement of DNL with another metric to better identify the cumulative noise exposure.[8]
- FAA is reviewing the previous research to more accurately identify the economic and health impacts resulting from exposure to aviation noise.[6]
- FAA is reviewing the 65 DNL threshold to determine if it is an appropriate significant noise exposure level.[6]
- FAA is reviewing the classification of land uses that would be considered "normally compatible" for a given level of aircraft noise exposure.[6]

Regional Efforts to Mitigate Noise Impacts

Following federal rules, both the Metropolitan Airports Commission (MAC) and the Met Council have instituted programs and policies to mitigate ongoing and future noise impacts for residents. In 1992 the MAC established the MSP Airport Noise Mitigation Program and implemented a computerized aircraft noise and flight tracking system that is used to collect and analyze data related to flights and noise in the Twin Cities Metropolitan Area.[9] The MACNOMS (MAC Noise and Operations Monitoring System) macnoms.com allows users to view live and historic flight data as well as file noise complaints. This system allows MAC staff to easily create and analyze operations and noise complaints over a specific time period for any of the airports within the MAC system.

Based on the noise control and compatibility planning guidelines provided in AC 150/5020-1 along with the metrics outlined in FAR Part 150 airport noise compatibility planning the Metropolitan Council has developed a Builders Guide for Mitigating Aircraft Noise in New Residential Construction, March 2006.[3]

The Builders Guide provides users with the information needed to comply with the land-use compatibility guidelines for aircraft noise. Both preventive and corrective noise mitigation recommendations are provided to achieve land-use compatibility. Preventive measures are applied through land-use control and zoning for new development and corrective measures are applied through redevelopment and sound insulation practices for sensitive land uses.[3] The guide separates development into two groups, new development or major redevelopment and

[8] Request for Comments on the Federal Aviation Administration's Review of the Civil Aviation Noise Policy, Notice of Public Meeting *Federal Register.* Retrieved on September 10, 2024
[9] MACNOMS *Metropolitan Airports Commission.* Retrieved July 10, 2024

infill – reconstruction or additions to existing structures and provides different compatibility recommendations for each.

Noise zones are identified based on the noise contours developed from the FAR Part 150 noise program through the development of the NEM and approved by FAA. Using the type of development, noise exposure zone and identified land use category the builders guide provides land use/noise compatibility recommendations outlined below:

- Compatible (COMP) – Uses that are acoustically acceptable for both indoor and outdoor activities.[3]
- Provisional (PROV) – Uses that should be discouraged if at all feasible; if allowed, must meet certain structural performance standards to be acceptable according to MS473.192 (Metropolitan Area Aircraft Noise Attenuation Act).[3]
- Conditional (COND) – Uses that should be strongly discouraged; if allowed, must meet structural performance standards, and requires a comprehensive plan amendment.[3]
- Incompatible (INCO) – Land uses that are not acceptable even if acoustical treatment were incorporated in the structure and outside uses restricted.[3]

After identifying the land use compatibility for a desired area, the builders guide provides specific noise reduction requirements to accommodate the development type, land use, and noise exposure zone. The builders guide also provides recommended construction practices and techniques to be used in noise level reduction. The guide also provides sample scenario calculation examples as well as a model noise attenuation ordinance for implementation at the reliever airports.[3]

The Builder's Guide was last updated in 2006, based on the FAA's 1983 AC 150/5020-1 guidance. With technological advancements in both construction materials as well as sound monitoring a Builders Guide refresh is warranted.

As noted previously, the FAA is currently in the process of reviewing the Civil Aviation Noise Policy with updates expected. As potential updates to this policy would impact the Part 150 requirements as well as the AC 150/5020-1 guidance it is recommended that any Builders Guide updates be completed after the completion of the review and or update of the Civil Aviation Noise Policy. The FAA is also in the process of updating the Noise Control and Compatibility Planning for Airports (150/5020-1) AC. As this AC provides the guidance for Noise Control and Compatibility Planning under Part 150 and the Aviation Safety and Noise Abatement Act of 1979, it is also recommended that any updates to the Builders Guide and land use compatibility planning be completed after the forthcoming publication of the updated AC 150/5200-1A.

Improvements in Reducing Noise Impacts

The FAA has worked to reduce the number of people exposed to significant aircraft noise levels and has been able to reduce the number of people impacted by approximately 90 percent from 1975 to 2000.[10] Between 1975 and 2022 the number of annual enplanements has increased rapidly from 200 million to over 850 million.[4] During this same time period the number of people

[10] Aircraft Noise *Federal Aviation Administration.* Retrieved July 10, 2024

exposed to significant aviation noise in the U.S. has decreased from approximately 7 million to 400,000.[4]

The largest driver of the decrease in aviation noise exposure is a result of the transition to quieter aircraft.[4] Additional reductions are attributed to the transition of airline fleets to utilize newer aircraft producing less noise.[10] Typically, regional jets are louder as they utilize older jet engines that lack newer designs to reduce noise generation found on many of the newer narrow-body and wide-body jet fleets. The fleet transition at MSP has been evident in recent years. In 2018, the carrier jet fleet mix indicated 40% regional aircraft, 57% narrow-body aircraft and 3% wide-body aircraft. By the end of 2023, the MSP carrier jet fleet mix indicated 25% regional aircraft, 71% narrow-body aircraft and 4% wide-body aircraft.[9] During the same time period MSP noise complaints have decreased from 139,524 in 2018 to 117,922 in 2023.[9]

The FAA has identified 4 stages of civil jet aircraft based on the aircraft noise produced. Stage 1 aircraft have been categorized as the loudest aircraft with Stage 4 aircraft being the quietest.[11] The FAA published a final rule in the federal register for prohibiting the operation of aircraft weighing less than 75,000 pounds within the contiguous United States that are not stage 3 noise compliant.[11] Hush kits may be retrofitted on older non stage 3 compliant aircraft to reduce noise levels and achieve compliance.[11] Compliance with this rule was required after December 31, 2015.

The FAA has also developed updated Instrument Flight Procedures (IFP) to minimize aircraft noise impacts to communities surrounding airports. IFP's are used to provide published routes for arriving and departing aircraft. IFP's provide directional heading and specific altitude requirements. These procedures allow for improved safety through aircraft separation and predictable flight patterns and provide navigational guidance in inclement weather or reduced visibility conditions. The procedure development also provides flight dispersion from departing aircraft to minimize the noise impacts to surrounding communities. By fanning or dispersing the paths of departing aircraft, noise impacts will be spread throughout the region as opposed to one single path that would concentrate noise impacts to a specific area. The fanning or dispersing of flights to distribute noise across the region has been applied in the recent development of the updated MSP Area Navigation (RNAV) departure procedures.

The current trend in the commercial aviation industry sees carriers upgauging or operating fewer flights with larger aircraft to accommodate the passenger load. The upgauging has led to fewer total flight operations from newer aircraft that produce less noise while moving more passengers than ever. Airlines have also been retiring the older louder aircraft from the operational fleets, as seen with the recent retirement of the Delta CRJ fleet that had been operational from MSP.

Conclusion

Noise is a significant contributing factor in achieving the goals established to meet the Metropolitan Councils vision for 2050. The goals and associated noise factors are detailed below:

1. **Region is Equitable and Inclusive** – Through the development of noise policies and land use planning it is vital to minimize noise across the region and work toward ensuring noise impacts are not disproportionate to any one specific community. Flight

[11] Aircraft Noise Levels & Stages *Federal Aviation Administration.* Retrieved July 10, 2024

dispersion or fanning of departing aircraft distribute noise impacts across the community and reduce the impacts to a single path.

2. **Communities are Healthy and Safe** – Aircraft noise is considered to be one of the most harmful environmental impacts from the aviation industry.[12] Any policies or actions to mitigate aircraft noise will directly contribute to the increased health and safety of communities throughout the region.
3. **Region is Dynamic and Resilient** – As impacts from aircraft noise change continually over time with new technology and changing flight paths, it is important to identify these changes and update noise related policies and plans accordingly. Improved building standards and construction materials used to mitigate aircraft noise provide resiliency to the adverse effects resulting from aircraft noise.
4. **Lead on Addressing Climate Change** – The aircraft industry is continually striving to develop and implement newer and quieter aircraft. As the industry continues to develop new technologies the aircraft being developed are quieter and more fuel efficient, leading to reduced carbon emissions. Policies developed should encourage the implementation of newer more efficient aircraft.
5. **Protect and Restore Natural Systems** – As noise impacts have decreased over the past decades through FAA noise regulation along with local land use planning and noise mitigation efforts, impacts to natural systems have also decreased with reduced noise. Policies and actions that encourage reduced noise should be evaluated with the goal of protecting and restoring the natural systems throughout the region.

The Metropolitan Council will continue to monitor aviation noise trends, policies and regulations in relation to achieving the goals established to meet the Metropolitan Councils vision for 2050.

[12] Basner M, Clark C, Hansell A, et al. Aviation Noise Impacts: State of the Science. Noise Health. 2017;19(87):41-50. doi:10.4103/nah.NAH_104_16