CHAPTER 4
NOISE MODELING

4.1 INTEGRATED NOISE MODEL

The standard methodology for analyzing the noise conditions at airports involves the use of an aircraft noise model. The FAA has approved, and requires, the INM for use in FAR Part 150 Noise and Land Use Compatibility Studies. The INM was developed by the Transportation Systems Center of the United States Department of Transportation (USDOT) and is undergoing continuous refinement. Version 7.0 of the INM, the most current version of the model, was used for the noise analysis described in this report.

4.2 METHODOLOGY

The INM works by defining a network of grid points at ground level around an airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure generated by each aircraft operation, by aircraft type and engine thrust level along each flight track. Corrections are applied for atmospheric acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (e.g., 65, 70 and 75 DNL). Using the results of the grid point analysis, noise contours of equal noise exposure can then be plotted.

4.3 INM INPUT DATA

In order to develop DNL noise contours, the INM uses a series of input factors. Some of these factors are included in the INM's database (such as engine noise levels, thrust settings, aircraft profiles, and aircraft speeds) and others are airport-specific and need to be determined for each condition analyzed. These airport-specific data include the airport elevation, average annual temperature, runway layout, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types at specific takeoff weights to individual flight tracks. Other INM input factors specific to OSUA include:

- Runway orientation and use
- Existing 2007 aircraft operations and fleet mix
- Future 2012 aircraft operations and fleet mix
- Future 2027 aircraft operations and fleet mix
- Time of day/night operations

Only the existing and future year (2012) scenarios are required to be analyzed under FAR Part 150. The analysis of aircraft operations and fleet mix for the future year scenario 2027 is not a requirement of FAR Part 150. This future year scenario was added to the scope of this Study at the request of the University to depict the aircraft noise exposure from forecast aircraft operations well into the future for land use planning purposes.

The factors listed above were developed for all activity at OSUA including itinerant aircraft, training aircraft, helicopters, and military aircraft. The specific operational input data for OSUA is included in the next chapter of this report.

4.4 NOISE POWER DISTANCE CURVE DATA

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a database containing tables correlating noise level, thrust settings, and distance for most of the civilian aircraft, and many common military aircraft, operating in the United States. This database, often referred to as the noise power distance curve data, has been developed under FAA guidance based on thousands of actual noise measurements in controlled settings for each aircraft type.

The database also includes performance data for each aircraft type. This data allows the model to compute airport-specific flight profiles (rates of climb and descent) for each aircraft type, providing an accurate representation of actual procedures.

It should be noted that guidelines under FAR Part 150 require that the annual-average DNL contours be computed. Consequently, the data presented in this document will reflect annual-average conditions.

4.5 NOISE CONTOUR MAPPING

The DNL is indicated by a series of contour lines superimposed on a map of the airport and off-airport environs. These levels are calculated for designated grid points on the ground from the weighted summation of the effects of all aircraft operations occurring on the average 24-hour day. Some operations are far enough away from a grid point location that their effect is minimal, while other operations may dominate noise exposure at that location.

The summation of noise levels was discussed in Chapter 3 of this report. One can think of the accumulation of noise energy throughout a 24-hour day from passing aircraft in the DNL computation like a series of passing rain squall lines. The important aspect to remember here is that at the end of a 24-hour period, a rain gauge would indicate the total rainfall received during that day, even though the rain only fell during brief periods. During the course of this study, DNL contour mapping was used as a tool to assist in the consideration of land use planning around OSUA. DNL contours were used to:

- Highlight an existing or potential aircraft noise problem area that requires attenuation,
- Assess relative exposure levels of various operational conditions and noise abatement considerations,
- Assist in the preparation of airport environs land use plans, and
- Provide guidance in the development of land use control measures in high noise areas.