GEORGETOWN MUNICIPAL AIRPORT

Chapter Three
AVIATION NOISE

Aviation Noise

This chapter describes the noise exposure maps for Georgetown Municipal Airport (GTU). Noise contour maps are presented for two study years: 2003 and 2008. The 2003 noise contour map shows the current noise levels based on estimated operations described in Chapter Two. The 2008 map is based on forecast operation levels from the forecast outlined in Chapter Two. The 2003 and 2008 maps are the basis for the official "Noise Exposure Maps" required under Federal Aviation Regulation (F.A.R.) Part 150.

These noise contour maps are considered baseline analyses. They assume operations based on the existing procedures at Georgetown Municipal Airport. No additional noise abatement procedures have been assumed in these analyses. The noise contour maps will serve as baselines against which potential noise abatement procedures will be compared at a later point in the study.

The noise analysis presented in this chapter relies on complex analytical methods and uses numerous technical terms. A Technical Information Paper (T.I.P.) included in the last section of this document, ***The Measurement and Analysis of Sound***, presents helpful background information on noise measurement and analysis.

AIRCRAFT NOISE MEASUREMENT PROGRAM

A noise measurement program was conducted over a five-day period from April 2, 2001 through April 7, 2001. The field measurement program was designed

and undertaken to provide real data for comparisons with the computer-predicted values. These comparisons provide insight into the actual noise conditions around the airport and can serve as a guide for evaluating the assumptions developed for the computer modeling. It should be noted that noise measurements are not required under F.A.R. Part 150 nor can measurements be used to calibrate the Integrated Noise Model (INM).

It must be recognized that field measurements made over a 24-hour period are applicable only to that period of time and may not -- in fact, in many cases, do not -- reflect the average conditions present at the site over a much longer period of time. The relationship between field measurements and computer-generated noise exposure forecasts is analogous to the relationship between weather and climate. While an area may be characterized as having a cool climate, many individual days of high temperatures may occur. In other words, the modeling process derives overall average annual conditions (climate), while field measurements reflect daily fluctuations (weather).

Information collected during the noise monitoring program included 24-hour measurements for comparison with computer-generated DNL values. DNL -- day-night sound level -- is a measure of cumulative sound energy during a 24-hour period. In addition, all noise occurring from 10:00 p.m. to 7:00 a.m. is assigned a 10 decibel (dB) penalty because of the greater annoyance typically caused by nighttime noise. Use of the DNL noise metric in airport noise compatibility studies is required by F.A.R. Part 150. Additional information collected on single event measurements is used as an indicator of typical dB and Sound Exposure Levels (SEL) within the study area as well as comparative ambient noise measurements in areas affected by aircraft noise.

ACOUSTICAL MEASUREMENTS

This section provides a technical description of the acoustical measurements which were performed for the Georgetown Municipal Airport F.A.R. Part 150 Noise Compatibility Study. Described here are the instrumentation, calibration procedures, general measurement setups, and related data collection items.

Instrumentation

Four sets of acoustical instrumentation, the components of which are listed in **Table 3A**, were used to measure noise. Each set consisted of a high quality microphone connected to a 24-hour environmental noise monitor unit. Each unit was calibrated to assure consistency between measurements at different locations. A calibrator, with an accuracy of 0.5 decibels, was used for all measurements. At the completion of each field measurement, the calibration was rechecked, the accumulated output data was downloaded to a portable computer, and the data memories were cleared before placement at a new site.

The equipment listed in the table was supplemented by accessory cabling, windscreens, tripods, security devices, etc., as appropriate to each measurement site.

TABLE 3A
Acoustical Measurement Instrumentation

4	Larson Davis 820 Portable Noise Monitors and Preamplifiers
4	Larson Davis Model 2559 - ½" Microphones
1	Model CA250 Sound Level Calibrator
1	Portable Computer

Measurement Procedures

Two methods were used to attempt to minimize the potential for non-aircraft noise sources to unduly influence the results of the measurements. First, for single-event analysis, minimum noise thresholds of five to 10 decibels (dB) greater than ambient levels were programmed into the monitor. This procedure resulted in the requirement that a single noise event exceed a threshold of 60 dB at each site. Second, a minimum event duration, longer than the time associated with ambient single events above the threshold (for example, road traffic), was set (generally at five seconds). The combination of these two factors limited the single events analyzed in detail to those which exceeded the preset threshold for longer than the preset duration. In spite of these efforts, contamination of single event data is always possible.

Although only selected single events were specially retained and analyzed, the monitors do, however, cumulatively consider all noise present at the site, regardless of its level, and provide hourly summations of Equivalent Noise Levels (Leq). Additionally, the equipment optionally provides information on the hourly maximum decibel level, SEL values for each event which exceeds the preset threshold and duration, and distributions of decibel levels throughout the measurement period.

Weather Information

The noise measurements taken during this study were obtained during a period of average spring weather for Georgetown Municipal Airport. On most days, weather conditions were generally considered to be marginal for aircraft using visual flight rules (VFR), referred to as marginal VFR (cloud ceilings between 1,000 and 3,000 feet and/or visibility of three to five miles). Occasionally, weather conditions deteriorated so the flight under VFR was not allowed and only specifically equipped aircraft with properly trained pilots could fly. Winds were generally from the south-southeast at about 10 knots with occasional gusts up to 30 knots. Daily temperatures ranged from highs in the low 80-degree range to lows in the 60s.

Aircraft Noise Measurement Sites

Noise measurement sites are shown on **Exhibit 3A**. They were selected on the basis of background information, local observation during the field effort, and suggestions from the airport management based on noise complaint history. Specific selection criteria include the following:

- Emphasis on areas of marginal or greater than marginal aircraft noise exposure according to earlier evaluations.

- Screening of each site for local noise sources or unusual terrain characteristics which could affect measurements.

- Location in or near areas from which a substantial number of complaints about aircraft noise were received, or where there are concentrations of people exposed to significant aircraft overflights.

While there is no end to the number of locations available for monitoring, the selected sites fulfill the above criteria and provide a representative sampling of the varying noise conditions in the airport vicinity. Two sites were measured for 120 hours, one for 96 hours, and one site for 24-hour periods. A noise monitor was placed southeast of the airport during the monitoring period. However, technical difficulties with the equipment prevented recording aircraft noise data.

Site 1 is located on airport property approximately 100 yards south of Lakeway Drive along the extended centerline of Runway 18-36. The location abuts an area of single-family residential dwellings on relatively large lots. The site is in an area that would likely receive regular arrival and departure overflight noise from the airport's primary runway.

The equipment was set up along a fence-line situated between the residential area and the Lakeview Drive road right-of-way. During the equipment setup, no overflights were observed although relatively constant automotive traffic was present along Lakeway Drive.

The 24-hour Leq for the first day at Site 1 was 53.3, 57.0 for the second day, 60.4 for the third day, 57.7 for the fourth day, and 59.5 for the fifth day. The Leq metric is derived by accumulating all the noise during a given period and logarithmically arranging it. The DNL level for this site was computed for the first day at 55.4, 57.0 for the second day, 61.4 for the third day, 58.0 for the fourth day, and 59.9 for the fifth day.

Site 2 is located near the intersection of Northwest Boulevard and Serenada Drive. This site is approximately 500 feet east-northeast of the airport. The area consists of single-family residential homes on large lots. The location is situated off the extended centerline of Runway 11-29 and was selected due to the likelihood that this area would

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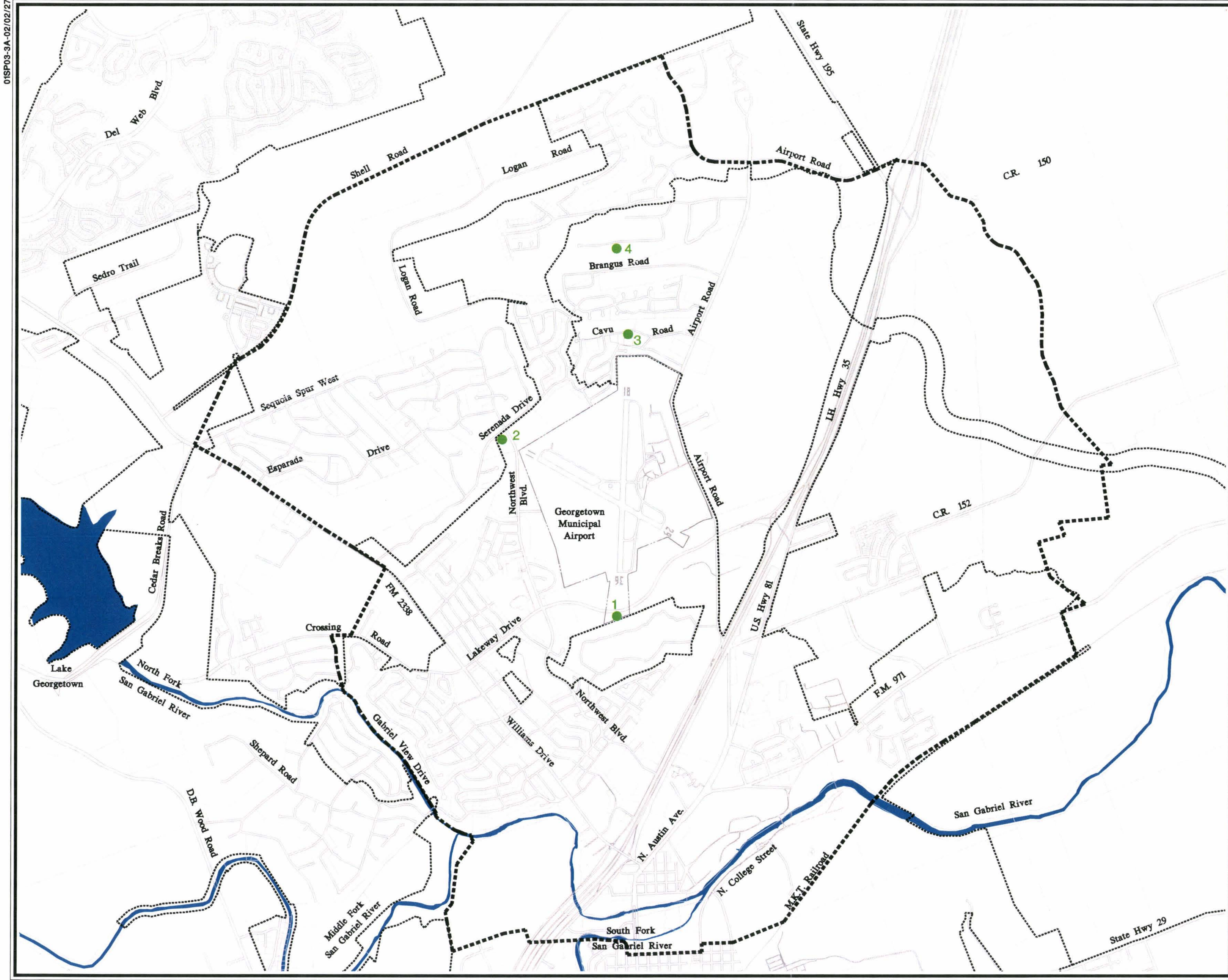

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- Temporary Noise Monitor Terminal

Source: Coffman Associates Analysis.

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SCALE IN FEET

GEORGETOWN MUNICIPAL AIRPORT

Exhibit 3A
NOISE MONITORING LOCATIONS

receive occasional arrival and departure traffic, and regular touch-and-go overflights.

The monitor was placed in the center of a large undeveloped lot adjacent to a place of worship. During the equipment setup, no aircraft overflights were observed.

The 24-hour Leq for the first day at Site 2 was 46.4, 41.6 for the second day, 49.3 for the third day, and 48.8 for the fourth day. The DNL level for this site was computed to be 53.2 for the first day, 45.4 for the second day, 49.7 for the third day, and 52.4 for the fourth day.

Site 3 is located at 3300 Cavu Road. This home is approximately 700 feet north of the airport. The area is comprised of single-family residences situated on large lots.

The equipment was set up in a large open area in the middle of the front yard. There is a paved road approximately 70 feet from the noise monitor location. There were no aircraft overflights during the monitor setup.

The 24-hour Leq for the first day at Site 3 was 61.1, 53.1 for the second day, 53.5 for the third day, 52.8 for the fourth day, and 54.0 for the fifth day. The DNL level for this site was computed for the first day at 61.7, 53.1 for the second day, 54.2 for the third day, 53.5 for the fourth day, and 57.9 for the fifth day.

Site 4 is located at 3310 Deer Trail. This home is approximately 2,700 feet north of the airport. The area is a single-family residential area of homes on large lots.

The equipment was set up in the side yard of the house approximately 200 feet from a paved road. There was a children's swing set located approximately 70 feet from the monitor. One single engine aircraft overflight was observed during the monitor setup and registered a peak noise level of 60.7 dBA. During the removal of the monitor, a lawn mower was being operated at an adjacent property.

The 24-hour Leq for Site 2 was 46.8. The DNL level for this site was computed to be 50.5 for the measurement period.

MEASUREMENT RESULTS SUMMARY

The noise data collected during the measurement period are presented in **Table 3B**. The information includes the average 24-hour Leq for each site. The Leq metric is derived by accumulating all noise during a given period and logarithmically averaging it. It is similar to the DNL metric except that no extra weight is attached to nighttime noise. The DNL (24) value represents the DNL from all noise sources.

In addition, the L(50) values for each site are presented. These values represent the sound levels above which 50 percent of the samples were recorded.

The table also presents data on other measures of noise that may be useful for comparisons. These include:

- Maximum recorded noise level in dB (Lmax);
- Maximum recorded sound exposure level (SELmax);
- Longest single-event duration in seconds (Dur max);
- Number of single events above sound exposure levels (SEL) 60, 70, 80, 90, and 100.

For comparative purposes, normal conversation is generally at a sound level of 60 decibels while a busy street is approximately 70 decibels along the adjacent sidewalk.

TABLE 3B
Measurement Results Summary
Georgetown Municipal Airport

	Site 1					Site 2				Site 3					Site4
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1
Measurement Dates	4/02 to 4/03	4/03 to 4/04	4/04 to 4/05	4/05 to 4/06	4/06 to 4/07	4/02 to 4/03	4/03 to 4/04	4/04 to 4/05	4/05 to 4/06	4/02 to 4/03	4/03 to 4/04	4/04 to 4/05	4/05 to 4/06	4/06 to 4/07	4/06 to 4/07
Cumulative Data															
LEQ(24)	52.3	57.0	60.4	57.7	59.5	46.4	41.6	49.3	48.8	61.1	53.1	53.5	52.8	54.0	46.8
DNL(24)	55.4	57.0	61.4	58.0	59.9	53.2	45.4	49.7	52.4	61.7	53.1	54.2	53.5	57.9	50.5
L(50)	51.4	51.4	51.4	51.4	51.4	45.8	45.8	45.8	45.8	46.3	46.3	46.3	46.3	46.3	44.5
Single Event Data															
L(max)	88.5	93.0	99.2	90.1	94.9	79.4	80.9	92.4	90.5	98.2	93.1	88.5	89.2	92.0	80.0
SEL(max)	94.5	97.7	102.3	95.1	101.0	86.5	81.4	95.7	93.9	109.4	96.9	93.9	93.1	94.5	87.1
Max Duration (sec)	44	206	59	262	108	280	48	188	362	109	70	571	125	53	53
Number of Single Events above 60 dB (Lmax)	163	222	143	216	368	82	57	71	54	122	79	145	129	105	71
Number of Single Events Above															
SEL 70 dB	125	170	114	166	271	59	43	50	44	88	61	112	106	88	94
SEL 80 dB	18	78	63	83	68	11	3	8	7	21	21	31	34	34	31
SEL 90 dB	0	8	10	13	13	0	0	2	2	6	3	4	2	6	7
SEL100 dB	0	0	3	0	1	0	0	0	0	1	0	0	0	0	0

Source: Coffman Associates Analysis

The program resulted in a total of two 120-hour periods, one 96-hour period, and one 24-hour period from four sites around the airport. A total of 2,027 single events were recorded during the program and 360 average hourly sound levels were calculated and recorded.

AIRCRAFT NOISE ANALYSIS METHODOLOGY

The standard methodology for analyzing the prevailing noise conditions at airports involves the use of a computer simulation model. The

Federal Aviation Administration (FAA) has approved the INM for use in F.A.R. Part 150 Noise Compatibility Studies. The latest versions of the INM are quite sophisticated, accounting for such variables as airfield elevation, temperature, headwinds, and local topography in predicting noise levels at a given location. INM Version 6.0b was used to prepare noise exposure maps for the Georgetown Municipal noise analyses.

Inputs to the INM include runway configuration, flight track locations, aircraft fleet mix, stage length (trip length) for departures, and numbers of daytime and nighttime operations by aircraft type. The INM provides a database for general aviation aircraft which commonly operate at Georgetown Municipal Airport. **Exhibit 3B** depicts the INM input assumptions.

The INM computes typical flight profiles for aircraft operating at the assumed airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The INM will also accept user-provided input, although the FAA reserves the right to accept or deny the use of such data depending upon its statistical validity.

The INM predicts noise levels at a set of grid points surrounding an airport. The numbers and locations of grid points are established during the INM run to determine noise levels in the areas where operations are concentrated, depending upon the tolerance and level of refinement specified by the user. The noise level values at the grid points are used to prepare noise contours, which connect points of equal noise exposure. INM will also calculate the noise levels at a user-specified location, such as noise monitoring sites.

INM INPUT

AIRPORT AND STUDY AREA DESCRIPTION

The runways were input into the INM in terms of latitude and longitude, as well as elevation. As previously mentioned, the INM computes typical flight profiles for aircraft operating at the airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The Georgetown Municipal Airport field elevation is 789 feet above mean sea level (MSL) and average annual temperature is 68.6 degrees.

It is also possible to incorporate a topographic database into the INM, which allows the INM to account for the changes in distances from aircraft in flight to elevated receiver locations. Topographic data from the U.S. Geographical Survey was used in the development of the noise exposure contours for Georgetown Municipal Airport.

ACTIVITY DATA

Noise evaluations made for the current year (2003) are based on a series of operational counts lasting two weeks each quarter during calender year 2000 and extrapolated to provide a full year's operations. A review of current fuel sales and based aircraft in Appendix E indicates no significant change in operations. Five-year (2008) contour sets were also prepared based upon forecasts presented in Chapter Two, Aviation Demand Forecasts. Existing and forecasted annual operations are summarized in **Table 3C**.

TABLE 3C
Operations Summary
Georgetown Municipal Airport

		FORECASTS
Operations	**Existing 2003**[1]	**2008**[2]
Itinerant	40,038	64,000
Local	59,330	96,000
Total	99,368	160,000

[1] Year 2001 operations are based on a series of operational counts lasting two weeks each quarter during calender year 2000 and extrapolated to provide a full year's operations. A review of current fuel sales and based aircraft in Appendix E indicates no significant change in operations.
[2] Chapter Two, Table 2H, p. 2-20

DAILY OPERATIONS AND FLEET MIX

For this analysis, current aircraft operations data (takeoffs and landings) and forecasts of future activity (2006) prepared as part of an operations forecast update presented previously in Chapter Two, Aviation Activity Forecasts, were used for noise modeling. Average daily aircraft operations were calculated by dividing total annual operations by 365 days.

The selection of individual aircraft types is important to the modeling process because different aircraft types generate different noise levels. The noise footprints presented in **Exhibit 3C** and **Exhibit 3D** illustrate this concept graphically. The footprints represent the noise pattern generated by one departure and one arrival of the given aircraft type. The aircraft illustrated are some of those commonly found at Georgetown Municipal Airport.

The distribution of these operations among various categories, users, and types of aircraft is critical to the development of the input model data. **Table 3D** lists the daily operations by aircraft type.

DATABASE SELECTION

The FAA aircraft substitution list indicates that the general aviation single-engine variable pitch propeller model, the GASEPV, represents a number of single-engine general aviation aircraft. Among others these include the Beech Bonanza, Cessna 177 and 180, Piper Cherokee Arrow, Piper PA-32, and the Mooney. The general aviation single-engine fixed pitch

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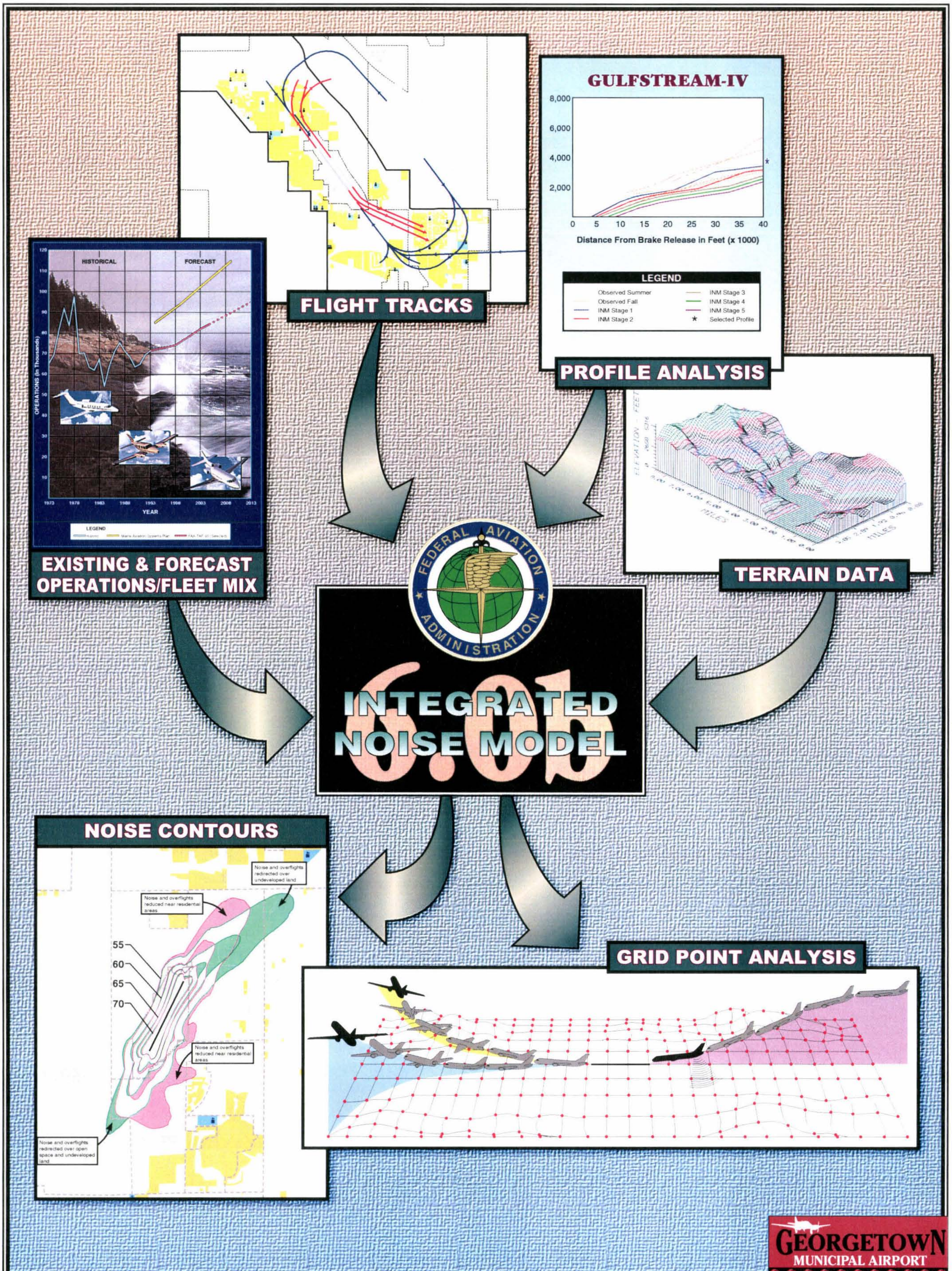

Exhibit 3B
INM PROCESS

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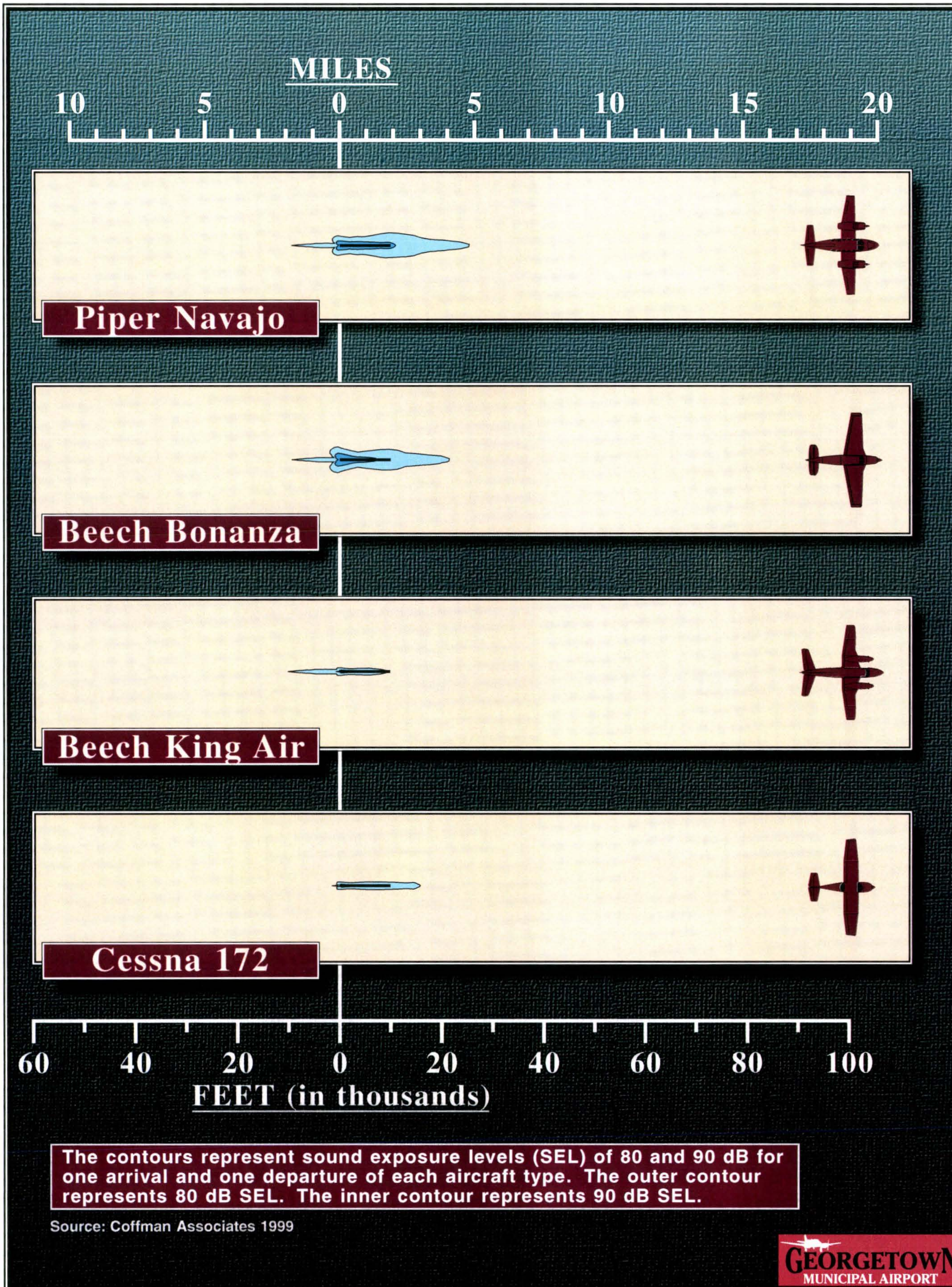

Exhibit 3C
PROPELLER AIRCRAFT NOISE
FOOTPRINT COMPARISON

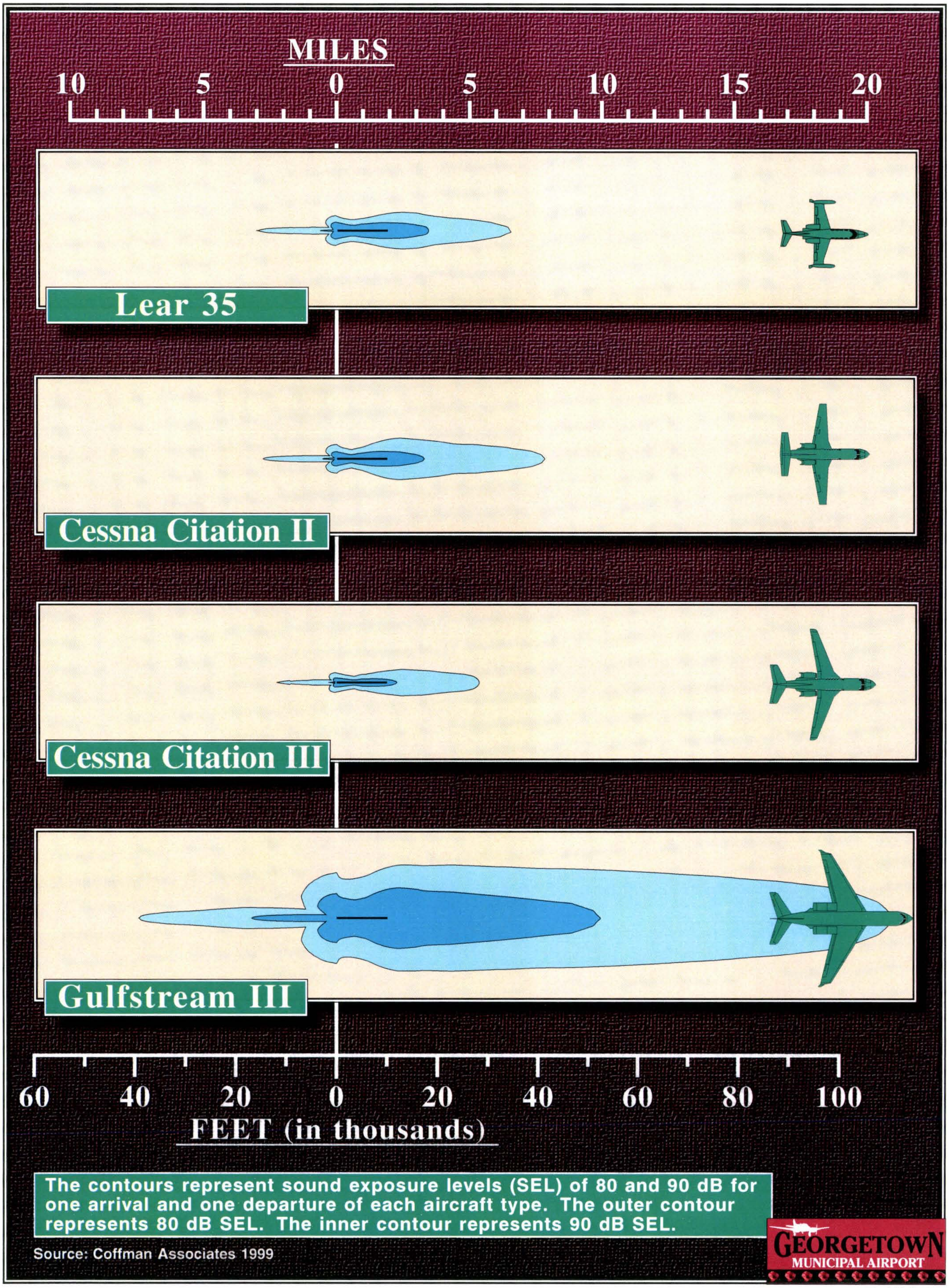

Exhibit 3D
TURBOJET AIRCRAFT NOISE
FOOTPRINT COMPARISON

propeller model, the GASEPF, also represents several single-engine general aviation aircraft. These include the Cessna 150 and 172, Piper Archer, Piper PA-28-140 and 180, and the Piper Tomahawk.

TABLE 3D
Operational Fleet Mix Projections

Aircraft Type	INM Designator	2003[1]	2008[2]
ITINERANT OPERATIONS			
Single Engine			
Light - Fixed	GASEPF	43.9	65.7
Light - Variable	GASEPV	38.4	60.5
Subtotal		82.3	126.2
Twin Engine			
Beech Baron	BEC58P	11.0	17.6
Cessna 441	CNA441	5.5	10.5
MU-2	DHC6	5.5	10.5
Subtotal		22.0	38.6
Business Jet			
Citation I, II, V	MU3001	1.2	2.1
Citation III, VI, VII	CIT3	1.2	3.5
Gulfstream III	GIIb	0.2	0.3
Lear 35/55	LEAR35	1.2	2.1
Subtotal		3.8	8.0
Helicopter			
Robinson 22	H-500	1.1	1.8
Jet Ranger	JRNGR	0.5	0.9
Subtotal		1.6	2.6
Total Itinerant		***109.7***	***175.4***
LOCAL OPERATIONS			
Light - Fixed	GASEPF	65.0	105.2
Light - Variable	GASEPV	65.0	105.2
Beech Baron	BEC58P	32.5	52.6
Total Local		***162.5***	***263.0***
Total Daily Operations		***272.2***	***438.4***

1 Year 2001 operations are based on a series of operational counts lasting two weeks each quarter during calender year 2000 and extrapolated to provide a full year's operations. A review of current fuel sales and based aircraft in Appendix E indicates no significant change in operations. Aircraft fleet mix developed from airport based aircraft lists and interviews with fixed base operators.

2 Chapter Two, Table 2H, p. 2-20