Desert Eagles Model Airplane Flying Club
Flying Field Noise Study

Desert Eagles Model Airplane Flying Club Flying Field Noise Study
Completed on 29 September 2006 (1100 to 1400 hours)

Problem:

New home building has placed our flying field in closer proximity to unprotected persons than when the field was constructed. Although the approved flying area is not over the homes, the proximity makes over flight more likely. In addition to the potential over flight, the proximity of our approved over flight area makes noise annoyance more likely.

Purpose:

To make noise dispersion verification tests and recommend changes in over flight patterns, if needed, for the Desert Eagles Model Airplane Flying Club Field off New Sweden Highway in order to maintain our "good neighbor" relationship with local residents

Definitions:

Current Approved Flight Operations Over Flight Area: a rectangle whose boundaries are 2000 feet (north-south) by 600 feet (east-west) in length centered on the eastern edge of the model runway 04-22 (see Figure 1)

Measurements/Conditions:

(a) Instruments for Noise Measurements: two Radio Shack, Cat. No. 33-2055 Sound Level Meters for average of readings

(b) Range Finder used for distance surveys: Bushnell Yardage Pro Compact 600 Laser Range Finder

(c) Google-Earth Satellite Shot of Layout for Figures 1 and 2, Scale = 1.5 inches for 1000 feet

(d) Wind: 2110 estimated

(e) Engines were running a full power for the static ground measurements. The helicopter noise measurements were made with the helicopter in hover at about 20 feet.

Validation of Layout Scale:

The DEMAFC flight operations over flight area shown on Figures 1 and 2 is 2000 feet long and 600 feet wide (scaled from the Google-Earth web site). This gives

a scaling factor of 1.5 inches per 1000 feet. The distance between the flying field sunshade and the nearest house is 1587 feet. By the range finder, this distance was 527 yards or 1581 feet. The distance to the fence line to the east is 938 feet. By the range finder, this distance was 925 feet (not quite to the fence line). Noise measurements were not made at the 925-foot distant location because the noise generated by the sources decayed off to background (<50 dB (A)) before reaching that point.

Layout for Measurement Points:

Surveyed locations for noise measurements were laid out along a track on a heading of roughly 110 degrees from the south taxiway of the field. The measurement distances were 10, 20, 40, 80, 160, 320, and 640 feet from the aircraft engine running over ground zero. The measurements with the helicopter were made with the helicopter hovering at an altitude of about 20 feet over ground zero.

Figure 1 shows a white trace of the over flight area and an approximate track location extending eastward for the sound measurements out to 640 feet.

Data: See pages of Attachment A for raw data sheets.

Objective:

Based on earlier noise test measurements, the background noise level on New Sweden Highway at the front yard of the homes was <50 db(A). with the passage of traffic on Interstate 15 and on the New Sweden Highway, the range is from 55 to 65 db(A), averaging 60 db(A). Our commitment to the Bonneville County Zoning Commission at the hearing to get our flying field property rezoned from agricultural to recreational was that we would be “good neighbors” and keep the noise levels to the homes no more than they would see from ambient noise generated by road traffic.

Our target for this study is to keep noise at the homes in the vicinity of our field below 55 db(A). Consider the graph of Chart A on page 4. Looking at the classical model for decay of sound intensity with distance and with a starting point of 95 db(A) at 3 meters from the engine (10 feet), the noise intensity falls off to 55 db(A) at about 1000 feet. If one started with the original noise intensity allowed by the club by-laws of 90 db(A) at 10 feet, the intensity falls off to 55 db(A) at about 500 feet. These numbers

become important when looking at the over flight area and the location of the surrounding homes.

Analysis:

The noise measurements were plotted as a function of distance in Excel for analysis. R squared values for all plotted data were greater than 0.95 which indicates good consistency in the data collected.

Data were gathered on operation of a helicopter in hover and three airplane models, with various types/sizes of engines to confirm the classical model. These models were being hovered or operated static at "measurement ground zero." Measurement ground zero was 10 feet west of the second fence post starting at the beginning of the south side of the south taxiway on the north-south line separating the south taxiway and the pit preparation area. The data indicated the following:

(a) with the classical model for fall off of noise intensity and starting at 95 db(A), the noise level drops to 55 db(A) at about 1000 feet,

(b) the 2-cycle O.S. 0.50 cubic inch displacement powered helicopter with a stock O.S. muffler measured during hover at a 20-foot altitude (see Chart B) was quieter than the classical model and the noise intensity dropped to 55 db(A) at about 500 feet (It should be noted that the noise level at 10 feet could not be safely measured, so the starting level may have been less than 95 db(A)),

(c) the ground-based measurement of a 4-cycle 50 cc BME engine with a stock muffler and swinging an XOAR 22x8 propeller at 6700 RPM (see Chart C) was quieter than the classical model with the noise intensity falling to 55 db(A) at about 320 feet,

(d) the ground-based measurement of a 4-cycle 3W 75-cc engine with a 3W Canister (Pitts Style) muffler and swinging a Master Airscrew 24x12 propeller at 5700 RPM (see Chart D) was similar to the classical model and the noise intensity was projected to drop to 55 db(A) at about 600 feet, but airborne measurements showed a sound level of about 62 db(A) at about 400 feet and

(e) the ground-based measurement of a 4-cycle ZDZ 50 cc engine with a Bisson 50 modified muffler swinging a JZ 22x8 at 7100 RPM (see Chart E) followed the classical model very well initially but then showed a more rapid drop with the noise intensity dropping to 55 db(A) at about 600 feet.

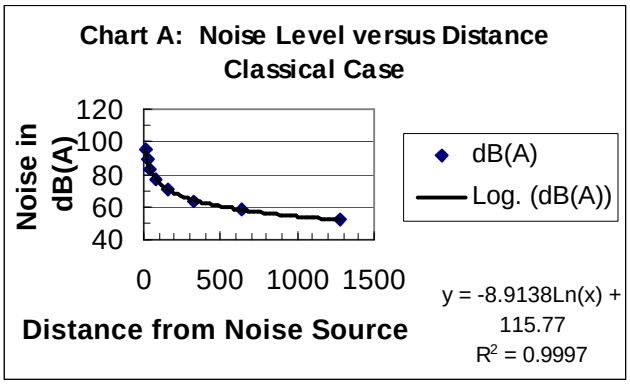
Chart A: Noise Level versus Distance
Classical Case
Noise in dB(A)
120
100
80
60
40
0
500
1000
1500
Distance from Noise Source
dB(A)
Log. (dB(A))
y = -8.9138Ln(x) + 115.77
R2 = 0.9997

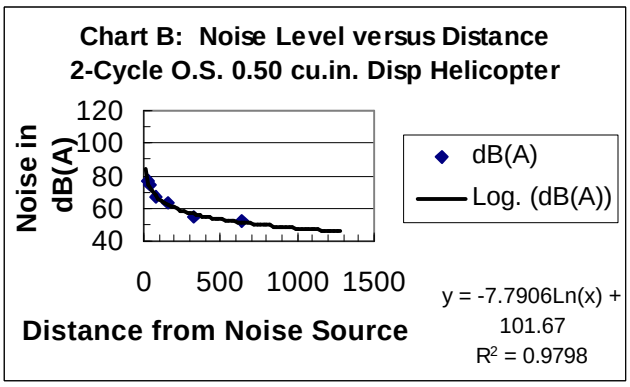
Chart B: Noise Level versus Distance
2-Cycle O.S. 0.50 cu.in. Disp Helicopter
Noise in dB(A)
120
100
80
60
40
0
500
1000
1500
Distance from Noise Source
dB(A)
Log. (dB(A))
y = -7.7906Ln(x) + 101.67
R2 = 0.9798

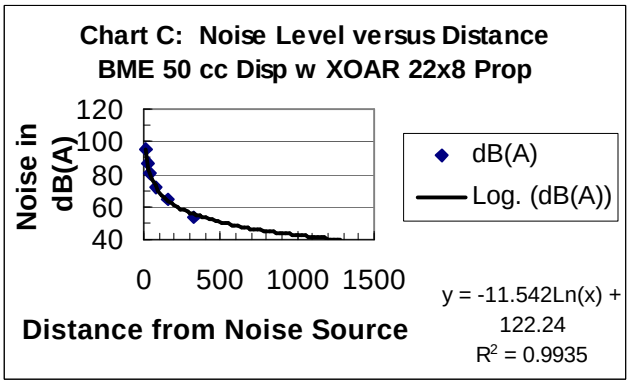
Chart C: Noise Level versus Distance
BME 50 cc Disp w XOAR 22x8 Prop
Noise in dB(A)
120
100
80
60
40
0
500
1000
1500
Distance from Noise Source
dB(A)
Log. (dB(A))
y = -11.542Ln(x) + 122.24
R2 = 0.9935

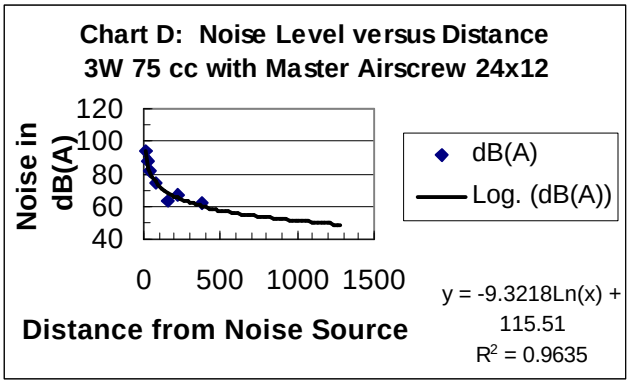
Chart D: Noise Level versus Distance
3W 75 cc with Master Airscrew 24x12
Noise in dB(A)
120
100
80
60
40
0
500
1000
1500
Distance from Noise Source
dB(A)
Log. (dB(A))
y = -9.3218Ln(x) + 115.51
R2 = 0.9635

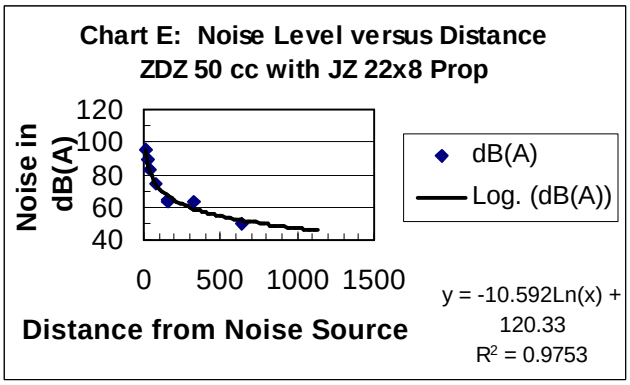
Chart E: Noise Level versus Distance
ZDZ 50 cc with JZ 22x8 Prop
Noise in dB(A)
120
100
80
60
40
0
500
1000
1500
Distance from Noise Source
dB(A)
Log. (dB(A))
y = -10.592Ln(x) + 120.33
R2 = 0.9753

Discussion:

(a) It should be noted that the classical model for sound dissipation is supported by the airborne measurements with the 3W 75-cc powered model. Sound from the airborne measurements fall to about 55 db(A) at approximately 1000 feet. The ground based measurements show dissipation at a more rapid rate than the airborne measurements due to ground absorption.

(b) Considering an engine which is producing 95 db(A) at 3 meters:

(1) The closest home is 410 feet north-northwest of the northwest corner of the currently approved over flight area. Expected maximum noise level at this home from a model airplane with a noise intensity of 95 db(A) at 3 meters being flown in this over flight area would be expected to be 62 db(A). If the closest approach point for the over flight area were moved 330 feet or more south, the maximum expected noise level would be 59 db(A) or less

If the closest approach point for over flight were moved out to 930 feet, the noise level would be expected to be 55 db(A) or less. This second case would be approximated if no over flight were conducted north of the berm on the south border of the gravel pit.

(2) The second closest home is 750 feet north-northeast of the northwest corner of the currently approved over flight area. Expected maximum noise level at this home from a model airplane with a noise intensity of 95 db(A) at 3 meters being flown in this area would be expected to be 55 db(A).

(3) All the homes to the east and further north are more than 925 feet away from the currently approved over flight area. Expected maximum noise levels at these homes from a model airplane with a noise intensity of 95 db(A) at 3 meters being flown in this area would be expected to be <55 db(A).

(c) Considering an engine which is producing 90 db(A) at 3 meters:

(1) The closest home is 410 feet north-northwest of the northwest corner of currently approved over flight area. Expected maximum noise level at this home from a model airplane with a noise intensity of 90 db(A) at 3 meters being flown in the currently approved over flight area would be expected to be 57 db(A).

(2) The second closest home is 750 feet north-northeast of the northwest corner of the currently approved over flight area. Expected maximum noise level at this home from a model airplane with a noise intensity of 90 db(A) at 3 meters being flown in this area would be expected to be <55 db(A).

(3) All the homes to the east and further north are more than 925 feet away from the currently approved over flight area. Expected maximum noise levels at these homes from a model airplane with a noise intensity of 90 db(A) at 3 meters being flown in this area would be expected to be <55 db(A).

Recommendation 1:

We, the undersigned, recommend that a permanent marker be placed in the ground for a 10-foot reference for making noise measurements at the DEMAFC field.

Recommendation 2:

We, the undersigned, recommend that the club ensure that all model airplane flown from the DEMAFC field are measured and registered in the Noise Measurements Log Book.

Recommendation 3:

We, the undersigned, recommend that the DEMAFC make available a diagram showing a clearly defined flight operations over flight area for all radio control flying flight from the DEMAFC model flying field and post this diagram at the field.

Other recommendations may be made at the 26 October 2006 Executive Board Meeting.

Signed:

_____	_____	_____
Bliss Wheeler	Donald Brooks	Jim Haldy
_____	_____	
Joe Mitchell	Mark Williams	

(14 October 2006)

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Attachment A: Raw Data Sheets for Noise Measurements
(see pages A-1 through A-4)