AMA Sound/Noise Abatement Recommendations

By a wide margin, the largest contributor to the loss of flying sites is the noise model aircraft produce. At some time, it is likely that someone living within earshot of your flying field will complain about the sound coming from the aircraft. If you don't have noise under a certain amount of control, you will quickly become a target.

This document should help you be reactive to a noise complaint and using these guidelines will allow you to become proactive in getting sound under control before problems arise. Being alerted to a noise problem is not really the best time to start getting a handle on it. The best time is long before there's an issue, and if it's done sincerely and adequately, there might never be a problem. Keep in mind that there is also a difference between what is a *recommendation* and what is *legal* for a particular piece of property. We'll discuss this difference later in the document.

What is "dB?"

It is the abbreviation for decibels, which is a measurement of sound wave impact. It is a measurement that increases exponentially. In layman's terms, as the number increases, the impact increases several times over. For example, 45 dB is slightly above a whisper, 96-98 dB is tolerable, and at 107 db and up, it starts to do real damage to your hearing.

The easiest way to measure sound/noise is with a decibel meter. These are relatively inexpensive and are mostly battery operated, enabling use at remote locations. The Internet is a great place to purchase a good one at a low price. A quick search for a dB meter will should you many to choose from costing roughly $50. Buy the best one you can afford. It can be mounted on a camera tripod, which will make testing and consistency simple. When you use this unit to measure noise, it should be set on the "A" weighting selection.

What is actually legal?

Unless you live in the middle of no-man's land, all property will fall under the jurisdiction of a set of ordinances. Whether it is state, county, township, etc., there will be a set of rules for what can and cannot be done with or on a particular piece of property. These ordinances contain rules for fence lines, building set-backs, types of building, and so on. There will also be a rule for how much noise is allowed to cross the property line. It might be hard to find, but if you look deep enough, or ask the right person, you'll find it. Normally that number will be between 50 and 65 db for what is allowed to cross a property line. After you find the information concerning your property, checking to see if you're legal is easy. Set your dB meter at different places on the property line and take readings. Keep in mind that other factors can add to the dB readings you get. If your field is located close to a major highway or busy road, tire noise and other road noise can make a big difference.

This might sound trivial, but knowing where you're flying site stands legally with regards to noise can and will give you a leg up if and when the need arises. Think of how handy it would be, if you were to be confronted with a complaint, to know and be able to state that your flying site is within the noise ordinance limits.

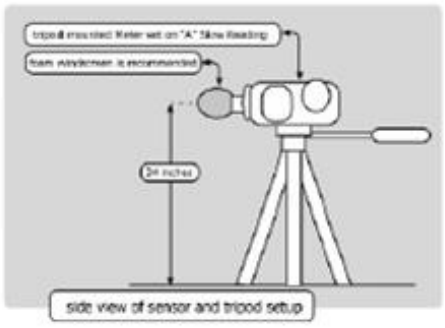
Establishing a sound limit for your club

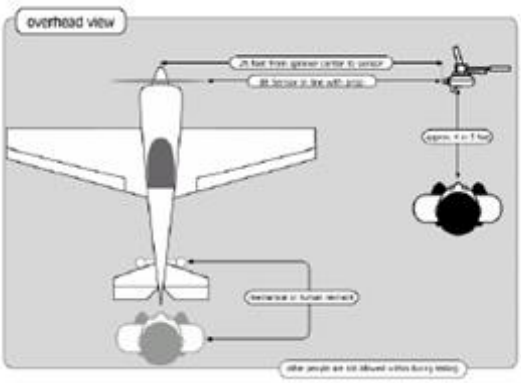
How loud is loud? Well, that is really up to the neighbors, or more likely, the local government that may already have noise laws in place. You should check with local government and know what the law is for your area.

Let's say that the local ordinance in your area is 65 dB at the property line. That means that the loudest sound emanating from your property at the property line is 65 dB. So what should the noise standard for your local club be? A sample noise measuring standard that a typical club might adopt is:

96 db measured from a 20-foot distance over soft field (sod).

98 db measured from a 20-foot distance over hard surface (pavement/concrete).





The process

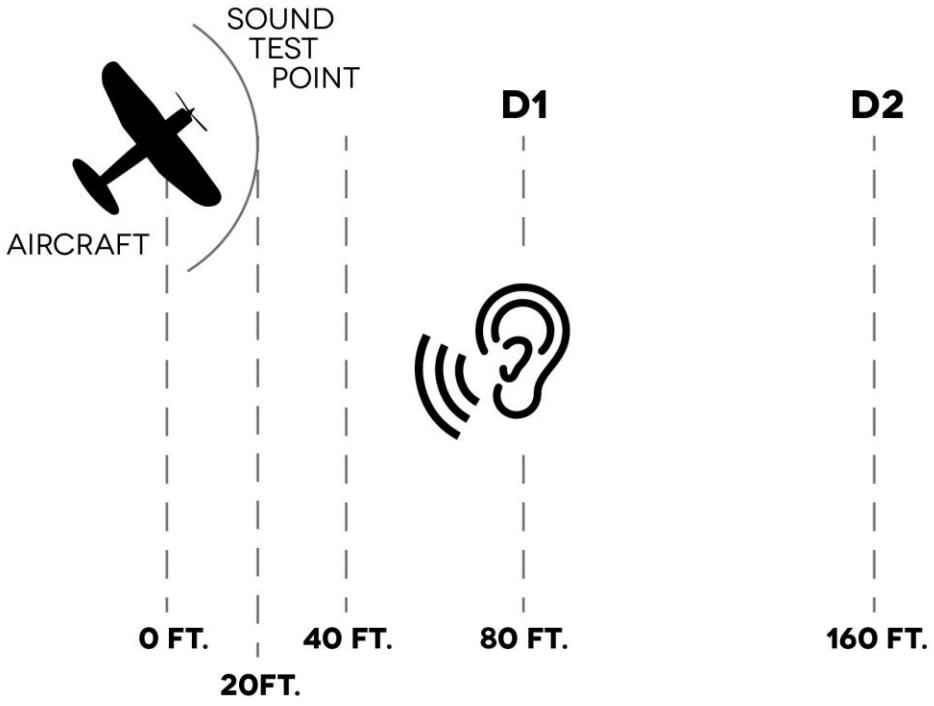
The dB meter listens to sound and gives you an accurate reading of the sound pressure. Following the instructions, set the meter to the "A" weighting scale, and follow the process in the graphics above. The dB meter should be held approximately two feet above the surface and in line with the propeller (or rotor blades in the case of a helicopter). This method should do a good job of measuring the actual sound level being put out by a particular aircraft/engine/muffler combination.

Calculating sound pressure level at a distance

If a sound is generated at a point source in a free field, meaning there are no walls or other obstructions, the sound pressure level will be reduced by 6 dB each time the distance from the noise source is doubled. Alternatively, the noise level will increase by 6 dB in a free field each time the distance to the noise source is halved. Consider the following example:

A model aircraft is tested for noise at a distance of 20 feet. The noise meter reads 96 dB. You can then calculate what the noise level will be. The following Sound Table shows the results.

Sound Table Sample Noise Test at a Local Flying Site	
Distance (ft)	**Sound Pressure (dB)**
20	**96**
40 (double the 20' distance)	**90 (reduction of 6dB)**
80 (D1)	**84**
160 (D2)	**78**
320	**72**
640	**66**
1280	**60**



Ways of abating noise problems

1. **Try a three-blade propeller**. The most important thing to remember about airplane noise is most of what you hear does not come from the engine, it comes from the propeller. What you hear when your engine unloads in the air are the propeller tips going supersonic, so getting the engine rpm down will limit much of that. So you think a bigger, two-blade propeller will slow the engine down, resulting in lower noise, right? Wrong! Yes, it will slow the engine down, but now you have longer blades and the tips are actually going faster (physics). The answer is to *add* blades so you can keep the diameter down while also reducing the rpm. The reason you see most of the big International Miniature Aerobatic Club (IMAC) fliers now using three-blade propellers is not for performance, but noise control. If you don't know how to figure for a three-blade propeller, ask your engine manufacturer for a recommendation. A rule of thumb is to reduce diameter or the pitch by one inch or both if needed.

2. **Use as large as possible "canister-type" muffler**. Nearly all engines, glow and gas, sold in the US market today are supplied with a large can-type muffler. Most of these supplied mufflers will adequately control the combustion noise coming from the cylinder. After-market mufflers will do a better job of quieting the engine, so look for those.

3. **Soft mount your engine**. There can often be quite a bit of noise coming from your airframe, especially if it contains a lot of fiberglass or is an open structure covered in plastic film. When the engine is hard mounted to the firewall, the vibration will be carried back through the airframe and essentially act as a drum unless there is some type of absorption material in there to soak it up. Many of the newer 30% and 40% aerobatic aircraft have foam turtledecks and other foam parts that absorb much of the vibration noise. If not, your beautiful machine will sound more like a drum kit than a purring kitten. There are several soft-mount systems on the market. To my knowledge, all full-scale piston engines are soft mounted. Take a lesson from the big boys.

Eagle's Nest RC Club—flying at Eagle's Nest Airport

The following is an example of how a professional engineering firm conducts sound studies for the purpose of measuring whether a flying field is legal according to local ordinances. It begins with a map overview of where the measuring devices (sound meters) were placed and then time, date, and sound level measurements taken at the specific sites, as well as the type of sound producer in the immediate area when the measurement was taken. The device positions correlate with the tables by the letter designations given to the devices and are shown in the location column on the table.

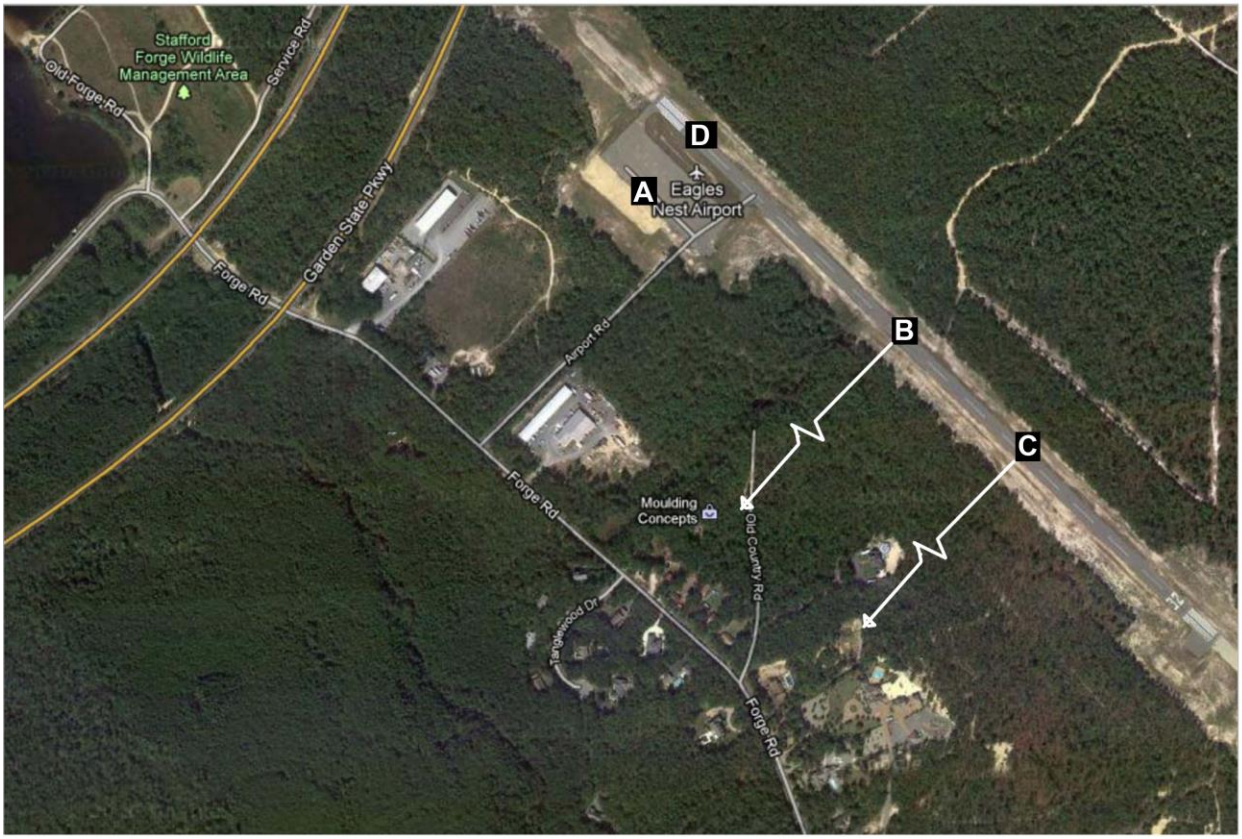
Table 1 shows the weather conditions at the time of the test.

Table 2 includes the measurements taken for ambient noise, birds, auto traffic, wind, etc.

Table 3 is a list of the actual measurements taken of RC aircraft in different operating regimes.

Table 4 is a mathematical calculation of noise using a baseline of 96 dB at 3 meters (9.8 feet) distance from the model on the ground. As the distance from the sound source is increased, the sound decreases. Using this as a guideline, the company calculated that if models met the baseline sound test, in order to

meet the local ordinance of 65 dB at the property line, the models would have to come no closer than 349 feet of the property line. The key here is knowing the sound limit for your local area.



Eagles Nest Airport, New Jersey.

Table 1 Weather Conditions					
Date	**Location**	**Time**	**Conditions**	**Temp.**	**Wind**
Saturday 7 May 2011	Eagles Nest Airport Eagleswood Township Ocean County, NJ	10:32 AM	Clear	66°F	< 5 MPH
		12:40 PM	Clear	70°F	< 8 MPH

Table 2 Eagles Nest Airport Eagleswood Township - Ocean County, NJ Daytime Ambient Measurements - 07 May 2011			
Location	**Time**	**Reading Range (dBA)**	**Comments**
A	10:46 - 10:47 AM	45.6 - 45.8	Primary: vehicular traffic on Garden State Parkway,
	10:47 - 10:48 AM	49.2 52.7	Birds; Secondary: off-road motorcycles / ATVs
B	11:01 - 11:02 AM	41.9 - 45.6	Primary: vehicular traffic on Garden State Parkway,
	11:02 - 11:03 AM	42.5 - 45.3	birds
	11:03 - 11:04 AM	42.4 - 42.9	
	11:16 - 11:17 AM	43.3 - 43.9	
	11:17 - 11:18 AM	42.9 - 43.9	
C	11:25 - 11:26 AM	42.9 - 46.2	Primary: vehicular traffic on Garden State Parkway,
	11:26 - 11:27 AM	41.9 - 43.7	birds
	11:29 - 11:30 AM	42.3 - 53.2	
	11:30 - 11:31 AM	44.3 - 53.8	
	11:31 - 11:32 AM	41.9 - 43.4	
	11:32 - 11:33 AM	43.4 - 44.8	
	11:33 - 11:34 AM	44.0 - 51.6	
D	12:45 - 12:46 PM	46.4 - 62.9	Primary: vehicular traffic on Garden State Parkway,
	12:46 - 12:47 PM	50.3 - 52.7	Birds; Secondary: off-road motorcycles / ATVs
	12:47 - 12:48 PM	49.4 - 54.2	
	12:48 - 12:49 PM	49.0 - 50.4	
	12:49 - 12:50 PM	52.4 - 54.5	
	12:50 - 12:51 PM	51.2 - 55.7	
	12:51 - 12:52 PM	51.7 - 53.0	
	12:52 - 12:53 PM	51.4 - 56.3	
	12:53 - 12:54 PM	51.9 - 58.8	
	12:54 - 12:55 PM	54.3 - 59.2	
	12:55 - 12:56 PM	49.4 - 54.5	
	12:56 - 12:57 PM	47.4 - 47.9	
	12:57 - 12:58 PM	47.1 - 48.1	
	12:58 - 12:59 PM	45.2 - 45.9	
	12:59 - 1:00 PM	43.7 - 44.7	
	1:00 - 1:01 PM	52.1 - 55.5	

Table 3
Eagles Nest Airport
Eagleswood Township - Ocean County, NJ
Daytime Source-On Measurements - 07 May 2011

Location	Time	Reading Range (dBA)	Corrected (Source) Level	Comments
	10:40 - 10:41 AM	46.3 - 52.0	---	RC aircraft taxi
	10:41 - 10:42 AM	48.1 - 55.3	---	RC aircraft flight
	10:42 - 10:43 AM	51.2 - 55.9	---	"
	10:43 - 10:44 AM	46.9 - 59.6	---	"
A	10:44 - 10:45 AM	47.4 - 55.1	---	"
	10:45 - 10:46 AM	44.5 - 59.7	---	"
	10:48 - 10:49 AM	47.5 - 55.3	---	RC aircraft take-off
	10:49 - 10:50 AM	52.8 - 58.6	---	RC aircraft flight
	10:50 - 10:51 AM	49.8 - 55.2	---	"
	10:57 - 10:58 AM	48.7 - 59.1	---	RC aircraft flight
	10:58 - 10:59 AM	47.0 - 61.8	---	"
	10:59 - 11:00 AM	47.6 - 62.0	---	"
	11:00 - 11:01 AM	45.5 - 60.0	---	"
	11:04 - 11:05 AM	44.7 - 47.2	---	RC aircraft taxi
	11:05 - 11:06 AM	60.7 - 63.1	59.7	Full-size aircraft
	11:06 - 11:07 AM	50.4 - 65.7	---	RC aircraft flight
B	11:07 - 11:08 AM	47.3 - 60.4	---	"
	11:09 - 11:10 AM	52.2 - 62.9	---	RC aircraft flight
	11:10 - 11:11 AM	46.4 - 62.7	---	"
	11:11 - 11:12 AM	45.8 - 60.0	---	"
	11:12 - 11:13 AM	48.2 - 62.6	---	"
	11:13 - 11:14 AM	47.4 - 66.1	---	"
	11:14 - 11:15 AM	47.2 - 62.9	---	RC aircraft overhead loop
	11:15 - 11:16 AM	46.2 - 59.0	---	"

Table 3 - Continued Eagles Nest Airport Eagleswood Township - Ocean County, NJ Daytime Source-On Measurements - 07 May 2011				
Location	**Time**	**Reading Range (dBA)**	**Corrected (Source) Level**	**Comments**
C	11:22 - 11:23 AM	45.1 - 56.5	---	RC aircraft flight
	11:23 - 11:24 AM	45.4 - 58.0	---	"
	11:24 - 11:25 AM	44.8 - 50.7	---	"
	11:37 - 11:38 AM	45.8 - 49.2	---	RC aircraft flight
	11:38 - 11:39 AM	46.7 - 54.4	---	"
	11:39 - 11:40 AM	44.8 - 52.2	---	"
	11:40 - 11:41 AM	44.6 - 51.9	---	"
	11:41 - 11:42 AM	47.6 - 54.2	---	"
	11:42 - 11:43 AM	46.8 - 52.9	---	"
	11:43 - 11:44 AM	47.3 - 54.3	---	"
	11:44 - 11:45 AM	45.5 - 53.0	---	"
	11:45 - 11:46 AM	45.2 - 57.2	---	"
	11:46 - 11:47 AM	45.1 - 51.6	---	"
	11:47 - 11:48 AM	44.5 - 50.9	---	"
	11:48 - 11:49 AM	42.8 - 54.1	---	"
	11:49 - 11:50 AM	45.6 - 50.0	---	"
	11:50 - 11:51 AM	43.2 - 50.9	---	"
	11:51 - 11:52 AM	43.1 - 52.6	---	"
	11:52 - 11:53 AM	45.8 - 52.6	---	"
	11:53 - 11:54 AM	44.4 - 49.4	---	"

Table 4 Eagles Nest Airport Eagleswood Township - Ocean County, NJ Sound Pressure Level (SPL) Projections	
Distance (ft)	SPL (dBA)
9.8	96.0
20	90.0
35	85.0
62	80.0
110	75.0
196	70.0
349	65.0
621	60.0
1104	55.0
1964	50.0
3492	45.0
6211	40.0