



Tutorial 07

Advanced Location Recording Loud and Fast Objects

written by Stephan Schütze

Overview

Continuing on from Tutorial 04 Basic Location Recording, this tutorial will address some of the more unusual aspects of location recording and demonstrate some more advanced recording setups and techniques. (Tutorial 4 dealt with the issues that arise when attempting to record a constant, static and easy to access sound source). When you add other elements like movement, variable sound levels and difficult access then a range of solutions needs to be found to maintain the ability to effectively record your subject. This tutorial will deal with loud and fast moving objects.



Figure 1. High Amplitude sounds

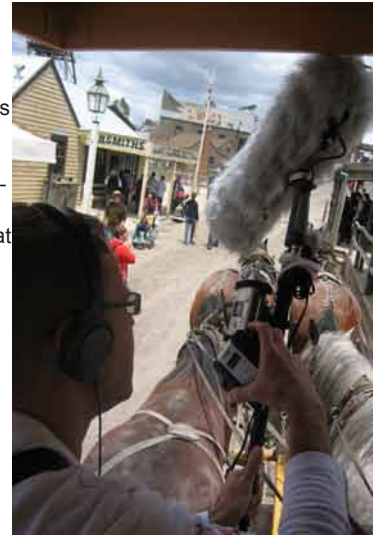
Objects that generate high volume levels can cause a series of issues that need to be overcome to capture good samples.

The location

One of the biggest issues with capturing good sound material is the environment in which the recording takes place. Sometimes you may have the good fortune to control where a recording will be made or at least prepare a location to make it more suitable for the purpose of capturing sound. More often however you will be stuck with the environment in which the sound source is located and will need to respond quickly and effectively to counter any negative aspects of this environment. Pretty much any sound recorded in a big city is going to have to deal with traffic noise, people and often industrial or commercial background noise. There is no way to prevent these sounds and often very little that can be done to reduce their effect. Depending on the type of sound you are trying to capture these contaminating sounds may or may not be an issue.

Figure 2. A noisy environment

It can be difficult to record sounds when there are a lot of people around. If the sound you want is generally louder than people talking it can be easier, even so you may still need to edit out voices at a later time.



As a general rule if you are recording something that is very loud, background sounds become less of an issue. Recording the constant sound of a big truck engine will probably drown out any other sound near it as long as the microphone is positioned well, but if you want to record that same truck driving away from the microphone then sooner or later other sounds will become apparent in the recording. Similarly a short sharp sound like a gunshot or a door slam can be trimmed after being recorded. The actual sound consists of a very short pulse and probably a quick fade out. Once this sound is edited any extra noise can usually be removed and the sound you want to keep will still work.

Using a directional microphone can help reduce some background noise by angling the mic so unwanted noise falls into the mic's dead zone. Positioning yourself behind a building or a line of trees may further reduce unwanted sounds. Try and arrive at a location with enough time before a recording session to investigate your options for positioning and setup. Performing some test recordings in different positions and orientations of the gear might provide some more ideas for solutions. Planning can often make a lot of difference to the end results. If you are recording in summer in an area with lots of insects then try mounting your mic on a stand of some type and moving yourself away from the mic when recording. Flies and other insects are attracted to humans and you yourself may be a source of contamination if there are insects flying around you.

A mic stand or tripod is also useful to reduce movement noise as holding a microphone can transfer vibrations if you move your hands or arms. Even shifting your weight or moving your feet can contribute to unwanted sounds. Vibrations can often be responsible for adding unwanted noise to recordings. Many professional recording setups utilize systems to reduce vibrations being transferred to the microphone. A series of rubber or other elastic materials are used to suspend the microphone within a special mount. These work in exactly the same way as a car's suspension by reducing the vibrations felt by the mic. Mounting the microphone on a tripod or stand can further reduce the chance of unwanted movement noise. Obviously it is not always possible to have a static mic, so it is a good habit to wear soft shoes like sneakers and clothes that are easy to move in without making extra noise. Leather, PVC, nylon and other artificial fibres will often make noise as you move in them. It is possible to run with a well set up microphone without creating much extra noise at all, but it takes a little practise.



Figure 4. Microphone shock mount setup
The microphone is suspended by elastic bands that reduce movement sound by absorbing vibrations.



Figure 3. Mounted Microphone setup
A traditional microphone stand is fairly heavy, but a camera tripod can be a good lightweight compact solution for reducing vibration and allowing hands free operation.

Loud sound events

There are sound sources that produce sounds of such high output that standard recording techniques and equipment may struggle to cope. Pointing a directional mic at any type of firearm at only a few feet away will almost certainly result in the equipment peaking and the sound distorting considerably. Similarly trying to record vehicles, large crowds or natural events such as thunder or large waves all need to be approached with caution if you want to capture good samples. Generally anything that might be uncomfortable for human ears will overload microphones if they are not set up appropriately. Sound travels in waves and these waves vibrate against the membrane of a microphone. A loud sound generates waves of greater intensity; this can produce vibrations too violent for a microphone to deal with. It is possible to purchase special microphones designed to capture these intense signals otherwise known as high SPL (sound pressure levels) but good placement of microphones and lower input levels can also compensate adequately for high volume sounds.

As previously mentioned scouting out a location prior to recording can be very useful. With loud sound sources it can really make the difference between a good session and total disaster. If possible, capturing some samples with different positions and different input levels can allow you choose a setup that has a better chance of succeeding.

Firearms are a particular event with various issues unique to themselves. Like all sound sources firearms will sound different depending on where and how close you place a microphone. Placing a mic too close to a firearm being discharged either in front or behind the firearm will increase the chance of distortion. Also setting recording levels very low to avoid distortion may result in anything other than the actual bang being lost. The sound of any firearm consists of far more than the explosive bang of the powder in the cartridge.

When a firearm is discharged the powder ignites and the resulting expanding gases propel the bullet forward. The actual "gun" sound is a combination of the powder explosion, the gases propelling the bullet, the sound of the bullet's movement and any subsequent echoing or reverberation of all these previous sounds. All of this happens in the blink of an eye but all the individual aspects are equally important. With input levels set low enough to allow for a clean undistorted recording of the loudest element, the bang, other elements such as the bullet travel and reverberation sounds can be lost. Recording just the bang impulse will result in sounds that are very thin and unsatisfying. These sounds may sound more like a whip crack or slap rather than a firearm. For this reason many sound recorders will approach recording firearms with a series of mics set up in different positions and set to different input levels.

Placing a mic close to the firearm itself with a high input level will allow you to capture the various stages of preparing a weapon for firing. Loading, cocking and the general movement of the firearm can all be captured by this close in mic. At the actual time of discharge this mic will certainly overload, but it will also probably capture a good sample of the reverberation and echo of the firearm after the initial impulse. A second mic placed a few feet in front of the firearm set to a very minimal input level can be used to capture the actual bang of the weapon. This would be the very minimum setup I would use to record a rifle or pistol. Optionally you could also use a stereo mic placed some meters behind the person firing the weapon set at a moderate input level to capture some general ambience of both the discharge and the resultant echoes. Any extra mics could be positioned at different locations around the shooter to capture other qualities of the sound. At the time of mixing, various of these captured sources can be edited and mixed together to create a rich full sounding firearm sound. It is not cheating to have to combine several recordings together to achieve a satisfactory final result. Some sound events are simply too complex to be captured with a single microphone and a bit of luck.



Figure 5. Multiple microphones used to record an event Using a series of microphones in different positions set to different input levels increases the chances of capturing good samples of events with very high volume levels, or just to capture a different point of view.

Complex Sound Events

While firearm sounds are made of several events that happen very quickly the main issue is with capturing the extreme volume levels. Other sound sources may have high volume levels, but the issue is the complexity of how the sound is produced. Vehicles are the best example of complex sounds that can have many issues for recording. Regardless of the type of vehicle being recorded there are several common issues that will arise. Most vehicles have the following characteristics.

- An engine sound (this is usually made up of many smaller sounds such as cylinder movement, fans, crankshaft movement and others)
- An exhaust source. Most engines have some form of exhaust output, whether it be an exhaust pipe right on top of the engine as with a F1 racing car, or traditionally at the back of the vehicle like a standard family car, or the thrust port on a jet engine or even the smoke stack on a steam train.
- Surface movement. Cars and trucks touch roads, trains run on rails and boats displace water. All vehicles create some sound as they interact with their environment. Even airplanes displace air as they move; an airplane with suddenly no engine sound will still generate a lot of sound. (Think of a dive-bombing plane from World War 2).
- Body sounds. Plastic, wood and metal all creak as they move. A wooden ship will creak quite audibly as it moves. The body of a space shuttle would vibrate quite violently during takeoff and landing and generate a lot of sound.
- Inside versus outside. The difference in a vehicle's sound inside the vehicle compared with outside is considerable. Most modern vehicles have considerable sound proofing to protect the passengers and this material greatly alters the sound. Even outside a vehicle will sound different depending on the position of the microphone in relation to the vehicle. A 360 path travelled around a vehicle will demonstrate how greatly the sound changes as you move relative to the vehicle.



Figure 6. Sound changes in different positions The sound of an engine will be very different depending on whether the bonnet is open or closed, or if you are in front of or behind a car.

Solutions

Hollywood sound recordists will often approach recording a vehicle with a team of people. Several mics will be placed around the exhaust pipe, and then several more will likely be placed under the bonnet to capture the engine. Once moving, there will likely be team members holding microphones positioned around the vehicle as it moves to further capture the event. This is very efficient on time, but obviously incurs a huge production cost. At a lower budget level, a similar effect could be achieved. Using a single stereo recording unit inside the car with one mic positioned near the exhaust and a second under the bonnet can achieve usable results. The mics need to be very well secured as a fall from a moving car will end badly for most gear. Small handheld portable recorders can work very well for positioning in unusual locations as they are self contained and have no cables or leads. Make sure you check the input levels well before you start to record as it is not practical to monitor them once the car starts moving.

Driving in a controlled environment such as an empty car park allows for quick changes of levels and alteration to setups more easily. If you need a long driving sound you can always create a looping sound at a later date. The goal of a recording session is to capture good usable material; this is most easily done when you have good control over the circumstances of a session. Doing a second pass with mics inside the car provides more material. Remember that whether it's for a game or for a film or TV project the camera will almost never be inside and outside the car at the same time. Even an unusual edit that depicts the same event from several camera angles both inside and out will be jumping back and forth and most people will not be able to tell the sound of one screech from another, so multiple passes with only a couple of microphones will usually get you the material you need.

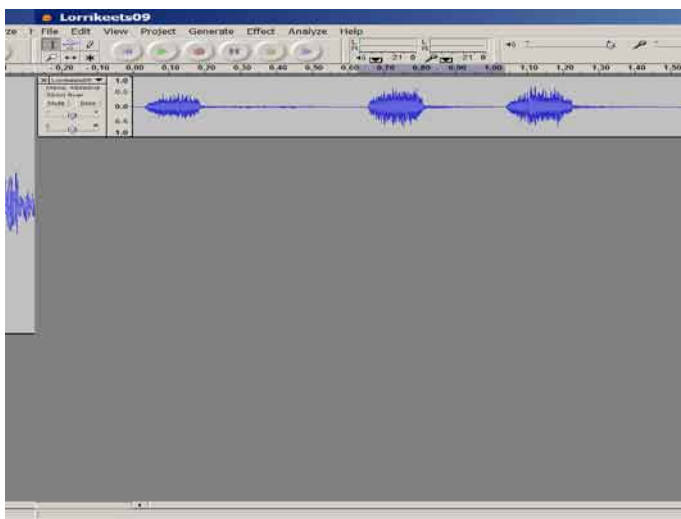


Figure 8. Handheld Recorder under the bonnet
A small self contained recorder can work very well for capturing the sounds of an engine while driving. Ensure the device is very well secured for both the sake of the device and the sake of the engine and safety.



Figure 9. Fast moving object at close proximity
The wind rush from this train made the recording unusable.

Fast movers

When recording fast moving objects externally remember to compensate for the volume level as the object gets closer. Obviously a speeding train will be at its loudest just as it passes you, planning for the volume increase is important. Better still wait while a few trains pass by and adjust your equipment to the perfect level for when you record. If you are recording a car under circumstances you control you can always ask the driver to do several passes until you get a good level. The most difficult situations are when you don't have control and an event is a one off. In these situations using more than one device set to different levels can increase your chances of capturing good material. I will usually tend to be over cautious as a soft recording is often more useful than a recording that is distorted and damaged, but it really depends on the situation.

It is very important to point out that recording fast moving objects has the very real risk to the sound recorder as well. It doesn't do anybody any favours to be putting yourself or others at risk to get a recording, and it will probably not make any difference to the final sounds anyway. When you are recording you need to be focused on what you are listening to and monitoring your levels. It is very easy to get distracted, knowing you are safely behind a barrier or that someone else is covering your back and keeping an eye out means you can do your job and not risk your neck. This is all part of working in an environment that you have control over. If nothing else, your equipment is worth too much to risk getting squished by a high speed train. Also, remember fast moving objects will usually create a fair amount of wind displacement so make sure you have a good wind shield fitted. I lost a good train sound in Japan years ago because I didn't have a good windshield and I completely underestimated how much wind the train would generate when it went past (It nearly knocked me off my feet even though I was safely behind the crossing barrier).

Location recording is all about going out and capturing the sounds you need where they occur. Sometimes this can be a fairly simple task, but often it takes planning and patience. While dynamic objects such as vehicles or moving machinery can involve some of the more difficult aspects of sound recording they also often produce some of the most impressive sounds that can be hugely satisfying if you can capture a good clean sample.

Vehicle sounds will often push your gear to its limits in both sound levels and the durability needed to survive being bumped dropped and run over. Owning a couple of cheap but sturdy mics can be a really good idea if you plan on strapping a microphone to the underside of a car while it is driving. Loosing a \$200 mic is obviously not desirable, but when compared to maybe loosing a \$2000 mic it definitely becomes the best option. Also many of the cheaper mics like a Shure SM57 will still produce good quality recordings and will probably survive falling off a moving vehicle, assuming you can find it afterwards.

As with most things good planning and careful implementation can produce good results, and if anything goes wrong, then there is always next time.