

## HEARING CONSERVATION AND PROTECTION ARTICLES

To give you an idea of how easy it is to damage your hearing, let me give you a simple comparison. The decibel level of a normal conversation is about 60. A subway is 90 decibels. A dance club is about 110. A jackhammer is 140 decibels! Guess what? So is a rock concert. 140 decibels. For Every 10 decibels, volume increases times 10. So, 20 decibels is 10 times louder than 10 decibels, 30 decibels are 100 times louder than 10 and so on. So, with a difference of 80 decibels between normal conversation and a rock concert, that would make a rock concert of 140 decibels 10milliontimes louder than normal conversation. The Occupational Safety and Health Administration (OSHA) recommend that the maximum decibel exposure for unprotected ears in 8 hours is 90 decibels. For every 5-decibel increase, the exposure time is cut in half. That means that the *maximum* exposure for 140 decibels is 28 seconds.*SECONDS!* That's a pretty sobering fact. These facts, and many more like them, are readily available on H.E.A.R.s website,<http://www.hearnet.com/index.html>.

### **Imagine, for a moment, that you must strain to hear ...**

the sounds of your favorite TV program or CD, or play them so loudly they drive everyone else from the room. Imagine that you have trouble hearing your family members from across the room or co-workers from 20 feet away. Imagine that you must also wear a hearing aid to hear your grand kids' laughter.

Unfortunately, for many workers in construction, manufacturing and other industrial settings these situations are all too real. They suffer significant hearing loss after 15 to 20 years of being subjected continually to noise from machinery, day-to-day activities, tools and traffic. Hearing loss has a dramatic impact on quality of life and also can pose safety problems on the job and off.

Fortunately, hearing loss in industrial settings and construction also is completely preventable through a combination of quieter equipment, hearing conservation programs, and use of proper hearing protection.

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### **How loud is your job?**

Noise exposures greater than 85 dB may cause hearing loss. General estimates of some work-related noises, according to the National Institute for Occupational Safety and Health (NIOSH), are listed below. Where does your job fit in?

- • Rocket launch - 180 dB
- • 12-gauge shotgun - 165 dB
- • Jet engine at takeoff - 140 dB
- • Ambulance siren - 120 dB
- • Pneumatic percussion drill - 119 dB
  - • Hammer drill - 114 dB
  - • Chain saw - 110 dB
- • Continuous miner - 108 dB
- • Bulldozer; spray painter - 105 dB
  - • Impact wrench - 103 dB
  - • Hand drill - 98 dB
  - • Tractor - 96 dB
  - • Belt sander - 93 dB
- • Hair dryer; power lawnmower - 90 dB
  - • Ringing telephone - 80 dB
  - • Normal conversation - 60 dB

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### **General Facts About Hearing Loss**

#### **What is a Temporary Hearing Loss (Temporary Threshold Shift)?**

With a temporary hearing loss, normal hearing will usually return after a rest period away from all sources of intense or loud noise. The recovery period may be minutes, hours, a day or perhaps even longer. It is believed that a temporary hearing loss occurs when hair cells in the inner ear have been bent by vibrations and need time to bounce back, or when the fluid in the inner ear has changed chemically because of over-stimulations, and needs time to revert to its original composition.

#### **What is a Permanent Hearing Loss (Permanent Threshold Shift)?**

A permanent hearing loss is the result of hair cells or nerve destruction within the cochlea. Once these important parts of the hearing process are destroyed, they can never be restored or regenerated. The resulting permanent hearing loss, also referred to as permanent threshold shift (PTS), can range from slight to total hearing loss.

#### **The following factors determine the degree and extent of hearing loss:**

- Type of Noise – continuous, intermittent, impact, high or low frequency
  - Intensity of Noise – level of loudness
- Duration of Exposure – length of time subjected to noise, and over time how often subjected to noise
  - Type of Noise Environment – enclosed, open, reflective surfaces
- Distance from Ears to the Source of Noise – earphones in the ear, centimeters from the ear, meters, etc.
  - Physical position/posture relative to the noise source
    - Age of listener
    - Individual Susceptibility
    - General Health of listener
- Number of other Exposures to Noise – at home, in the workplace, during recreational/leisure activities, etc.

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|              |     |
|--------------|-----|
| Jet Take Off | 150 |
| Gun Shot     | 140 |
| Jack Hammer  | 130 |
| Car Stereo   | 120 |
| Headphones   | 110 |
| Factory      | 100 |
| Subway       | 90  |
| Busy Street  | 80  |
| Restaurant   | 70  |
| Conversation | 60  |

decibels

**Sensorineural** hearing loss is the result of damage to the inner ear and accounts for over 90% of hearing loss in adults. This type of hearing loss is generally permanent.

Causes of Sensorineural hearing loss include:

- Deterioration of hair cells due to exposure to loud sounds or aging
- Deterioration of nerves pathways that transmit signals to the brain, most commonly caused by a tumor pinching the nerves
  - Trauma to the head
- Infection that reaches the inner ear
  - Heredity

**Sensorineural hearing loss** that is irreversible– and unnecessary is caused by loud, sudden noises and are more damaging to hearing than regular and extended exposure to loud sounds over a period of time

It is generally thought that loud noises in excess of 90 decibels are harmful to hearing over prolonged exposure. Using the correct ear protection can prevent needless and permanent damage to hearing.

**Conductive hearing loss** occurs when there is damage or blockage in the outer or middle ear, preventing sound from traveling normally through the ear canal to the inner ear. This type of hearing loss can often be corrected.

Causes of Conductive hearing loss include:

- Fluid build up, often due to ear infection
  - Ear wax
- Perforated ear drum

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#### **Now hear this!**

**Big Ear Inc. CEO Glenn Hood on the importance of hearing protection.**

As a motorcycle owner, you know firsthand how uncomfortable the noise associated with riding can be; both the sound of the bike, and the roar of the wind in your ears. After a ride you may experience ringing in your ears, a full feeling in your head and maybe even dullness in your hearing. These symptoms are a natural reaction to excessive and damaging noise, almost like your body is trying to make its own ear plugs.

Whether you ride a dirt bike or a street motorcycle, protecting your hearing is a must. Exposure to noise levels over 80 decibels for more than a few minutes can start to cause irreparable hearing damage, and motorcycles can easily produce sounds of 100 decibels or more — levels that can damage hearing even in very short exposures. That's why it's so important to wear hearing protection when you ride. Most people aren't aware that hearing damage is not reversible — there's no cure. But there is some good news: hearing loss can be prevented.

Many riders incorrectly assume that by wearing a helmet, they're doing enough to protect their hearing, but that's simply not true, because helmets are designed to protect heads, not hearing. In fact, studies have found that a helmet only reduces noise levels by about four decibels. In some cases, believe it or not, noise levels can actually increase while wearing a helmet. Now, tolerance to sound and frequency levels differ from person to person, but in many cases a helmet can amplify hearing-damaging frequencies to unsafe levels (whistling caused by the helmet's design, weather, speed and additional noises around you).

Thankfully, when it comes to protecting their hearing, riders have several options. These range from inexpensive disposable earplugs all the way up to the custom-molded variety designed specifically for motorcyclists. Molded earplugs work remarkably well because they're the exact shape of your inner ear, and as a result they

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block out more sound and wind. If you already have some hearing damage, but find that solid plugs block out too much noise, check into the filtered options that molded earplug companies sell.

If more motorcyclists wear hearing protection, they're not just protecting their own hearing, they're also setting a positive and healthy example for the next generation of riders.

### **Glenn**

*Glenn Hood is CEO of Big Ear, Inc., a leading custom earpiece manufacturer on the forefront of hearing health technologies.*

*Let us know what kind of earplug works best for you.*

\* Allstate Insurance Company is not affiliated with Glenn Hood or Big Ear, Inc.. Allstate makes no warranties or representations and is not liable for any goods or services provided by this individual or organization. The views presented here do not necessarily represent the views of Allstate.

- See more at:

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**Big Ear Stereo Plugs Can Save Your Hearing**

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Big Ear Inc. manufactures custom-molded in-the-ear stereo plugs especially designed for motor sports enthusiasts. A soft inner acoustic material combined with a hard outer shell provides the maximum noise attenuation available with a passive system. Big Ear stereo plugs were originally conceived for motorcycle riders but can be incorporated into many existing aviation systems as a direct replacement for the standard ear cups. They can be used to provide audio communications with any type of helmet or flying head gear.

Glenn Hood developed Big Ear plugs as a way to reduce the pain experienced from wind noise when he rode their motorcycles across country. Glenn, suffering from tinnitus (ringing in the ears), already knew the strain of having constant noise in his head, so he wanted to help others avoid such problems. Their stereo ear plugs have been designed to be tough and rugged and are completely repairable. The wires can't pull out of the earplug due to the nature of the design, and the leads incorporate a Kevlar thread for toughness. The stereo ear plugs are tuned for voice communications, but many riders also use them for music.

The company has already sold over 40,000 sets of earphones, creating its own niche in the market. It now produces a complete line of custom earphones and earplugs for a variety of uses including custom inserts for the popular [Lightspeed Aviation](#) in-the-ear headsets. Learn more about the wide range of products at [www.BigEarInc.com](http://www.BigEarInc.com).

All Big Ear stereo plugs are custom made and require a mold to be made from your ear cavity. Big Ear products and representatives are available across the country at many local, regional, and national trade shows and events including EAA AirVenture Oshkosh. A list of local providers can be found [here](#), and Big Ear also offers a do-it-yourself home kit for making the casts. Contact Big Ear at 719-271-9081 or e-mail Glenn Hood at [ghood@bigearinc.com](mailto:ghood@bigearinc.com) for more details. Ask about the affiliate online sales program if you operate an aviation website. The stereo earplugs for motor sports depicted in the photo above (model BE-1C) are priced at \$349.95.

### **Big Ear Protection**

Constant loud noises, such as riding a motorcycle, will deteriorate our hearing over time. It's not necessarily the exhaust sounds we have to worry about; wind noise can wreak havoc on our auditory system. By the time we notice there may be a problem, it's often too late and there is almost nothing that can be done once our hearing has been compromised. The best bet is to protect our hearing before the damage is done.

While on the road this spring we ran into our old friend, Ann Marie, who takes hearing loss seriously. She works with Big Ear Inc., a company that is dedicated to protecting our precious hearing through its products



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as well as education. We got a chance to meet up with Glenn Hood, the founder and CEO of Big Ear. We explained how our squishy, store-bought ear plugs just weren't cutting it; the plugs don't fit well, break down over time, and can be uncomfortable under a helmet.



02. The first step was to put a barrier (foam) in the ear to prevent the molding material

Glenn understood and suggested we try a set of custom-made earplugs for our ride back to L.A. Within the hour we were all set up with custom-fitted earplugs. Big Ear also makes custom-fit stereo earplugs that can be used in a variety of situations from shooting activities, to industrial, to motorcycling. We got fitted for a set of Stereo Ear Plugs as well. About 10 days later they arrived in the mail.

We really wished we had gotten some of these earplugs sooner. Wow! What a difference. No more ringing ears at the end of a ride. The Stereo Ear Plugs sound amazing and perfect for either using on your non-audio equipped bike or just lounging around the pool. Follow along as we take you through the basic steps of making custom stereo earplugs, the Big Ear way.

Call (866) 661-2041 or log on to [bigearinc.com](http://bigearinc.com) for more information.



03. Glenn gently pushed the barrier into Toph's ear. The string is for easy removal later



04. Glenn then injected the molding material into each ear. In about 10 minutes the silic

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06. There are a variety of colors to choose from for the ear plugs (BE-SP, Ear Plugs \$84).



05. Here are the custom fit Big Ear BE-1C Stereo Ear Plugs (\$349.95). The flat outside bl



07. A view of how low-profile the Stereo Ear Plugs are. They are very comfortable to wear

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08. Likewise, the Ear Plugs are comfortable and easy to use. We wouldn't leave home again without them.



08. Likewise, the Ear Plugs are comfortable and easy to use. We wouldn't leave home again

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<http://www.fireworld.com/Archives/tabid/93/articleType/ArticleView/articleId/86956/Big-Ear.aspx>

### Big Ear

Ear protection for firefighters in development  
Volume 24, No. 1

#### Related Images



When most emergency responders talk about interoperability, they are usually referring to multiple radio users operating on different frequency bands. Captain Bill Salmon of the Poudre Fire Authority (PFA) in Fort Collins, CO, says that interoperability is even more basic than that.

"At the fire or emergency scene there is an awful lot of noise that gets in the way of being able to communicate," Salmon said. "Many NIOSH line of duty death reports usually have communication at the heart of the problem."

Big Ear Inc. of Colorado Springs, CO, specialist in hearing health technology, is working on a solution. Using Big Ear custom-molded earpieces, the firefighter receives radio traffic through his left ear at low volume. Meanwhile, the right ear is protected by a noise filter which limits noise above 85 decibels.

In 2007, the fire authority conducted a hearing enhancement and protection study that focused on battalion chiefs, captains and driver/operators. Today, all 151 line personnel with the Poudre Fire Authority wear this earpiece combination.



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"So what we have is hearing protection that most of the guys are using for non-emergencies and during training," Salmon said. "That gives them coverage most of the time."

Ear protection in industry is nothing new. With regard to extending that protection to firefighters, Big Ear innovator and CEO Glenn Hood sites the following statistics:

- According to OSHA, 5.2 million American workers in the manufacturing industries are exposed to average noise levels of 85 decibels (dB) - the level considered hazardous.
- One million workers of these manufacturing industry workers have sustained job-related hearing loss, and about one-half million of these have moderate-to-severe hearing impairments.
- More than 9 million American workers are exposed to noise levels above 85 dB when all noisy jobs are considered. These include, but are not limited to, the military, mining, construction and transportation industries.

That list of noisy jobs should include fire fighting, Hood said.

"Firefighters are losing communication and can't understand a sent message," Hood said. "Noise gets loud, sirens go off. The guy operating the pump can't hear above the pump noise. The guys fighting the fire can't hear the radios on their shoulder."

Big Ear, Inc. was born in pain – literally! Glenn Hood was looking for a way to reduce the pain experienced from wind noise when he rode their motorcycles across country. Nothing worked till he saw an early prototype of what was to eventually become Big Ear, Inc.

When they saw this early use of silicone to make custom fit ear plugs, they realized its potential and decided to find a way to help others solve their same problem – noise induced hearing loss. Glenn, suffering from Tinnitus, already knew the strain of having constant noise in his head so wanted to help others avoid such problems.

Big Ear, Inc. became a reality in 2003. As a consequence of their hearing conservation efforts for motorcyclists, Big Ear, Inc. now enjoys a national reputation for quality and exemplary customer service as described frequently in the many product reviews that have appeared in major trade publications.

Big Ear, Inc. has adapters for customized applications for every major Bluetooth headset model; is developing a Bluetooth product that will convert any Bluetooth application to a customized solution (patent pending); introduced new products for gamers and pilots; working on an electronic compression circuit for shooters, military, swat and security forces that includes a Bluetooth "no mike" application that can be modified to the wearer's specific preferences and has a custom fit.

Big Ear, Inc. is also one of the leaders on the forefront of hearing health technologies. In 2007, Big Ear, Inc. incorporated International Hearing Conservation Awareness Foundation, as a not-for-profit organization for the purpose of furthering noise induced hearing loss education supported by a research grant from industry and government.

Testing done the Poudre Fire Authority during live fire training exercises show that custom molded earpieces significantly increased the ability to hear. Salmon said the research extends to how the firefighters process the information and, in turn, communicate with other crew members.

"It's a very complex process," he said. "The communication issues we are working through involve many human factors. You have to track how the firefighters react in a multi-stimulus situation, performing at the expected task levels while managing communications with other members of the team."

The Poudre Fire Authority training delivery model includes using six facilitator companies to deliver training to the other 30 companies. The curriculum includes properly fitting Big Ear earpieces, interlacing the components within the PPE, responding to emergencies with earpieces in place and managing cognitive work loads once firefighters can consistently hear their radios.

While fire scene communications are the focus for review, the required final practical evolutions also include simulated fire conditions at an acquired structure, where positive-pressure attack and mayday evolutions are involved. No firefighter receives their components without this training and practical

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exercise.

"Fire responders have tolerated an unacceptable level of sounds and alarms that make it difficult to use their lapel mikes and radios at the scene," Salmon said. "Communications become unreliable. But using this ear piece we have the ability to communicate while reducing the redundancy of repetitive radio traffic. People realize they don't have to shout to be heard."

Salmon's PFA team and Big Ear are still working out technical bugs with the new system. Big Ear has been meeting with equipment designers over the past six months to reach a standardized design that will allow the Big Ear system to connect to any brand or model of radio that various departments are using.

Another issue to resolve is that in order for Big Ear to reach maximum effectiveness each firefighter has to be fitted for custom-made earpieces. Ear buds are simply not as effective, although they can be used on a temporary basis, Hood said.

"Audiologists have years of extensive training to do this," he said. "Departments don't want to do ear impressions on each firefighter at \$50 apiece. What we propose is training fire department personnel to make ear impressions."

As a comparison, OSHA requires fit testing of the facepiece of self-contained breathing apparatus. Many fire departments today perform the required fit testing procedure themselves rather than bring in expensive outside experts.

More research is the only solution, Hood said.

"Firefighters have tolerated this situation because nobody has wanted to step up and do the research," Hood said. "In doing this research, we have accepted the challenge to make this happen."

For more information about Big Ear, Inc., call 719-271-9081 or visit [www.bigearinc.com](http://www.bigearinc.com). Visit Big Ears in Booth 41 of the IFW Conference & Exposition in March.