LRAD SAFETY POSITION STATEMENT

In response to safety concerns associated with LRAD's use as a communications tool by law enforcement, we offer the following position statement. LRAD is not a "sonic weapon"; LRAD is a highly intelligible communications system and a safer alternative to non-lethal measures. LRAD fills the critical gap between the limited range and poor vocal clarity of bullhorns and vehicle P.A. systems, and non-lethal measures including tear gas projectiles, rubber bullets, pepper balls, Tasers and flash bang grenades.

Unlike bullhorns, megaphones and vehicle P.A. systems that have limited broadcast range and poor voice intelligibility, LRAD systems deliver live or prerecorded voice messages with exceptional clarity to individuals and large crowds over short and long distances. LRAD systems safely establish standoff zones, inform and direct, prevent misunderstandings, resolve situations without the use of kinetic force, and can save the lives of both the public and officers during elevated risk operations.

LRAD operators are trained in the proper use of the device and have complete control of the audio output through a prominently positioned volume control knob. Unlike tear gas, Tasers, rubber bullets, pepper spray, mace and flash bang grenades, LRAD is non-kinetic and does not fire projectiles that could injure, incapacitate or kill. During protests, LRAD systems have proven very effective in assisting officers to clearly communicate their instructions and warnings to demonstrators and resolve uncertain situations with minimal property damage and fewer arrests. Clear, concise safety instructions are printed prominently on the back of every LRAD system to ensure operators have immediate access to required information.

Like all loudspeakers, LRAD's audio output is measured in decibels (dB) at a distance of 1 meter in front of the device. LRAD voice and alarm tone broadcasts follow the inverse square law, which teaches that for every doubling of the distance from an audio source, sound pressure levels (SPL) diminish by 50% (6 dB).

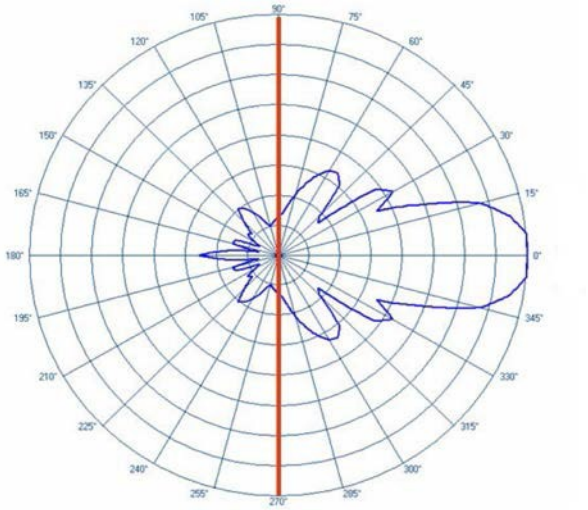
When used properly, LRAD broadcast levels are kept below the threshold that could cause permanent hearing damage from instantaneous exposure. Hearing damage is a factor of exposure time, frequency and intensity of the sound/audio broadcast. We note that ambulance and fire engine sirens measure 130 dB. We also note that police and military organizations use

flash bang grenades, which emit an instantaneous burst of up to 175 dB, exponentially louder than LRAD systems used by police.

When LRAD is activated at close range, if any individual experiences audible discomfort they either quickly cover their ears and/or move away. Just the act of covering the ears with hands reduces the SPL approximately 25 dB. By covering their ears, the maximum SPL individuals could be exposed to at 10 meters is less than 100 dB, 15 dB less than what rock concert fans willingly listen to for several hours. Per the inverse square law, every doubling of distance from a sound's source decreases the SPL by 50%. This law, combined with LRAD's 30-degree directionality, allows individuals to quickly move away from LRAD's focused broadcasts.

OSHA allows exposure to 115 dB of noise for up to 15 minutes per day. LRAD systems have been tested to ensure that operators standing behind the device are exposed to no more than 105 dB during normal operation.

Operators are instructed to wear hearing protection due to the potential for reflected sound to increase the SPL behind the device and when LRAD is used for extended periods.
In front of the LRAD 100X and LRAD 450XL systems, SPL falls below 115 dB at approximate ranges of 10 meters and 28 meters respectively.



Sound behind LRAD unit is over 40 dB less than the on-axis forward output.

For larger LRAD systems, the operating manuals clearly state that targeted groups and individuals must be 75 meters away for safe operation at higher volume settings. OSHA prohibits exposure to bursts of noise above 140 dB. If groups and individuals are 75 meters away from an LRAD system, they will not be exposed to anywhere near these levels, even when the devices are at maximum output. For operators standing behind the device, LRAD noise exposure is minimized with the use of LRAD provided foam earplugs. We strongly recommend safety and operator training before deploying LRAD systems and accessories.

Qualified operators must ensure the area immediately in front of LRAD is clear before activating the system and that the volume control is NOT set at maximum (the RED zone of the volume knob's scale). LRAD operators must ensure the device is positioned, aimed and operated in a

manner that avoids exposing nearby personnel and bystanders to excessive SPLs for extended periods.

Using Penn State University's widely accepted Applied Research Lab analysis below, we have posted safety information on the back of every LRAD system and included it in each LRAD manual to ensure system operators use LRAD systems safely and effectively.

Appendix 2 – Hearing Damage Risk Criteria

Damage risk criteria (DRC) are used to specify a maximum allowable noise level (MANL) and the maximum allowable exposure time (MAET) to prevent the occurrence or reduce the progression of an existing noise-induced hearing loss (NIHL). The MANL depends on the maximum acceptable occupational hearing loss (MAOHL) and excess risk defined as the difference between the percent of people that exceed the MAOHL in an occupational noise-exposed minus an unexposed population. The MAET is typically an 8-hour day and is reduced if the noise level exceeds the MANL using a time/intensity relation called the exchange rate (ER).

The DRC used by the Occupational Health and Safety Administration (OSHA) uses a MAOHL >25 dB for both ears averaged over 1000, 2000, and 3000 Hz and a MANL of 90 dBA for an 8-hour day and a 5 dB ER. That is, if a noise is >90 dBA then the MAET is reduced by one-half for every 5-dB above the MANL (e.g., 8-hrs at 90 dBA, 4-hrs at 95 dBA, 2-hrs at 100 dBA, etc.). The MANL is 115 dBA regardless of the MAET. The 5-dB ER is based on the premise that noises that produce equal amounts of temporary threshold shift also produce equal amounts of permanent threshold shift or NIHL.

The most recent DRC used by the National Institute for Occupational Safety and Health (NIOSH) uses a MAOHL >25 dB for both ears averaged over 1000, 2000, 3000, and 4000 Hz. The DRC used by the ACGIH and in MIL-STD 1474D use a MAOHL (called the threshold limit value) >25 dB for both ears averaged over 500, 1000, 2000, and 3000 Hz. The NIOSH, AGCIH, and MIL-STD are more conservative than the OSHA DRC because they all use a MANL of 85 dBA for an 8-hour day and a 3 dB ER. That is, if a noise level is >85 dBA then the MAET is reduced by one-half for every 3-dB above the MANL (e.g., 8-hrs at 85 dBA, 4-hrs at 88 dBA, 2-hrs at 91 dBA, etc.). The 3-dB ER is based on the premise that sounds having equal amounts of energy will be equally hazardous and is more strongly supported by research compared with the 5-dB ER. The ACGIH DRC was designed to protect the median population against a MAOHL >2 dB after 40 years of occupational noise exposure. Further, the ACGHI specifies a MANL of 80 dBA for a 24-hour day with a 3 dB ER so that at 139 dBA the MAET is .11 seconds.

Even though several studies have been conducted and national and international standards have been developed, it is very difficult to define excess risk due to several variables including the statistical modeling method, type of noise, MAOHL, age, gender, race, exposure level, and years of exposure. Table 1 shows mean and 95% confidence interval (CI) 1997 NIOSH excess risk estimates for the MANLs of 85 and 90 dBA for 5 to 10 and >10 years of exposure for workers 30 and 60 yrs old (Prince, M.E., et.al., (1997). A re-examination of risk estimates from the NIOSH occupational noise and hearing survey (ONHS). *Journal of the Acoustical Society of America, 110(2)*, 950-963.). Because the Table 1 excess risk estimates are based on the NIOSH MAOHL that includes 4000 Hz, excess risk estimates for the OSHA, ACGIH, and MIL-STD 1474 MAOHL that does not include 4000 Hz would be slightly lower.

Table 1- Excess Risk Estimates (95% Confidence Interval)

		5 to 10 yrs of Exposure		>10 yrs of Exposure	
		30 yrs old	*60 yrs old*	*30 yrs old*	*60 yrs old*
Daily dBA Time Weighted Average Noise Exposure	85	1.4% (.3-3.2%)	4.9% (1.0-11.5%)	2.3% (.7-5.3%)	7.9 (2.3-16.6%)
	90	5.4% (2.1-9.5%)	15.9% (6.2-26.2%)	10.3 (5.8-16.2%)	24.7 (14.9-34.3%

For military personnel the ACGIH/MIL-STD 1474D DRC (85 dBA MANL, 3 dB ER) should be used for determining LRAD safe operating noise levels. Considering the majority of military personnel potentially using the LRAD will be <30 years old and have <10 years of occupational noise exposure they will be at very minimal risk (about .3 to 3.2%) for NIHL. If the LRAD noise level exceeds the ACGIH/MIL-STD 1474D DRC, military personnel can use a hearing protection device to remain at very minimal risk for NIHL.

The OSHA DRC (90 dBA MANL, 5 dB ER) should be used for determining LRAD safe operating noise levels for non-military personnel. Even though the excess risk levels for the OSHA DRC are higher than the ACGIH/MIL-STD 1474D DRC, non-military personnel will still be at minimal risk for a NIHL especially if they are younger and have less years of occupational noise exposure (2.1 to 9.5%). In addition, the OSHA DRC is the mandated DRC used by the U.S. industries. As such, the U.S. Department of Labor (OSHA) has accepted the excess risk estimates to prevent the occurrence or reduce the progression of a NIHL due to occupational noise exposure.

Note: Acoustic safety standards are stated relative to average human hearing thresholds, dBA.