

Revised: May 2021

LRAD – Long Range Acoustic Device

Police Negotiation Team – LRAD training



OVERVIEW

- Introduction
- Application
- Deployment
- Equipment
- Policy



INTRODUCTION

LRAD 100X



BACKGROUND

- Long range communication system.
- Designed to safely broadcast in a wide variety of situations.
- Ability to safely communicate beyond standoff distances
- Safer alternative to kinetic force measures.

KEY FEATURES

- Portable – can be mounted on a tripod or vehicle.
- 20-30 decibels louder than typical loudhailers or vehicle P.A. systems.
- Live or recorded broadcasting.
- Highly intelligible communication capability up to 600 meters.
- Focused, directional sound pattern for targeted communication.
- Voice broadcasts penetrate buildings & vehicles.
- Optional aversion tone – provides a non-lethal deterrent, capacity to escalate Police response to gain attention or change the subject's behaviour.

LRAD 100X

The lightest, most intelligible voice communication system available. Hand-portable and easily mounted on tripods and vehicles, the LRAD 100X broadcasts voice messages over background noise with exceptional clarity out to 600 meters.

Maximum range 600m in ideal conditions. Operational range up to 250m over 88dB of background noise. Range is based on continuous output.

In addition to featuring best in class broadcast voice intelligibility, the LRAD 100X is 20 – 30 decibels louder than typical bullhorns and vehicle-based P.A. systems. Live or recorded broadcasts from the portable LRAD 100X are clearly heard and understood above background noise. Optimized driver and waveguide technology coupled with power efficiency ensure several hours of clear, continuous communication. The LRAD alert tone safely alerts attention to the voice messages that follow in every incident scenario.

FEATURES

- 8-hour rechargeable battery (2hrs of continuous use at maximum volume)

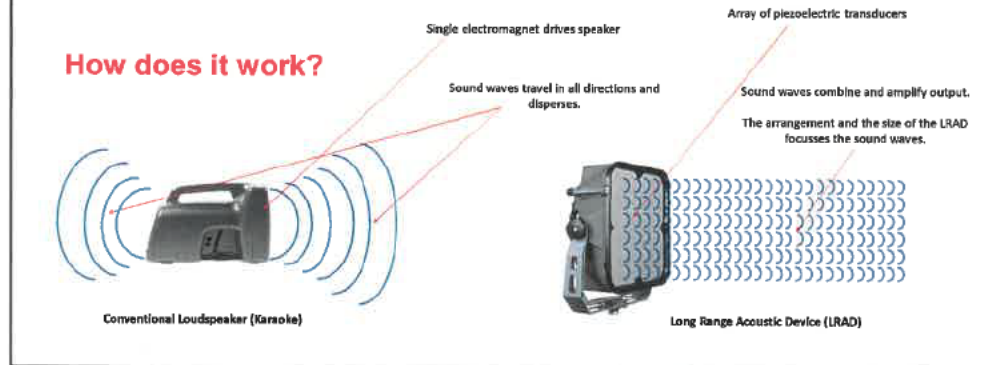
- Simple user interface
- Water resistant

DIRECTIONALITY, POWER EFFICIENCY & RANGE

- Highly intelligible communication out to 600 meters
- Focused, directional sound pattern for targeted communication
- Voice broadcasts penetrate buildings & vehicles to ensure warnings, commands, and notifications are clearly heard and understood

INTRODUCTION

How does it work?



Sound waves can pass through one another without much distortion or change. But in the right conditions, sound waves can change each other dramatically. For example, identical sound waves that are **out of phase** (their compressions and rarefactions are reversed) can cancel one another out. On the other hand, identical waves that are **in phase** combine their compressions and rarefactions, doubling their amplitude.

As sound waves travel, they spread out in all directions in a curved **wave front**. The farther they travel from the source, the more they spread and the quieter the sound becomes. But high-frequency waves don't spread as much as low-frequency waves. Also, waves with long wavelengths generally travel farther than ones with short wavelengths.

Instead of using one big, moving device to make sound, the LRAD uses lots of little ones. A [speaker](#) usually uses one rapidly moving diaphragm to make sound. The LRAD uses has an array of **piezoelectric transducers**. A transducer is simply a device that changes one kind of energy into another kind of energy. In this case, it changes electrical impulses into sound.

All of these transducers are attached to a mounting surface. They're staggered to allow more of them to fit into a

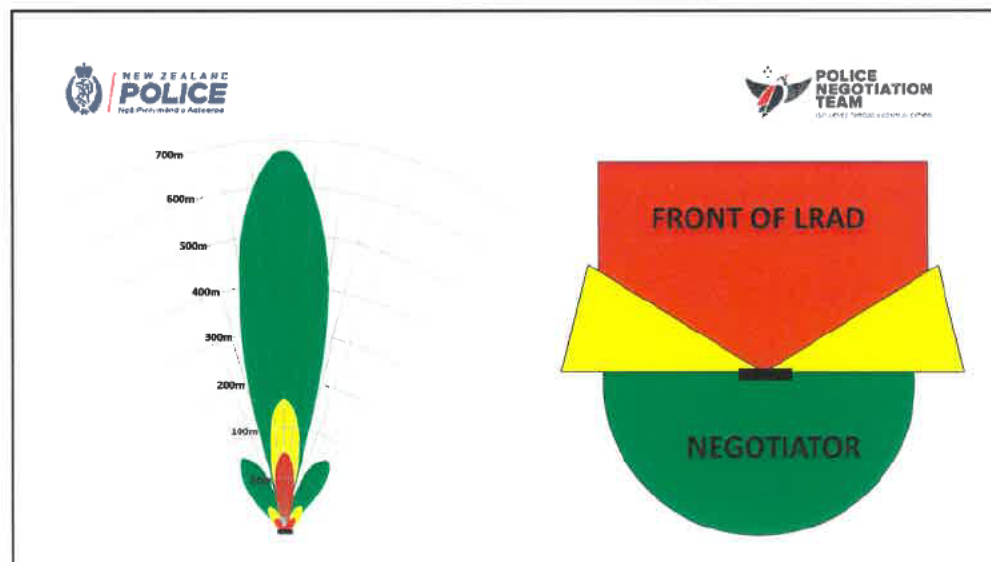
smaller space. This helps the LRAD create very loud sounds -- identical waves emerge from the transducers, and their amplitudes combine to create louder sounds.

So that's how the LRAD creates lots of volume. But the sound coming from the LRAD is also relatively **directional**. It doesn't disperse as much as sounds from typical speakers. People behind or next to the device still hear the sound, but not as loud. Even outside the beam, the sound can still be loud, so operators and nearby personnel often wear ear protection.

The LRAD uses the phase of the sound waves, the size of the device and the properties of air to create more directional sound: The outer transducers are not completely in phase with the inner transducers. The sound waves interact with one another, cancelling out some of the outermost waves and making the sound less audible outside of the "beam."

The device's diameter is larger than most of the wavelengths it produces. This allows the device to create a wave front that's more flat than rounded, keeping the sound from dispersing.

Air interferes with sound waves as they pass through it. As the LRAD's sound waves interact with the air, they create additional frequencies within the wave. Such waves are referred to as **parametrically generated**, and many speakers try to prevent them. The LRAD uses them to create a greater range of pitches and to add volume.



By design, the LRAD® transmits a focused, narrow beam (+/- 15°) of sound directly ahead of the device with up to 40 dB reduction in sound pressure levels to the sides and behind the device, as can be seen in the diagrams. International health and safety standards allow exposure to 115 dB of noise for up to 15 minutes per day.

The design of the LRAD® ensures that the operator standing behind the device is exposed to no more than 105 dB during normal operation (i.e. about ten times lower than the maximum permitted). However, operators should wear hearing protection (such as foam ear-plugs) so that they experience no discomfort due to the potential for reflected sound to increase the sound pressure level behind the device or in the event the system is operated for extended periods.



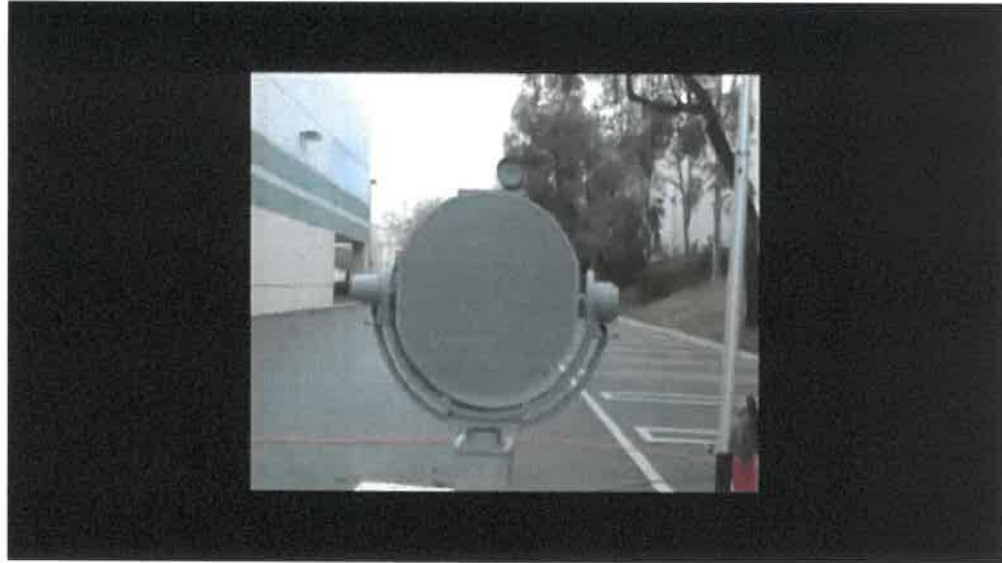
LRAD Promotional

**LRAD: GAME CHANGER
FOR LAW ENFORCEMENT
COMMUNICATIONS**





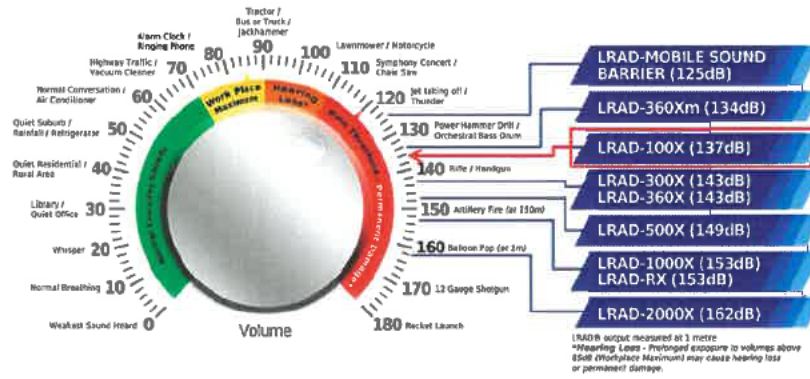
LRAD demo – Focused sound





LRAD demo – Helicopter use

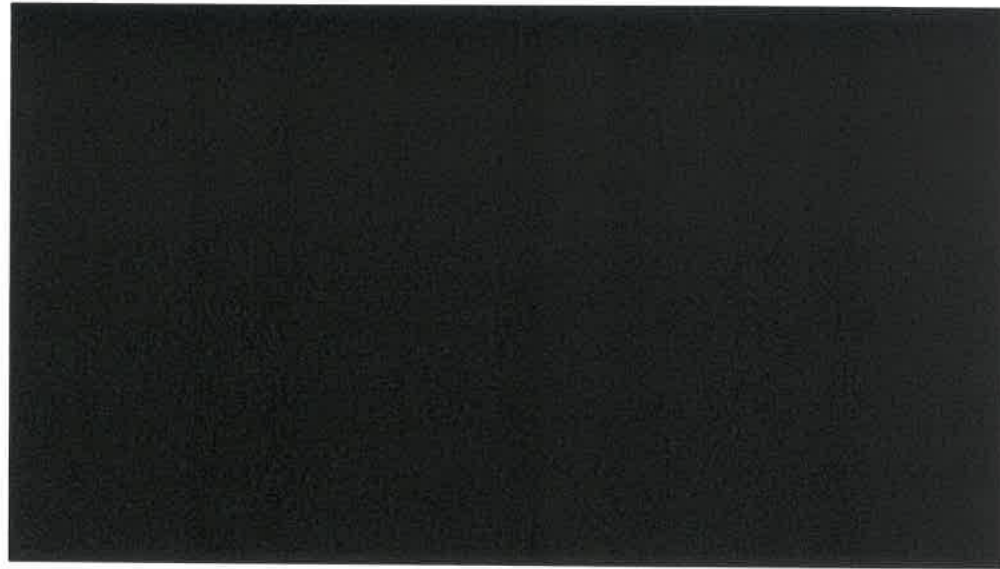




LRAD® output measured at 3 metre.
 *Hearing Loss - Prolonged exposure to volumes above 85dB (Worldwide Maximum) may cause hearing loss or permanent damage.



LRAD use - G20 protests





LRAD APPLICATION

Uses

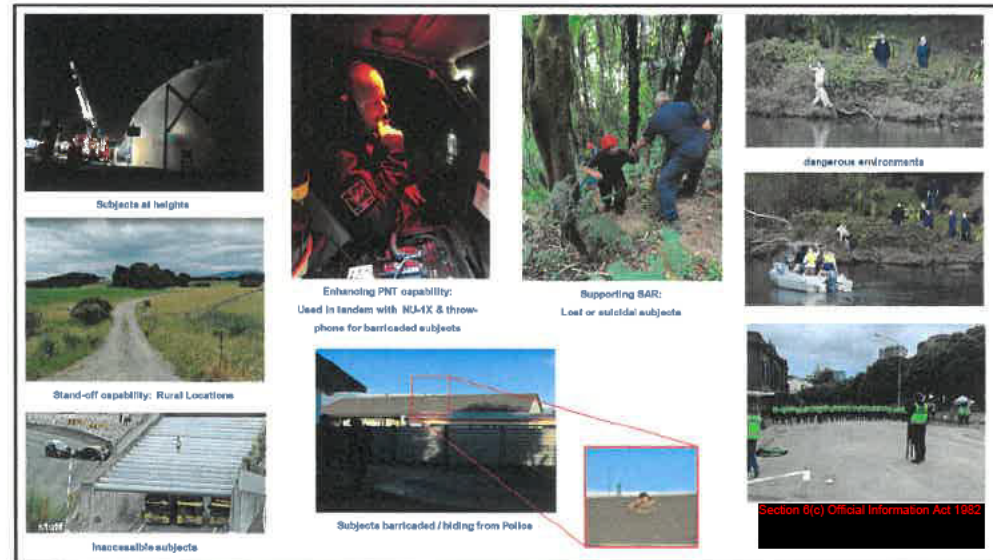


LRAD available for deployment by PNT in support of:

- District operations where AOS/STG are utilised.
- Crisis intervention.
- Search and rescue.
- Public Order Policing – District operations where PSU is utilised.
- Cell extractions.
- High risk warrants.
- Civil Defence emergencies & disaster management (COVID, Tsunami etc).
- Useful in helping end hostage situations and barricaded subject situations.
- Allows clear communication from Police to subject.

Advantages Include:

- Greater stand-off distance compared to Karaoke.
- Negotiator and LRAD can be in cover – sound penetrates buildings & vehicles.
- Can be operated from platforms such as vehicles and helicopters.
- Broadcasts can be clearly heard over surrounding noise.



PNT supporting PSU units with protesters at the s.9(2)(a) OIA

Not used with aversion tone, but used to be able to warn trespassing protesters.

Court cases have previously struggled to gain a conviction due to evidence as to whether the defendant heard the warning to leave, prior to arrest.

Evidence can be given by qualified PNT member trained in the LRAD regarding it's use and the fact that the sound will penetrate objects meaning the protester can't not hear it.

Rural Negotiation – s.9(2)(a) OIA

Three subjects inside the lounge of a farm house in a rural location.

Around midnight AOS surround the house and the LRAD is set up at the start of the driveway, approximately 350m away from the house. A stand of thick trees is between the LRAD and property.

LRAD commences – the occupants can hear the dialogue and can't work out where it is coming from. Once they hear that Armed Police are outside, one person comes to the door to look and is challenged.

When spoken to afterwards, they state that they could hear the PNT member clearly and believed that the voice was coming from within the lounge.

They thought that Police had a secret tech ability that allowed remote access the speaker on the cell phone (which had been on the coffee table at the time) – They even removed the battery to ‘stop the voice coming from the phone’.

Shots fired within residential address s.9(2)(a) OIA

Family Harm incident – male has argument with his partner in the lounge of their two-storey s.9(2) OIA house. He goes upstairs, takes a .22 and fires two rounds through the floor into the lounge. Female leaves.

House is located s.9(2)(a) OIA

LRAD is setup for wireless operation, setup on tripod and placed on back seat of AOS vehicle. PNT member in separate vehicle at rear of stack.

Vehicles leave SFP to deploy hard cordons on target house. PNT member stops short at intersection, 250m away.

AOS drive to address and place LRAD on driveway. Appeal commences.

Initially no response from subject so aversion tone used. Male comes to back door and is challenged before being taken into custody.


Wireless connection worked flawlessly at that distance (had previously been tested during training at 400m).

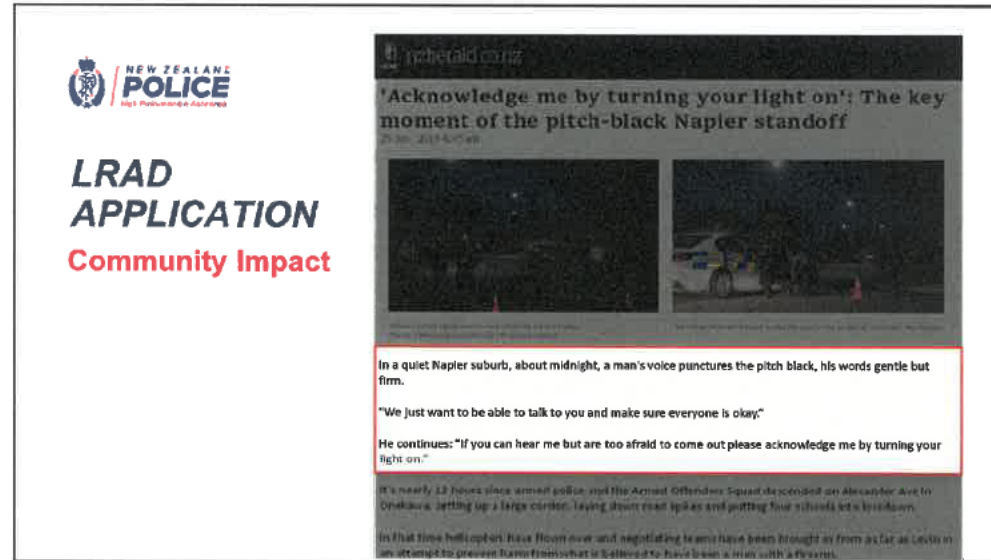
s.9(2)(a) OIA – LRAD on standby (but not deployed)

Male on top of the s.9(2)(a) OIA in Wellington. LRAD was brought down from Palmerston North, however was not utilised do to the excellent work done by the primary negotiator.

s.6(c) OIA

s.6(c) OIA





24th June 2019 – Male has fired a shotgun in public before going to his house. Partner and baby are also inside. Area cordoned off around 3pm. Manawatu PNT contacted to assist at 5pm.

LRAD deployed forward (by PNT) to be used in **s.6(c) OIA** and throw-phone.
LRAD set up in property opposite to the target address, throw-phone thrown onto front doorstep.

LRAD commences and used to enable male to retrieve throw-phone, before convincing male to accept the phone call from PNT.

LRAD was able to project empathy and a calm voice to help build trust and rapport.

Members of the public also reassured by the tone and delivery used with the LRAD.

LRAD APPLICATION

Uses



First option or alternative to deploying kinetic measures including:

- Tear gas projectiles.
- Sponge/rubber projectiles.
- Flash bang grenades.

Advantages as alternative to above:

- No damage to dwellings buildings.
- Lower community impact.



NOTE

- The LRAD is a one way communication tool.
- It needs to be used as part of an overall communication strategy

LRAD OPERATION

Deployment



Setup of LRAD:

- Consider whether used in conjunction with tripod or magnetic mount.
- Consider whether used wired or wireless. Check transmitter battery capacity.
- Ensure battery is charged and connected. Backup battery available.
- Connect wireless receiver to the LRAD or
- Connect 20m lead, hand-held control module and 'record-on-the-fly' microphone.
- Connect LRAD to mounting system.
- Check and recheck all connections and test LRAD prior to deployment.

Brief Zero Alpha Prior to Deployment:

- Where within the AO the LRAD and PNT is being deployed.
- Cover and AOS support if needed.
- Overall goals and desired outcome of LRAD deployment. Expectations of LRAD.
- Briefing for AOS operators if deploying LRAD forward for PNT.

LRAD OPERATION

Deployment



Negotiators deploying forward should ideally have the following kit:

- Ear protection (dynamic headsets or ear plugs at very least).
- SRBA / BAS and full appointments.
- Ballistic protection (HAP or similar).
- Means of Communication with the duty PNT Commander (encrypted radio, phone).
- Consideration given to deploying with firearms (depending on staffing & resources).

When deploying consider:

- Background of target address.
- Community Impact, evacuating public.
- Option to landslide back to SFP if needed.
- Consideration for staff on the ground.

Exfill of LRAD:

- Generally left in place until incident is resolved (unless there is a need to redeploy).

LRAD OPERATION

Equipment



HIGH STRENGTH
MAGNETIC MOUNT SYSTEM

WIRELESS KIT
FOR REMOTE
OPERATION



HANDHELD CONTROL
MODULE (MP3 PLAYER)
WITH
RECORD-ON-THE-FLY
MICROPHONE

LRAD OPERATION Equipment





LRAD OPERATION

Policy

POLICE NEGOTIATION TEAM

STANDARD OPERATING PROCEDURES

LRAD 100X



SOP Title	Police Negotiation Team (PNT) Standard Operating Procedures LRAD 100X Equipment
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Review Date	National distribution – 27 April 2021
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Replaces	Previous LRAD material on District basis
Approved General Order	None
Approved by	PNT National Capability Advisor



Questions?