e((w))s
emergency warning systems

INFORMATION DOCUMENT

A new emergency warning system (EWS)
'A simple way to manage cities and roads'

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1. Overview

Emergency Warning Systems Pty Ltd are developers and owners of an Australian invention that uses radio broadcast frequencies to send localised hazard or warning messages to public drivers or the broader community. This emergency warning systems (EWS) is a fixed or mobile, short-range radio re-broadcast system that, in real time, quickly and efficiently creates widespread awareness, alerting the public to dangers, regional emergencies or road hazards that may concern them.

2. The Product

EWS's patented technology is designed to save lives in emergencies by broadcasting a radio message saying what to do, when to do it and how. It searches for and finds every radio station operating in an area. It then broadcasts the emergency message in the target zone on all stations to ensure that anyone listening to any radio station will get the message to take the appropriate action.

When activated, the EWS overrides normal radio frequency broadcasts to transmit on FM bands, (currently upgrading to AM) a pre-recorded warning message or alert tone to anyone within a range of 50-500 metres from the device (short range mobile application) or upgradeable to broadcast >1km (longer range fixed application). Depending on the nature of the emergency, messages may be short, brief or detailed. In order to provide greater awareness during emergency situations, the EWS has an optional Radio Data Systems (RDS) feature that offers the ability to broadcast warnings by switching over from the CD player on an RDS compatible radio. This can further increase the penetration of the public that are receiving warning messages.

3. Applications

The EWS has numerous fixed or mobile applications. These may include:

3.1. ***Emergency Vehicles:*** The EWS can be activated during high speed pursuits or emergency transits to directly contact or warn drivers to make way for the approaching emergency vehicle.

3.2. ***Road Traffic Authorities:*** For warning vehicles on roadways of upcoming road accidents, spillages, breakdowns or other incidents where there is some risk. The EWS can create awareness to warn drivers well before the incident of potential dangers such as accidents, ice on the road, heavy fog, poor visibility, impending train crossings and cautioning or instructing them to slow down, take an alternative route or stop.

3.3. ***Catastrophic Events or Natural Disasters:*** The EWS can serve as an early warning system for tsunamis, forest fires, floods, major crime scenes, terrorist attacks, bomb threats, hostage sieges and any other local emergency where the public is under threat and needs to be quickly notified or directed to safety.

The yellow shaded area in the diagram below represents the classic EWS broadcast pattern from a moving emergency vehicle and the number of cars in the surrounding area that receive the warning message

The Mobile EWS unit comes as a complete unit which is easy to install and operate.

Above: The Mobile EWS unit installed in the National Safety Agency's Police Concept Smart Car.

The following diagrams show the Fixed EWS in operation as a roadside broadcast for traffic and incident response and as a regional emergency broadcast for the wider community:

Fixed EWS activation for road traffic and incident response

Fixed EWS activation for longer range community or public broadcast

All members of the community who have a standard radio or the Personal EWS (as we describe in the next section) will be able to receive key safety and emergency information.

The Fixed EWS unit (trailer mounted) was deployed by Victoria Police during the Easter long weekend in April 2011 for incident management and road safety initiatives due to the closure of the Princes Freeway in Morwell, Victoria. Successful deployment was confirmed in the media release "Emergency warning system to be used to update Morwell motorists" issued on Thurs 21 April 2011 and can be found in Appendix 4 of this document.

Fixed EWS unit (trailer mounted)– deployed by Victoria Police over Easter 2011

4. Benefits (Safety, Economic and Social)

4.1. Safety Benefits

Our EWS has number of important safety benefits. Some of these include:

- Improved response times for emergency vehicle in transit situations
- Improved driver awareness and the ability to directly alert motorists or drivers of potential dangers or hazards
- Better penetration of driver warning messages through audible radio means versus short range sirens/flashing lights
- A reduction in secondary accidents and an increase in road safety

- Emergency Services provided with better distribution and control of emergency messages with the localised, targeted dissemination of community warnings
- Rapid and effective response capabilities during disaster events
- Better protection of emergency service personnel and the general public and the ability to save lives.

Economic and Social Cost Benefits

4.1.1. Major Incidents (Emergency Transits/Traffic Incidents)

Whilst the key objective of an effective means of communication is public safety, a number of direct economic benefits accrue to emergency services, road traffic authorities and government agencies through the deployment of our EWS. It can be shown that fatalities and serious injuries resulting directly from emergency vehicle accidents, road incidents or 'wake effect' collisions (collisions involving other vehicles as a result of a high speed transit) can incur the following direct costs:

- Property damage
- Insurance excess
- Investigation and incident reporting
- Depletion of available vehicles
- Staff downtime
- Driver trainer and refresher courses
- Legal costs and if due to negligence/dangerous driving, possible criminal or civil action for accidents where death, injury or property damage occurs
- Counselling

In addition, in the event of a major incident where injury or loss of life has occurred, emergency services face an increased risk of the following direct effects:

- Negative publicity
- Increased scrutiny on driver habits and behaviour
- The inability or failure to meet critical emergency key performance indicators and safety related targets
- Pain, suffering and psychological trauma across injured/deceased personnel, colleagues and their families

If the EWS can, by improving driver awareness and communicating time critical warning information, prevent even a small number of such incidents, the economic cost savings to the user would be substantial.

4.1.2. Regional Emergencies (Natural Disasters/Catastrophic Events)

Regional emergencies such as bushfires, floods or other natural disasters, present emergency services personnel with a number of challenges. These include notifying the public of immediate dangers and implementing appropriate responses and coordinating evacuation arrangements in an effective and orderly manner. An automated radio re-broadcast warning system allows for the better utilization of emergency service personnel and resources and leads to the following direct cost benefits:

- Opportunity cost benefit of having emergency personnel available. The costs associated with door knocking the general public to inform them of emergencies e.g. bushfires and floods, particularly at times where the means of communication are limited and power supplies or phone lines are interrupted or unreliable and staff availability is limited.

- Savings associated from not needing to have emergency services personnel implement road blocks to provide drivers with emergency information such as road closures, danger zones, high risk areas etc.

In both instances, a reliable automated rebroadcast system can provide the public with updated, real-time information about emergencies, thus alleviating some emergency personnel from a message delivery role, allowing them to focus on other priorities pertaining to the emergency.

In addition, Emergency Services become their own broadcaster of 'trusted' warning information and have total control of the information which is received by the public, rather than relying on an 'external broadcaster' for updates.

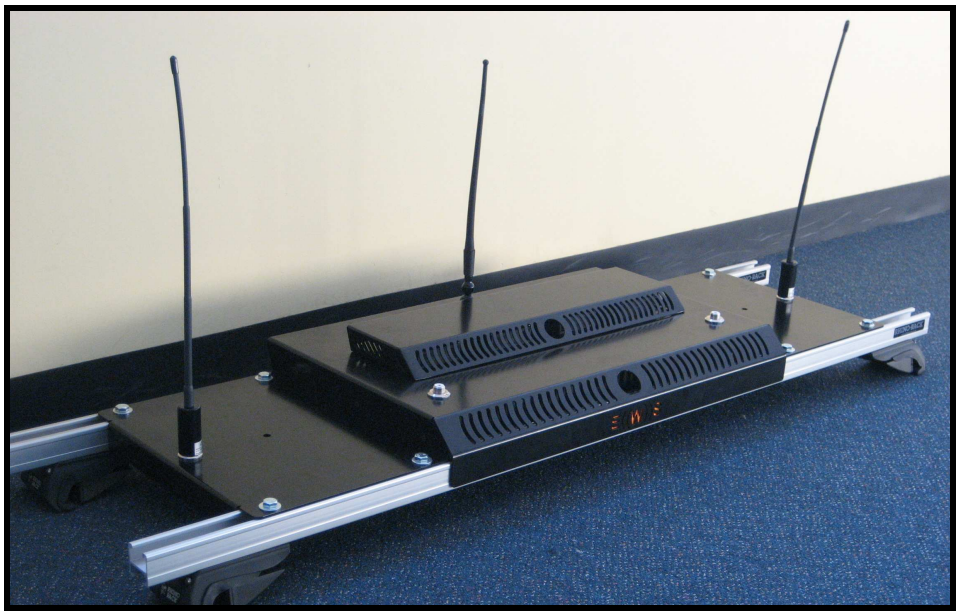
5. Technical Overview

5.1 How the EWS Works

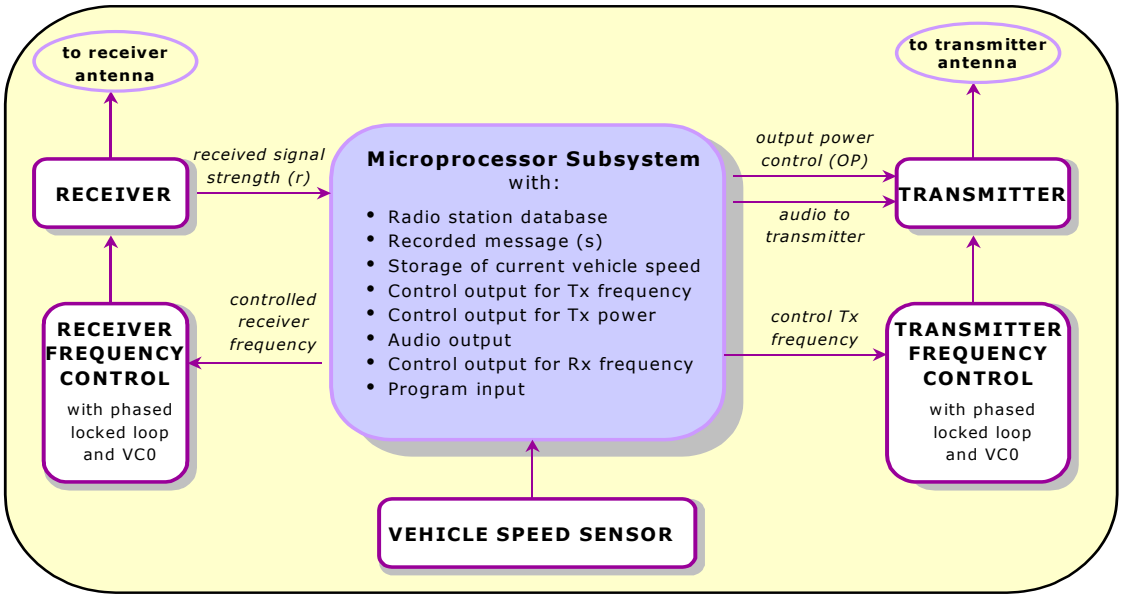
The microprocessor uses a radio receiver to scan active frequencies, recording the measured broadcast signal strength of each and updating a database of operational radio stations in the transmission area. These updates occur at pre-programmed intervals (normally one second) to ensure all active radio stations are captured and stored regardless of where the EWS is located.

The microprocessor then calculates the required transmitter output needed to override the frequency and successfully cover the identified transmission area. Calculating a margin factor above the recorded signal strength, enables the transmitter to broadcast to multiple radio frequencies, simultaneously at the power required to override the existing ones. This sequence is repeated for all frequencies/stations in the database greater than a pre-programmed signal strength threshold. Anything below this threshold is classified as an invalid station.

Mounting options for the Mobile EWS unit include having it inside the vehicle, attached to the roof or fixed in the boot/trunk. A picture of the universal multi-application EWS unit is shown below:



The following diagram represents a technical overview of the EWS device:



Transmitting within commercial radio frequency bands, the EWS is a software-controlled microprocessor that stores the messages to be rebroadcast, while simultaneously managing each frequency and controlling the broadcast range. By using the existing radios on hand to receive warning messages, the EWS does not require the installation of any additional receivers in passenger vehicles.

5.2 The Personal EWS

An additional product offered is Personal EWS. This is a low cost, complementary product to the fixed and mobile EWS units that can be installed into any public vehicle, household or business dwelling. It has the operational capability to monitor a single commercial radio frequency and when required deliver an emergency warning broadcast message to the public vehicle occupants or the household. The Personal EWS is part of the overall EWS solution package and allows audio warning messages to be received regardless of whether the radio is off, tuned to AM/FM, playing a CD or even an MP3. Anyone who has a Personal EWS in their vehicle, their home or their business premises, will receive the warning message that has been broadcast to that specific location.

This product enhances the existing EWS product portfolio by increasing the penetration and captured audience for emergency warning notification.

The Personal EWS physical layout and installation in a motor vehicle is depicted below:

The Personal EWS installed into a public vehicle

6. Why the EWS provides an effective means of warning

The compelling need for the timely communication of broadcast warnings to the driving public is demonstrated by:

- Greater sound proofing and insulation in modern vehicles has increased the difficulty and the ability to hear emergency vehicle sirens, especially from 'side-on'
- Drivers lack of understanding of what action to take with approaching emergency transits or upcoming road hazards
- Increased road traffic congestion
- The need to travel into, or flee from areas of poor visibility, heavy fog, snow, regional emergencies or danger zones such as bushfires or forest fires
- Studies that indicate that effective 'in-vehicle' siren range penetration is only 8-12m[1]

Using radio to communicate emergencies to the mobile and home audience

Over 100 years after the first broadcast, radio remains the key means of communicating information to the public. Almost 100% of homes have at least one radio and statistics suggest that a similar percentage of the driving public listen to some form of media or entertainment medium such as a radio or CD player in their cars. It is this market that the EWS embraces. The EWS warning message can intercept radio and with the latest RDS upgrade, can also interrupt a CD in RDS compatible radios allowing it to capture a large percentage of the driving public as well as those at home.

Statistics obtained from Australian and US sources provide an indication of driver listening. *See Annexure 1, Tables 1 and 2:*

- 97% of vehicles have a radio
- Commercial radio penetration captures an average of 80.2% of the public in the 10-55 year old age bracket

[1] National Academies of Emergency Dispatch, Annals of Emergency Medicine, December 1991, Robert A. De Lorenzo, MD, EMT-P; Mark A. Eilers, MD, FACEP, Lights and Siren: A Review of Emergency Vehicle Warning Systems – '*Audible Warning Systems' http://www.naemd.org/articles/warningsystems1.htm*

- Radio is overwhelmingly the device most used in a car – 75% of drivers use AM/FM radio 'almost all or most of the time'.

The Australian Department of Human Services also regards radio as a key communication means, as demonstrated by the following quotes:

"Radio is a key communication channel during emergencies." - Department Of Human Services, Emergency Management Risk Communication Project – Jan 2006

"Radio continues to be considered a particularly important medium for crisis communication due to its flexibility and very wide availability." - Department of Human Services, referencing the Journal of Health Communication (2005), Volume 10, p.49, Crisis and Emergency Risk Communication As An Integrative Model, Barbara Reynolds, and Matthew.W Seeger.

7. Competitive Features and Benefits of the GFW *(1)*

- Broadcasts a 'line of sight' range from 50m – 500m for a mobile unit. This can be varied as required, for example during a high speed pursuit. Fixed units can upgraded to broadcast at >1 km.
- FM broadcast with RDS (CD intercept) capability. AM is being developed as an upgradeable.
- Variable and adjustable strength patterns for different sizes and shaped coverage areas as required
- Portable, mobile or fixed capability
- Recorded messages or direct microphone usage as an upgradeable option
- Able to store multiple messages
- Durable and almost failsafe with the ability to work as long as radio continues to broadcast
- Narrow broadcast ability NOT a 'jammer'. The software in the EWS individually interrupts radio frequencies providing the ability to narrow broadcast and target specific corridor 'patterns' *versus* other market options which 'jam' frequencies on the whole radio spectrum and blanket broadcast
- Low power usage. The transmitter can be used using either a 12 or 24 volt car battery or be solar pawered
- Small 'footprint' with the ability to be concealed within existing structures or in transit vehicles without the public knowledge
- Ability to mount in a number of different vehicle locations
- Immediacy of message delivery.
- Able to use existing available technology (i.e. in car radios) to efficiently and immediately deliver specific messages

(1) Note: Maximum transmission coverage is dependent on a number of factors which include antenna positioning, antenna type, power availability, operational environment, existing radio signal strengths in a given area, and weather conditions. Installation on mobile vehicles may have limitations on parameters such as vehicle power, antenna sizing, and other factors which may impact transmission coverage and/or overall performance. An assessment of a vehicle's electrical load capacity and power capability would need to be conducted prior to acceptance and installation.

The EWS is the only available solution worldwide that provides the ability to nominate or exclude specific frequencies, measure radio signal strength and determine accurate transmission coverage based on the real-time sampling of existing frequencies in the area. This is a critical factor that ensures maximum delivery and unnecessary disruption.

8. Conclusion

The GFW provides a technologically advanced and effective means of emergency communication to the public. It can broadcast and directly target drivers with critical warning information to warn of hazards, dangers, or emergency transits. This immediacy vastly improves public awareness improves road safety and will **save lives**.

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ANNEXURE 1: Market Research

Table 1: Radio Penetration in Australian Society

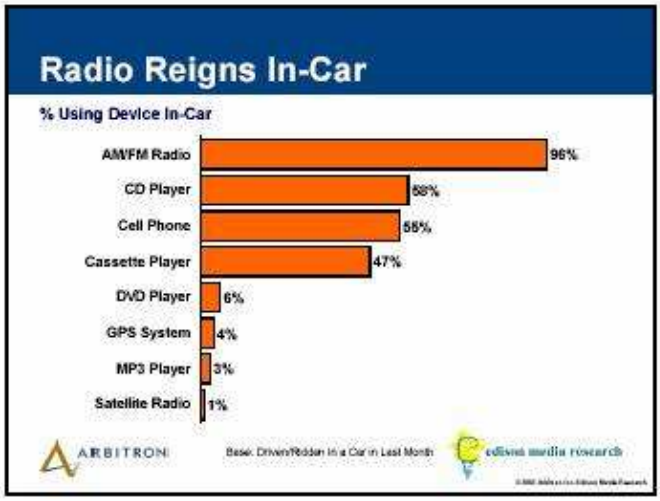
• All homes in Australia have at least one radio
• 45% of homes have 1-4 radios and 56% have 5 or more radios
• 99% of cars have a radio
• Radio reaches 95% of Australians
• Commercial radio reaches 72% of Australians each week
• 80 per cent of working adults listen to commercial radio each week

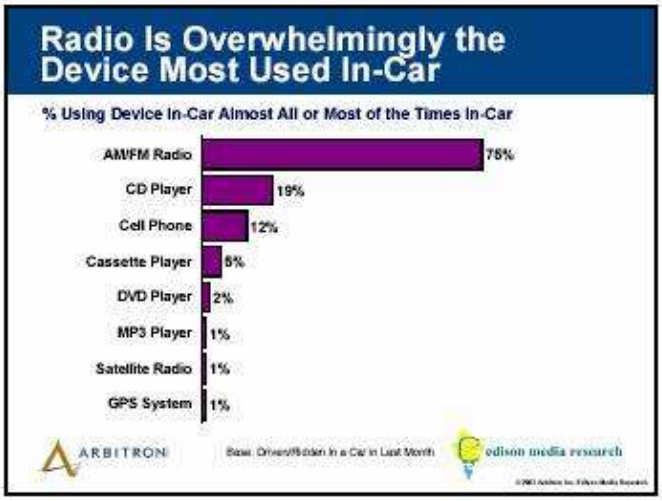
(Source: Radio Marketing Bureau and AC Nielsen, *All Australian Listening Report, 2000*)

Table 2: National Radio Survey Results, Survey 8, 2008
Monday - Sunday, 5:30am - midnight

Age (Yrs)	Reach (000's)	Reach (%)	Time Spent Listening (hh:mm)
People 10-17	1117	83	9.15
People 18-24	1131	81.2	16.47
People 25-39	2371	78.9.	16.27
People 40-54	2163	78.7	18.00
People 55+	2116	68.7	21.05

Radio Listening and Penetration





ANNEXURE 2: Case Study: Two Hundred Car Collision in Thick Fog - Dubai 12/03/08

On the morning of Tuesday 12th of March 2008, six people were killed and 277 injured in a horrific two hundred vehicle pile-up, on the highway between Dubai and Abu Dhabi. With the area blanketed in thick fog, police blamed the accident on a combination of poor visibility and drivers' continuing to travel at excessive speeds, despite the hazardous road conditions. In the accident over 20 cars caught fire with 130 injured motorists taken to Abu Dhabi's Al Mafrak Hospital.

Early morning fog around the accident scene

Of these, ten were reported as critical, 20 sustained moderate injuries and 100 minor injuries. Dubai's Al Rahba hospital received four critically injured patients, 32 with moderate injuries and 100 with minor injuries.

With the ability to warn oncoming vehicles of the limited visibility and the treacherous road conditions ahead, the EWS may have, through its installation at fixed points along the roadway, reduced the chance of such an accident occurring. By broadcasting a simple message via the car radio to oncoming vehicles, drivers could have been cautioned to slow down, to exert care or to be prepared to stop and thus prevented many of the injuries or deaths.

Possible messages could have been:

- "This is the RTA/Civil Defence/Police – Due to heavy fog, slow immediately to 40km/h."
- "This is the RTA/Civil Defence/Police – Poor visibility ahead - drive cautiously at low speed."
- "This is the RTA/Civil Defence/Police – Please be aware. Accident ahead."

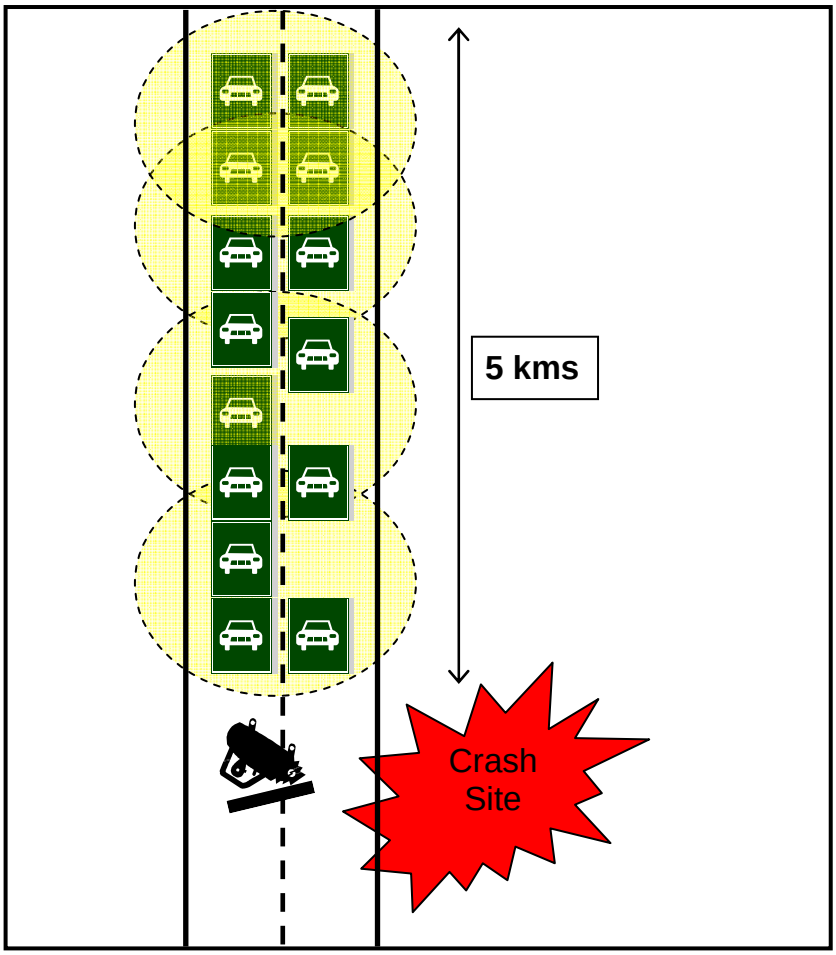


Diagram 1: Four EWS units used in a fixed broadcast application

Alternatively, the EWS could have been installed in an emergency vehicle and used as a mobile transmitter and activated during an emergency transit. In this case it can be used to warn surrounding motorists to yield or make way for approaching emergency vehicles enabling them to arrive at their destination quicker, and reducing the risk of further accidents.

The yellow shaded area represents the classic EWS broadcast pattern from a moving emergency vehicle and the number of cars in the surrounding area that receive the warning message.