

Emergency Communications 'Out West' - a Look at the WA State Emergency Service

The West Australian State Emergency Service is now in the final stages of a significant upgrade to its statewide radio communications network. In designing and implementing the upgrade, there are a number of special conditions and challenges faced by the WASES given that it is responsible for covering Australia's largest state with a failsafe communication network for emergency applications. Many government organisations around Australia (and indeed in other large isolated countries) will be able to appreciate at least some of these challenges.

The mission of the WASES is "to assist the community to cope with natural or man made emergencies". It is the Lead Combat Authority for floods, cyclones, storms, tsunamis and earthquakes, as well as a Combat Authority for land search, vehicle rescue, cliff/cave rescue and civil defence. It also fulfils a valuable support role to other government agencies such as the WA Police Service, Bush Fires Service and Department of Conservation and Land Management. As such, integration with the existing communications equipment used by these agencies is vital.

The WASES has a network of some 2,500 volunteers supported by a small group of full-time staff. Amongst the group of full-time staff based at the WASES headquarters in Belmont (Perth) is Jim Eayrs; Manager for Communications, and Chris Robins; Communications Officer. Jim and Chris are charged with the huge task of designing, purchasing, implementing and maintaining a vast network of communications equipment and training around 20% of the volunteers as dedicated communications people. All of this must take into account the relatively transient nature of a volunteer based organisation. For example, in the state's remote North West it is not uncommon to see a 50% annual turnover of volunteers!

Furthermore, Western Australia, from the perspective of geographical coverage, still has very little in the way of mobile telecommunications infrastructure.

As an example, the existing cellular telephone services provide coverage to around 95% of the population, however this hardly extends outside of the few major urban centres in Western Australia (more than 90% of the state's population lives in urban centres which account for less than 5% of the geographical area).

Jim Eayrs comments; "All of these factors mean that the WASES has to tailor its communications network to suit a very demanding set of circumstances. After all, the correct communications network is vital. WASES volunteers are frequently working in very severe conditions trying to save people's lives and property, and communications form an integral part of the emergency relief service which we offer."

An Overview of the WASES Communications Network

The WASES, like many organisations, relies heavily on land-line telecommunications services for its day-to-day operations. However, it is the other forms of communication, in particular radio, which are relied upon during the course of emergency operations. The WASES operates a UHF radio network (fixed and portable) for short range command and control operations. This network comprises approximately 23 fixed repeaters, 20 portable repeaters, 200 mobiles, 90 transportables and over 350 handhelds. Equipment used is mainly Motorola, Tait, Kyodo and Philips. In addition to the UHF

radio network, the WASES also operates 11 transportable satellite phone systems (Satcom M and Minisat on the INMARSAT system) mainly for facsimile transmissions, plus an extensive HF radio network (fixed, mobile and portable) for long range and rear link voice communications.

HF Radio - a Vital Part of the WASES Communications Network

The HF radio network is undoubtedly one of the most important components of WASES emergency operations, for the following reasons:-



Ability to communicate over very long distances:- Given the size of the state and the geographical occurrence of many natural disasters, the WASES are frequently communicating over very long distances.

Terrain independent:- Given the nature of skywave propagation as used with HF radio, WASES radio operators are able to communicate in variety of different locations. There are few limitations with respect to hilly terrain and gorges (as with UHF/VHF radio) or bush cover and precipitation (as with satellite phones).

Not reliant on infrastructure:- HF radio propagation is such that one radio can communicate directly with others, without the need for expensive repeater systems and without having to rely on a satellite. There was an incident recently where the WASES was unable to use their satellite phones, given that the relevant satellite had been temporarily shut down for programming! This is not a factor as far as HF radio is concerned.

Low cost:- HF radio is still significantly less expensive than alternative forms of communication, in terms of the upfront capital cost and the long term running costs. The purchase of communications equipment for the WASES units is funded by the State Government, however any running costs (such as service access fees and call costs) are normally borne by the unit's Shire Council. Given that many units have limited budgets, it is important that such operating costs are minimised.

Ability to communicate in broadcast mode:- Whereas satellite phones will only allow point-to-point communications, HF radio will allow point-to-multipoint communications (or broadcast mode), which is vital when coordinating large numbers of volunteers for an emergency relief effort. It is also invaluable with respect to interfacing with other government agencies, as the WASES does frequently.

Even in areas which are covered by the public telephone system, the WASES requires a backup communication system to cater for emergency situations. Chris Robins says; "In the aftermath of Cyclone Bobby, telephone communications with Onslow broke down temporarily on several occasions. Initial problems were caused when the fibre optic cable to the North West was broken by floodwaters in the Fortescue River. Police and the WASES were conducting a search for two fishing vessels missing with seven people on board. WASES Headquarters was trying to contact Onslow Police to assess the progress of the search, damage from the cyclone and assistance required. Initial contact after the telephone system failed was made by HF using Selcall to one of the Police vehicles (the Police station had been temporarily abandoned during the cyclone). HF continued to be a valuable additional link to Onslow when the Karatha SES moved in during the recovery operation, as there were only two lines into the Police station and these were often congested by media enquiries. Later in the operation a transportable Mobilesat system loaned from Optus was flown in to provide a further backup to communications in Onslow".

HF Radio Equipment Used by the WASES

The WASES are currently upgrading all of their fixed HF base radios and vehicle radios to Codan 9323s including the 9350 auto tune antennas on the vehicle sets. Only the Great Southern and Midlands Regions of the state remain to be converted. They operate around 70 HF radio base stations throughout the state (refer to the map on this page). Three telephone interconnect stations are located at Port Hedland, Carnarvon and Perth with a fourth system being considered for the southern part of the state. In addition, around 120 HF mobiles are installed in WASES vehicles.

However, the most recent introduction to the WASES HF radio network is 140 portable HF radio systems, custom-designed and

supplied by Q-MAC Electronics. These systems, which incorporate the extremely compact HF-90 radio, are going to play a vital role in WASES emergency operations. Each Country Regional Headquarters and SES unit will be allocated between 1 and 3 of these systems. They will be used primarily for the following applications:-

- They will be brought into areas where there are no existing facilities and set up in temporary headquarters - given that natural disasters frequency occur in 'inconvenient' places!
- Rear-link and command networks in the field.
- Rear-link for cliff rescue operations (mainly carried out by Tom Price at distances of up to 300 or 400km from their base).
- Also, as back-up units should there be any failures with the HF base/mobile radios.

The Q-MAC HF-90 portable system was chosen to fulfil the above roles for a number of reasons. First and foremost the HF-90 Transceiver is the most compact, lightweight HF radio available on the market. It is designed as a versatile multi-role unit and is particularly well suited to portable applications. In addition, the HF-90 Transceiver is widely acclaimed as a very simple to use set - an extremely important factor considering that the equipment must be used in emergency situations by volunteers. As a result of these factors, operators have no hesitation in making good use of the equipment, even in the most challenging of circumstances.

Reliability is also a very critical factor for such applications. The HF-90 Transceiver's track record in the international market place has been exemplary. A large number of users which operate frequently in dangerous and/or emergency situations now rely on the performance of the HF-90 Transceiver. These comprise

aid/relief organisations, military/paramilitary organisations and emergency service organisations worldwide.

Q-MAC was also willing to custom-design a complete package specifically for use by the WASES. This package incorporates the following items:-

HF-90 Transceiver:- This unit features a 50Watt PEP power output and the ability to program up to 255 channels between 2 and 30MHz. It can operate on a variety of different power sources of either 12 or 24V and has low current consumption. It also incorporates Selcall (Selective Calling) which is fully compatible with the standard format used by Codan, plus the special "WA2" format still used by certain West Australian government authorities.

Portable Broadband Antenna:- The antenna supplied with the WASES package is a compact end-fed broadband antenna which is designed specifically for temporary/portable applications. It allows reliable operation over the entire frequency range of the HF-90 Transceiver. The antenna is very durable as a result of its multi-strand stainless steel wire construction and is supplied on a military-style shuttle for easy deployment and storage.

Battery/Power System:- A rugged 7Ah sealed lead acid gel battery is supplied with the system. This gives around 10 hours of operation (assuming a duty cycle of 90% Rx/standby and 10% Tx). It is accompanied by two different chargers - a 1A DC step-up charger (which charges the battery via a vehicle cigarette lighter socket) and a compact 2A AC mains charger. A DC power cable with heavy duty croc-clips is also supplied for direct connection of the HF-90 Transceiver to a vehicle battery.

Custom-Designed Fibreglass Carry Case:- A compact, rugged fibreglass carry case houses all of the above mentioned items in neat compartments. The case is weatherproof and floatable and very easy to recognise as being property

of the WASES given its bright emergency-orange colour. The case incorporates a speaker with audio mute facility mounted internally (under the lid) plus integrated sockets for connection of antenna coaxial cable and headphones.

Jim Eayrs says; "The volunteers are absolutely 'rapt' with the new Q-MAC HF-90 portable systems. Many have commented on the small size of the entire package and also just how easy the radio is to operate. The portable broadband antenna is also a winner. We have been able to deploy it in a number of different configurations and it appears to be very omni-directional ... the signal just booms through."

The Importance of Product Training and Preventative Maintenance

One cannot talk of the WASES radio communications network without making mention of the product training and preventative maintenance which takes place. These two factors are a primary ingredient of the efficiently managed WASES radio communications network.

All SES volunteers must complete a 6 hour Basic Communications Course which covers basic radio and telephone procedures. Those volunteers who wish to become more involved in the field of communications would then complete a 2 day Voice Procedures Course. This particular course reinforces what is taught in the Basic Communications Course, however it also covers formal message passing procedure and voice procedures in detail. These two courses mainly focus on the use of UHF radios but do touch on HF radio where appropriate.

Volunteers may then proceed to the next level, which is to complete the Communications Field Equipment Course. Two separate courses are run; one for metropolitan and one for country students. The country students, in particular, cover the use of HF radio in detail. They will look at HF radio propagation, how to plan an effective communication system (incorporating the setting up

of schedules), the effective deployment of antennas, the use of power systems (incorporating battery charging practice) as well as basic system fault-finding.

All of the above courses are pre-packaged courses. They cover set course material and have associated training literature which is distributed to all attending students. All of the courses can be run by WASES Regional Centres (by trained personnel), whilst the preliminary courses can also be run at a unit level (by WASES Local Centres). From time to time the WASES also run special Communications Workshops to cover certain subjects, on a needs basis. These are less formal than the courses and can be designed to suit particular unit needs.

In conjunction with proper training of its staff and volunteers, the WASES also produce simple, straight forward operation instructions in the form of a small booklet, which always accompanies the appropriate radio.



Chris Robins comments; “The training plan for the new Q-MAC HF-90 portable systems is going to be very straight forward. We will only be training the permanent regional staff and senior volunteers. The region will then be responsible for training its own people. We can do this given that the HF-90 radio is viewed as less intimidating than more complex radios. The volunteers’ acceptance of the radio has been very high because of its simple operation. The combination of proper training and simple to use equipment is extremely important. We heard of an instance where someone working for another government department actually walked 17km from his broken down

vehicle into the nearest town to get help, even though he had a fully functioning HF radio in his vehicle!”

The other very important function with respect to the WASES radio communications network is preventative maintenance. The organisation has a strict policy which ensures that every radio receives a maintenance check at least once a year. In outer areas the radios are checked twice a year, given the heavy reliance on equipment in these areas. In addition, the WASES encourages its volunteers to use the radio equipment as much as possible to ensure the equipment is in good

working order, even if this is only during training exercises.

If any readers wish to speak with the WASES Radio Communications Network, please contact them on Ph:- (08) 9479 9318 or Fax:- (08) 9277 8320. Alternatively, if readers wish to enquire about the Q-MAC HF-90 portable system used by the SES they should contact; Q-MAC Electronics) on Ph:- + 618 9242 2900, Fax:- +618 9242 3900 or E-mail:- info@qmac.com