



# RAY ~ Link

Issue Forty One  
September 2001

The Regular Newsletter of The Radio Amateurs' Emergency Network

RAY-Link is published for the benefit of all members of the Network. It is posted to all current members' registered addresses.

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## Working with under 18s

There has been publicity recently concerning incidents, involving adults and persons who are under the age of eighteen.

The Network insists that parental permission is obtained before Under 18s can join, but this, in itself does not protect other members from potential allegations which could be raised following duties where an adult is placed alone with a juvenile.

The Committee of Management has considered the situation, and has issued the following guidance:-

1. No member should be placed alone with a member who is under eighteen, unless they are blood relatives.
2. As some of our user services now use under eighteens for marshalling or other duties, it should be agreed at the event planning stage that RAYNET are unable to provide an adult operator to work with a User Service representative unless another adult is present. It is an unfortunate consequence of the World today that the Committee has had to consider the above.

## AGM

The Annual General Meeting will be held at The Red Lodge Millennium Centre, Lavender Close, Red Lodge, Suffolk, on Saturday 3rd. November.

The AGM dinner will be held at the Rutland Arms on the Saturday evening. The cost will be £20.00 per person, and a deposit of £10.00 should be sent to Hunters Moon, making cheques payable to The Radio Amateurs' Emergency Network.

## Leicester Show

The Leicester Amateur Radio Show Committee has announced the Convention programme for the 30th Show, to be held at Donington Park in Leicestershire on the 21st and 22nd of September. This year the Convention will be held in the Lounge adjacent to the Main Exhibition Hall and not at the Motor Museum site.

The Convention will feature presentations of APRS, audio tailoring for amateur transceivers, amateur radio at the National Space Centre and the AGMs of various amateur radio organisations.

In addition, there will be a joint presentation by the RSGB and the Radiocommunications Agency, at which the future of amateur licensing in the UK will be revealed. This is an important presentation which is the culmination of the past year or so of discussions between the RA, the RSGB and the amateur community in the UK. Further details of the Leicester Amateur Radio Show are on the Internet or can be obtained from Geoff Dover, G4AFJ, by e-mail: g4afj@argonet.co.uk

RAYNET Supplies will also be at the show.

Membership Fee 40p/month  
PAI £1.05 per year or part year  
(1st May - 30 April)

All correspondence and membership registrations should be sent to:-  
"Hunters Moon", Newton-le-Willows,  
BEDALE, North Yorks, DL8 1SX

Emergency 24 hour contact  
line:- (0141) 621 2121

### CHAIRMAN:

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### SPECIALIST TEAMS

#### Emergency Planning:

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#### Finance:

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David Hicks, G6IFA

#### Information Systems and Registrations:

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Emergency Network.

The exercise was run at Horndean Community School on 25th June by Hampshire County Council's Emergency Planning Unit and in particular by their Divisional Emergency Planning Officer for the Havant and East Hampshire Districts. This was a small exercise lasting from 1300 to 1600 and the aims of the exercise were:

1. To test the emergency plan for prepared rest centres
2. Familiarise responding personnel with the site
3. Familiarisation of personnel with procedures

**Incident Scenario**                      **Time of Call 1245 hrs**

## Incident

A fully laden articulated lorry with a mixed load of chemicals, bagged and in drums, has caught fire on the A3 at Cowplain due to the rear wheel brakes binding.

The fire has spread to the load and is producing a cloud of toxic smoke.

After consultation with the driver regarding load information Hampshire Fire and Rescue Service believe that there is a possibility of an explosion.

At 1300 hrs Hampshire Police units start an evacuation of 10 roads in the immediate area. The predominant properties are bungalows but there are also some houses. The area has a high level of retired people but also includes younger people with families. The Police contact Hampshire County Council and East Hampshire District Council (EHDC) for a rest centre and Horndean Community School is chosen in view of its safe proximity to the incident.

Cowplain Activity Centre is used as an assembly point and transport has been sent there to collect evacuees, who are expected to start arriving at the rest centre from about 1400 hrs.

## Details of RAYNET operation

RAYNET's role in the exercise was to provide a radio link between the Prepared Rest Centre (PRC) Information desk and East Hampshire District Council (EHDC) Emergency Centre at Penns Place, Petersfield.

## Communications

At a rest centre exercise for Havant Borough Council, earlier this year, we found that the amount of radio traffic from the PRC to the local authority Emergency Centre was such that it was difficult to find time for return messages on the single channel used for that exercise. Closer liaison was also found to be needed with the PRC staff without distracting the actual radio operators. With the agreement of the DEPO we used this exercise to try out solutions to those problems.

Separate radio 'channels' were used for incoming and outgoing messages at both ends of the link. Because of high ground between the two locations, and the possibility that the aerial at the PRC may not be particularly high, it was decided that talkthrough should also be available. Separate talkthrough was provided for each channel with the talkthrough stations some distance apart to prevent interference.

Formal messages from the PRC to EHDC were transmitted on

433.725 to one talkthrough site and retransmitted on 144.775. Return messages from EHDC to the PRC were transmitted on 433.700 to the second talkthrough site and retransmitted on 144.625.

The permanently installed equipment at EHDC is capable of dual band simultaneous operation, so equipment was only required at the PRC and at the talkthrough sites.

SE Hants Group holds up to date copies of the emergency orders, including layouts of the PRC's, for all districts in our area. However, the location for RAYNET is not shown on the PRC plans and, with had no previous experience of this particular site, the exact location for our operation within the building was unclear. Also unknown was the location for an external aerial with suitable means of cable access.

In the event, a convenient metal pillar alongside an opening window was used to support the 15ft sectional mast holding a dual band co-linear. This was connected via a duplexer to separate 2m and 70cm sets which were located approximately 15ft from the window. The aerial and mains cables were run across the floor and protected by a line of chairs along the length.

The forward control Land Rover was used for one talkthrough site and a mobile station with small mast and aerials for the other.

Message Traffic Once evacuees began to arrive at the PRC, various messages were passed to Raynet from the centre's information desk (to which evacuees were going with queries). Although a few queries were dealt with by PRC staff, others had to be sent to EHDC for action. Exercise traffic started being transmitted at approximately 1415 and continued for about one hour. During this time a total of 8 messages were sent from the PRC with 5 replies being received from EHDC. Although not great in number, all messages were very lengthy.

The 'messages' as passed to RAYNET were on a standard Home Office rest centre enquiry form that contains a number of sections, one of which is the enquirer's name and address in a 'from' box. It was difficult to decide which parts of this whole form should constitute the 'to' 'from' and 'text' parts of a standard RAYNET message. It was decided that the whole form should therefore be regarded as the text of a message with the 'to' and 'from' being the PRC and EHDC respectively. As we do not edit the text of any message given to us (to avoid the risk of a subtle change of sense) the messages were quite lengthy, containing unnecessarily long phrases such as "please can you arrange for the Police to go around to the house" etc.

Liaison with the PRC supervisor was done by a dedicated RAYNET member to avoid the disruption to the actual operators. Even so, some people still tried to speak directly to the operators whilst they were busy. This may have been avoided if a further RAYNET member, acting as a logger/message collator, had been permanently at the desk.

Lessons Learned The use of separate channels for incoming and outgoing traffic greatly reduced the pressure, and thus stress, on the operators compared to a previous exercise. This would not necessarily be needed if traffic levels were low but should be borne in mind if things get busy.

The operators need to be segregated and not interrupted.

## ***Election of Zonal Co-ordinators***

A RAYNET admin. officer (not necessarily licensed) is needed for general admin. support to the operator/s by checking messages handed in for transmission, querying anything unclear, allocating a message number and designating the priority of the message if necessary. All communication with Centre staff should be through this officer. A further person, again not necessarily licensed, would act as a runner from RAYNET to the centre Information Desk. This means that a minimum of 3 RAYNET members are required at a PRC (assuming just 1 radio channel in use) with extra operators for additional channels etc.

The message length needs to be kept down by the use of 'telegraph' language whilst still retaining the correct sense. The Centre staff should do this when taking the original details from the enquirer prior to the message being given to RAYNET for transmission. This matter will be taken up with the DEPO.

RAYNET staff should be readily identifiable by wearing RAYNET tabards. The wearing of ID cards only is not adequate. The only exception to this could be the operators whilst operating, as they should not be directly contacted by Centre staff.

The Group needs a predetermined plan for all rest centres in our area. This will enable the right equipment to be taken to the PRC to install equipment and eliminate wasted time establishing the operating position, looking for suitable locations for aerial mounting and cable routing. This will require visits to the PRC's and will need to be arranged via DEPO's for that district. The information could then be added to the Rest Centre pages in our copies of the District Plans.

Other methods of transmitting messages by radio such as data or fax must be investigated.

If dedicated radio equipment cannot be provided for use at a PRC then members' personal equipment may have to be used. This means that, unless all members equipment has been CAIRO'd, the use of a full headset is probably unlikely. Headphones, preferably the enclosed type, are however essential, and a system similar to that already in place at Portsmouth City Council Emergency Centre needs to be provided at all District EC's, together with additional ones for PRC use. Fist mic's are adequate but noise-cancelling types would be preferable.

District Emergency Centres are usually well equipped with stationery items but Rest Centres are not. The Group therefore needs a pre-prepared box, which can be taken to a PRC containing admin. and essential radio items such as:

RAYNET message forms

Pens Pencils Pencil sharpener

Stapler

Headset switch control box(s) 2 off headsets (it is better if members supply their own)

Antiseptic wipes for headsets.

Tissues.

3 off logbooks (hardback) - One for the admin. officer to record the progress of messages One for each operator for notes and service traffic

Post-its 3 off

In-Out trays for the operators (IN, OUT, and PENDING REPLY)

We are expecting to have the opportunity for further PRC exercises later and will continue to try out solutions to earlier problems.

A report has been sent to the CEPO's office for their information.

**Nominations are requested for Zonal Co-ordinators for Zones 2, 3, 5, 6 and 22.**

Zones 3 and 22 currently have co-opted "Caretaker" ZCs who are eligible for election and the Zonal Co-ordinator in Zone 6 is retiring by rotation, but is eligible for re-election. Should more than one valid nomination be received for any zone, an election will be held.

All nominations, which must include a statement from the nominee that they are eligible and willing to serve, must reach the Secretary at Hunters Moon by 30th. September.

### **Notes:-**

Zone Co-ordinators have four distinct roles to fulfil.

They are:-

- 1) Directors of The Radio Amateurs' Emergency Network, a company limited by guarantee.
- 2) Trustees of the Registered Charity
- 3) The voice of the National Organisation to members
- 4) The voice of the members to the Committee of Management

As Directors of the Network, ZCs may also be the leaders of a Volunteer Teams, co-ordinating its work, and reporting to the other Directors.

Any member of the Network, who is registered by a Group defined to be within the named Zone is eligible to stand. Nominations should be sent to the Company Secretary at the BEDALE address, marking the envelope "ZONE ELECTION", to arrive by 30th. September 2001.

The nomination must contain a declaration from the Nominee stating that he/she is willing to stand for the post and is not disqualified from being either a Company Director or Charity Trustee. (see Charity leaflet CC3a, and Article 54 of the Articles of Association of the Network). The nomination should be supported by Controllers or Members from within the Zone. If the post is contested, ballot papers will be distributed to controllers by 5th. October and these should be returned by 20th. October. The result of the elections will be announced at the Annual General Meeting on the 3rd. November. (Note:- All group, area and county controllers in the Zone, who are registered with the Network, are entitled to vote.)

If there is a current local arrangement to elect a ZC at a Zonal Meeting a Zone may notify the Company Secretary and then conduct its own election, notifying the result to the Company Secretary by 23rd October 2000.

**It is YOUR NETWORK!** Please check that your group controller knows your views on who should represent your zone during the next three years.

# Underground Radio Tests on the Nene Valley Railway

by John Rabson, with additional contributions from Rob Gill, Chris Trayner and Roger Goodchild

**I**ntroduction Tests were conducted in a railway tunnel to establish the best frequencies for radio communications. Best results were obtained at UHF, next best being an LF induction/earth current system. VHF was of somewhat marginal performance, and mobile telephones did not work any useful distance into the tunnel.

Caves are not the only holes we find in the ground. There are railway tunnels in many parts of the British Isles. We do not usually venture into these but in an emergency RAYNET or similar organisations might be asked to provide communications in and from them. It is a good idea to do our homework beforehand.

Enquiries about previous work revealed that one or two things had been tried but not written up. Some years ago tests were done in a mile-long tunnel on BR's West Coast Main Line. UHF was effective but VHF was not. Some tunnel tests were also done in Essex a few years ago with similar findings, but no report seemed to have been published. We felt it was time to stop theorising, find a tunnel and do some experiments.

Unfortunately, it is not easy to get permission to use railway tunnels since many of them are regularly used: the light at the end of the tunnel tends to indicate an approaching train rather than a breakthrough! I sought advice from railway enthusiasts and ended up arranging to use Wansford Tunnel on the privately owned and run Nene Valley Railway in Cambridgeshire, on Monday 9th February 1998 with Chris Trayner, Rob Gill and Roger Goodchild.



Wansford Tunnel is 550m long and straight, 7m high and 7.5m wide. It runs through oolitic limestone and is lined with Victorian brick. It contains two standard gauge railway tracks, one of which runs only about 150m into the tunnel and is used in winter to store rolling stock in the dry. The notional markings on the sleepers, which were supposedly at intervals of one chain (22 yards or 20m) were not always accurate. We therefore took our own measurements of distance into the tunnel.

The Tests We tried four different frequency bands: LF, VHF (145MHz) and UHF (433MHz amateur band and 934MHz CB2). On LF we used John Hey's scaveradios. These worked well from one end of the tunnel to the other, using loop aerials. It made no difference whether the loops were placed between the rails or at the side of the tunnel, or in the 6 foot space between the two tracks. We then moved one station to the surface above the point where the tunnel was at its deepest, about 20m below the surface, and replaced its loop aerial with an earth current system. This used a 40m wire lying on the ground and running at right angles to the tunnel, with a step-up transformer between the transmitter and the earth wire. (It was not possible to run the wire along the line of the tunnel because of the layout of the roads). This configuration worked satisfactorily for a distance of 250m along the tunnel, centred on the point vertically below the surface station. Reception was noticeably better with the loop vertical than with it horizontal.

A pair of 433MHz hand-helds with rubber duck aerials worked perfectly satisfactorily from one end of the tunnel to the other, as did the 934MHz mobile equipment which used a rubber duck aerial at one end and a 10 element beam at the other. We also checked how far into the tunnel it was possible to get service from

the local GSM900 mobile telephone cell. The answer was about 10m from the eastern portal and 4m from the western portal: GSM1800 was not tested.

VHF hand-helds were much less effective than UHF ones. We got rather less than half way along the tunnel before we lost our signal altogether. Replacing the rubber duck aerial at the tunnel mouth with a 4 element Yagi gave us only a few metres increase in range. Replacing the rubber duck in the tunnel with a mobile whip on a rucksack gave a large improvement. We repeated the tests using a field strength measuring receiver with the beam horizontal (vertical was not so good). The results are shown on the graph. The received signal strength varied very little for the first 100 metres into the tunnel probably an artifact due to receiver saturation. Thereafter the signal fell off steadily until, at the mid point of the tunnel, it was more than 55dB weaker than at the entrance. At

about this point it fell below the FM threshold of the receiver and therefore was unusable further along the tunnel. We thought at first that the presence in the tunnel of rails with rolling stock on them might have enhanced the propagation at VHF; but the signal strength, as we said, started falling off about 100 metres into the tunnel, while the rolling stock and rails it was on extended to nearly 150 metres into the tunnel. This suggests that the presence of all this metal had only a minor effect on the propagation. We would welcome comments from experts in wave-guide matters as to whether we are on the right lines in our reasoning.

We then tried an earth current system on the surface as before, but on 145MHz. The earth spikes were 2 metres apart and fed by a pair of wires about 2 metres long, connected to the transmitter via a 4:1 balun. The transmitter output power was 1W. This station could just be received in the tunnel, provided the tunnel set was below

the surface station and had its rubber duck pressed firmly against the wall of the tunnel.

Conclusions From these results we conclude that the best choice of band for working in tunnels is likely to be UHF. Second choice is an LF induction/earth current system. VHF seems to be of somewhat marginal performance, and mobile telephones do not seem to be much use in tunnels. If anyone else is thinking of doing such tests, they must obtain permission from the railway company concerned. We found the Nene Valley Railway very helpful and even brought in two cheerful volunteers to provide refreshments. The exercise did, however, cost us a £100 donation to their funds, which was met in part by contributions from some of the participants and in part by sponsorship from The Word Factory, Eyke, Limited. If anyone would like to know more about these tests, I would be happy to talk to them on 01 394 460298 or via email to [word.factory@zetnet.co.uk](mailto:word.factory@zetnet.co.uk).

This article is reproduced with permission from the Journal of the Cave Radio & Electronics Group, Issue 32, pp. 27-28, June 1998. Members of the Group have active research and development interests in many aspects of cave radio. Since this uses low frequencies, there is a lot of common interest with the Amateur LF community active on 73kHz and 136kHz. The Journal is published quarterly. To see what there is that may be of interest, look at <http://www.mcsolv.demon.co.uk/aabeta01/index.htm>. The Group has a Website at <http://www.bcra.org.uk/sig/creg.html>. Should you be interested in joining, or simply buying back issues of the Journal, contact Rob Gill, G8DSU, 61 Cross Deep Gardens, Twickenham, Middx. TW1 4QZ. You can also email him at [creg@twickenham.freemove.co.uk](mailto:creg@twickenham.freemove.co.uk).

## Dr Jack Swanston GM3ZVF

Dr Jack Swanston GM3ZVF, a member of Fife RAYNET, died of pneumonia on Friday 13th of April, aged 95. Jack was still active, and our photograph shows him at the Loch Leven ½ Marathon last year.



## RAYNET stand at Alexandra Palace



## AGM

## How to get there

The 2001 Annual General Meeting will be held at The Red Lodge Millennium Centre, Lavender Close, Red Lodge, Suffolk IP28 8TT on Saturday 3rd. November. The day's program can be found elsewhere.

### Directions:-

#### By Car - From the North

Red Lodge is 10 Miles south west of Thetford (three miles south west Barton mills) on the A11, turn left off the A11 signposted "Red Lodge" and take the left hand fork at the top of the slip road on to "Warren Road" take the second right in the housing estate "Heatherset way" follow the twist in the road and turn second right into "Magnolia close" passing the road on the left turn left at the tee junction onto "Lavender close" the "millennium Centre" is at the far end of the close.

#### By Car - From the South

Red Lodge is three miles north east of Newmarket on the A11. turning north off the A14 onto the A11 at Newmarket turn left at the B1085 slip road signposted "Red Lodge", at the top of the slip road turn right over the A11 and then turn left at the roundabout. After passing the outdoor pursuit centre a mile further on you enter the Red lodge village continue through the village until just before exiting you take the only right turn into boundary road (if you find the roundabout take the fourth exit into warren road). At the tee junction turn right onto warren road, take the next right into the housing estate "Heatherset way" follow the twist in the road and turn second right into "Magnolia close" passing the road on the left turn left at the tee junction onto "Lavender close" the "millennium Centre" is at the far end of the close.

**By Train** The nearest train station is Newmarket.

Talk in will be provided by G0RFH.

