

AN ARGUS SPECIALIST PUBLICATION

JULY 1985

# CB Citizens' Band

Britain's Leading Communications Magazine

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The Radio Ham

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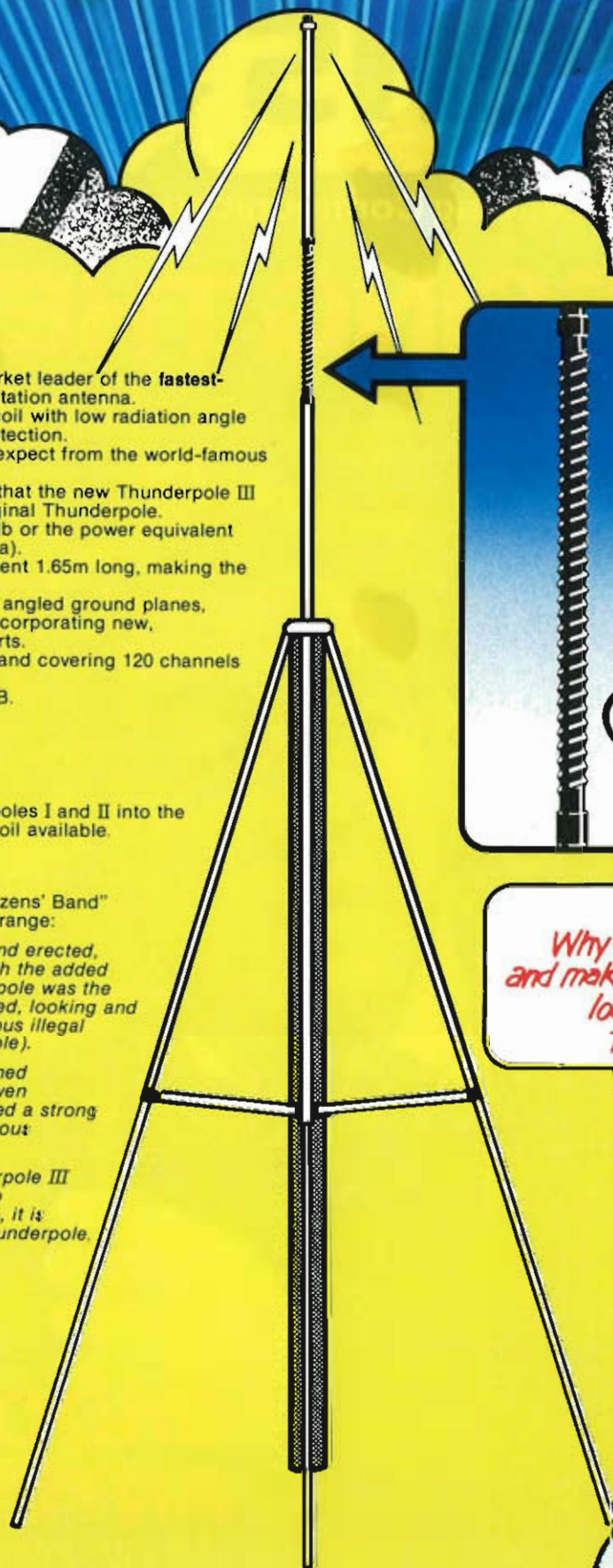
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# CB Citizens' Band



## Inside this month

A look at the next step up — amateur radio

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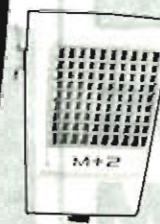
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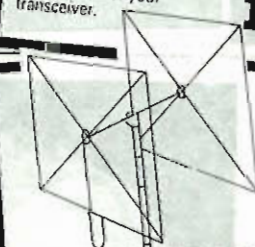
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# NEWS FROM THE WORLD OF CB

# NEWS FROM THE WORLD OF CB

# NEWS FROM THE WORLD

# UPDATE

## Editorial

Elsewhere in this issue, there is a letter from Tony Jaconelli pleading for more co-operation and less in-fighting between various CB organisations. I could not agree more. In the nine months I have been with this magazine, I have noticed more and more power struggles and bitterness between clubs and organisations in the CB world. I constantly receive letters and phone calls on the subject. You know the sort of thing — "So-and-so's left the organisation and set up his own splinter group... they're using our name... we've got more members..."

This is not what the true spirit of CB should be, surely? Most organisations do an awful lot of good work with monitoring, fund-raising and the like. Why does it so often end up with the "My dad's bigger than your dad" attitude? I suspect that it is mostly to do with personality clashes, over-inflated egos and a perverse love of officialdom.

I have neither the time nor the inclination to get too involved with what is basically petty bickering from various camps. Suffice to say, CB is a mode of *communication*. Let's try and keep it that way.

**Eamonn Percival**

## More Ham

For a good many years, Ham International has been a by word for CBers. Their reputation for both quality and the right product has meant that their products have always been avidly sought. Unfortunately, it has been difficult, even impossible at times, to locate Ham equipment.

A company called Cognet in Ludlow, Shropshire are hoping to rectify this situation by becoming major distributors and retailers for a good part of the Ham range. This range includes antennas, SWR meters, power supplies, mikes, speakers, cables and plugs and components for Ham

equipment. They will also be stocking equipment for marine navigation, transceivers, test service equipment, telecommunications and in-car entertainment with the familiar Ham badge. Cognet also hint at some new 40-channel mobile and handheld rigs!

Cognet are establishing a dealer network which will include servicing and repair facilities. More information on local dealers and products is available from Cognet and Company, Whitegates, 12 Farden, Near Bitterley, Ludlow, Shropshire. Telephone (0584) B90136/890861.

## CB on the Royal Map

Lots of consciences were stirred last October when our TV screens were filled with the horrors of Ethiopia. Help came from many quarters and it's always heartening to hear of breakers "doing their bit". Computer Lady from the Claygate Village Breakers Club decided to organise a sponsored square-knit to send blankets to Ethiopia and were soon joined by many others. Other events were organised including a bizarre "sponsored ducking" and a 48-hour charity

network.

The result of all this frantic activity was that £1,000 was raised and ten blankets provided for the Save the Children Fund. In appreciation, the ring-leaders, Computer Lady and Gipsy, were invited to an informal get-together of many fund-raisers at the Save the Children offices where they met the President, HRH Princess Anne. Congratulations to them and to all the other breakers who took part in these projects.

## Knickers with a Handle

The items shown in this photograph turned up in our offices the other week and turned a few heads. They actually came from a company called West Bromwich Sports Trophies, who specialise in printing and engraving of all kinds. They offer t-shirts, sweatshirts, QSL cards, cloth badges, car stickers, metal handle badges — you name it, they can personalise it. So, as you can see from the photo, if you want a pair of panties with your club or handle on them, you know where to go!



## Grey Beard's Gleanings

Hello there. This month's column is a bit patchy, but so many of you write to me with questions that I thought I should catch up a little!

First of all, if you have written to me and not received an answer, drop me a line and I'll get your reply in the post. To Hooray Henry of Middlesex, who wanted to know the address of the manufacturers of the recently-reviewed Mister Stick antenna, write to Marksman Products, PO Box 40, Milton Keynes, Buckinghamshire MK6 2UT. To Chip Man up there on Merseyside, the only log-book type of computer programs that I know of are 'Logger', 'Breaker' or 'Network', all of which are available from Martello Computer Services, 235 Downs Road, Folkestone, Kent. These are on cassette for ZX81, Spectrum (16k and 48k) and the Amstrad CPC464. If anyone has any information on the use of

micros in CB, please let me know so that we can all get organised!

For all the wheelchair men and ladies out there, the only antennae that I can personally vouch for as suitable for wheelchairs are the Dial-a-Match and the Les Wallen Modulator range, but I would imagine most of the mobile antennae would work. If you have any problems with CB from your wheelchair, then drop me a line.

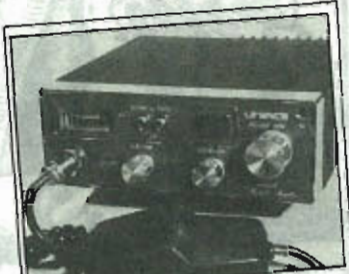
Recently, another accidentally mis-sited antenna has tragically resulted in the death of yet one more CBER. I know that a lot of people get pleasure in DXing on local high points but please, please don't site your antenna close to overhead power cables. Don't become another statistic!

News is coming in from all over the country that the modern versions of the once-dreaded Busby are becoming more noticeable

as they tackle the multitude of illegal CBERs. All sorts of people are having to dismantle their illegal antennae, hide their AM/SSB rigs away and so on. They don't seem to be doing anything about the wallies though!

From the letters I receive here, a large proportion express a need for penfriends to exchange either letters or cassettes. If this applies to you, write and tell me (Grey Beard, 24 Sally Ward Drive, Walsall Woods, West Midlands) — and don't forget the SAE, please! I will not include any names on any lists without permission, so there is nothing to worry about from this end. If you wish to take advantage of this service, then a donation can be sent with your application; any surplus to the cost of the service will be passed on to the Disability Aid Fund (registered charity number 287300). Well, that's all for this month. 73s.

**The Grey Beard**



## New Uniac 934

Uniac Telecommunications Ltd recently announced the introduction of their Model 400 934MHz transceiver. We don't have too many details on the rig yet, but we hope to be able to get our hands on one for a full review in the next issue.

## The Radio Ham

If you liked our front cover this month, you might be interested to know that BBC Tapes have just released four video tapes, each of which contains three episodes of *Hancock's Half Hour*. They include some of Tony Hancock's classic comedies such as *The Blood Donor*, *The Litt*, *The Bowmans*, *The Cold* and of course, *The Radio Ham*. If you are thinking about taking up, or are already involved in amateur radio, then this last sketch is a must! It's almost a textbook example of how *not* to handle an emergency.

Our thanks, too, to the Beeb for supplying us with the photograph that graces our cover.

## Calling all Truckers

We recently received a copy of the 1985/86 Truck King catalogue — and very impressed we were too. It's very professionally produced and features nearly 300 CB items plus a host of trucking accessories. We particularly liked the extremely naughty stickers! Well worth £1 of anyone's money and they come with £10 worth of discount vouchers. Truck King are at 867 St Albans Road, Garston, Watford.

## Disabled Breaker's Olympic Hopes

A disabled CB radio enthusiast of Wishaw is hoping to be selected for the British Disabled Team at Stoke Mandeville this year.

Jim Stevenson (24) has been tetraplegic for four years but, in those four years, has won 13 medals and two trophies at wheelchair sports at events all over Scotland and England. Jim, whose handle is Wailer, is hoping to gain selection at the meeting at Stoke Mandeville and, to help him realise his ambition, members of local CB clubs are busily engaged in fund-raising for him.

The aim is to buy a special racing type wheelchair for him to improve his performance and the chance of selection. We wish him all the best and hope to be able to report on his selection for the British team in the near future.



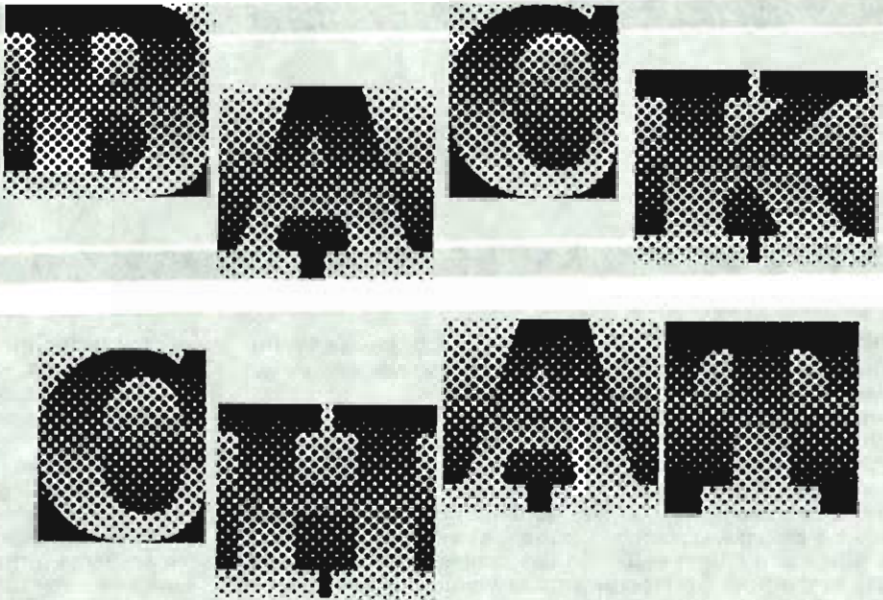
## Young Truckers

Are there any truckers out there who want something to keep the kids quiet for a while? If so, then a new children's book has just been published which might be of some help. It's called *Lorry Driver* and is published by A&C Black Limited (ISBN 0-7136-2642). Written by David Simson, it tells the

story of a trucker's trip to Paris with his son, and is illustrated with full colour photographs throughout. Our photo shows, from left to right, Shane Lewis (the boy featured in the book), David Simson (author and photographer), Shane's sister Cara (holding the book) and father Dave. The book is in the Beans series and costs £3.95.



## More readers thoughts from the mailbag



### Hooray for Homebases *Floatbox and Micromaster, from Newark, defend homebase monitors...*

Having read Ranger3's letter (Citizens' Band April 85) giving the trucker's view of things on channel 19, we thought we'd like to write in with the case for the defence of the homebases.

Ranger3 asks homebases to move off channel 19 'which is for mobile use'. If he means that homebases (or mobiles for that matter!) should not hold conversations on channel 19 then we are in full agreement. The same applies to channels 9 and 14. However, if he is saying that homebases should never use channel 19, then just let him try and obtain directions when he is delivering in Newark!

We both spend a lot of our time on channel 19 helping truckers out in many ways, along with several other homebase users. As already mentioned, we give them directions through the town, pass on 10-13s to a greater distance than can be achieved mobile-to-mobile, make phone calls when requested, act as information centres for local pubs, cinemas, cafes, car parks, hotels etc. I think that it can be seen from this that channel 19 would lose a great deal of its usefulness and effectiveness if the homebases were to vacate it.

It is interesting to note that one only has to turn four pages in the same magazine to read Gismo's praise of the homebase users on channel 19, and indeed of his 'Monitor of the Month'.

Don't knock all the homebases, Ranger 3, as one of these days you might need us. And it could easily be for a more serious matter than simply to find the best cup of tea in town!

### Call for Callsigns

*Whiskey Sierra 96, of Staffordshire, is another supporter of callsigns on CB...*

To 'Let's Campaign' (April), I quite agree with Ranger 3. It is beyond comprehension the amount of 'brainless prats' that can be squeezed onto any one channel. Take channels 9, 14

and 19 in my area. These appear to be open channels for would-be disc jockeys to air their talents. If you ask them politely to refrain, you are told in bucketmouth language what you can do.

I now think that personalised handles have outlived their usefulness and that we should adopt the callsign system, whereby all licenses would have a callsign printed on it. This system is used worldwide and the army of illegal CB operators is growing rapidly. If one is operating SSB AM or lower FM, one is asked for callsign, name and QTH. If these are not forthcoming, you can forget about QSK, QSL or a QSO — you are politely asked to QSY and go QRT.

So, before the army of illegal operators once again goes on the march or swamps the DTI, let's have our CB cleaned up or let somebody other than the DTI take over and let's get in tune with our EEC partners or get out of the EEC and have our CB taken away from us and once again start from scratch — rallies and marches included.

### No Reply

*Tony Jaconelli, chairman of the Scottish Association of CB Clubs wants to patch things up...*

On three separate occasions I have written to the British CB Council on behalf of this Association in an attempt to establish contact. Twice to the address of the Treasurer which you published in your magazine, the other to an address I was given from another acquaintance. Even assuming that this address was wrong and my letter did not arrive, it would seem to be a waste of your efforts when they do not even afford the courtesy of a reply to a letter.

I understand that there is some animosity between organisations south of the border and we have no wish to become party to that feeling. Is it the case that by being affiliated to one group that the others don't want to know? If this situation is true, then none of them can truly claim to represent the British CBer for we are certain



that the average operator is not in the least interested in in-fighting or power struggles, which seem to be the order of the day. Their only ambition is to better CB.

I do hope you can convey our disappointment to the CB Council and pass our misgivings to all the other groups. Tell them to bury the hatchet, not in each other's back, but in the heart of problems of a purely CB nature.

### A Satisfied Customer

*S Moore, from Suffolk, seems happy enough. . .*

I wonder how many breakers experience interference from arcing from 400,000 volt and 33,000 volt electric pylons. I have had this problem for over a year now and so called in the RIS officer for the DTI. He did his best but the trouble got worse to the extent that it was impossible to copy any incoming signal. I got nine pounds of crackle coming in on the carrier wave. Everything metal acted as a radiator—even the house wiring and the central heating pipes.

No Japanese sets were available with ANLs and noise blankers. The only two had gone out of production i.e. the Wagner and the Bluebird home-base. Anyway, would an ANL and blanker work? The 'naughties' had these as standard. So, I borrowed a Super Star to see if it worked in my case. Yes, it worked 100%, even though the rig had been legalised.

Now, to get a 40-channel FM rig with these fitted. Nobody seemed to want to know. One firm said 'Sorry, it can't be done', while another said 'Sorry, costs too much to research'. I nearly packed up with CB but, looking through an old copy of *Citizens' Band*, I noticed Electro Medical Supplies had fitted a noise blanker as standard. This sounded promising and a phone call to their managing director confirmed that, yes, they did fit a noise blanker as standard and that they could also fit a noise limiter for an extra £25.

I gave them the order and also had them disconnect the PA switch and put a 100pf condenser across the switch to act as a top cut tone control. Also, there is much more filtration done inside than any Japanese rig.

The result? No more crackle, so come on you breakers; if you have this trouble, contact Electro Medical Supplies at Wantage, Oxon. It will cost you £156, which might seem a lot but then you only get what you pay for. I am very satisfied with their Mercury 1040.

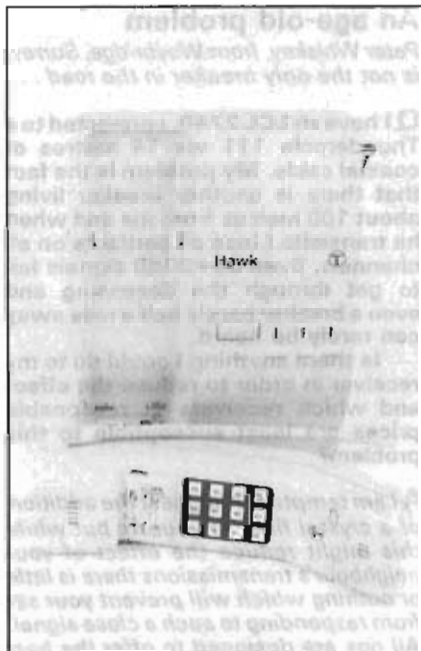
### Interference from Buzby?

*Merlin, of Lincolnshire, is suffering from a new source of interference. . .*

Having used CB radios for about six years (AM and FM), put up with bucket-mouths, button-pushers and been wiped out by the big burner brigade using 200 watts+ and blanking out half the county speaking to their friends about a mile away from them and using all of the 200 watts to do so, I am disgusted to find out that British Tele-

com also belongs with the interference brigade.

A close friend of mine, after getting S5+ of hash for over a year, got in touch with the radio interference people. After about six weeks, they sent a van to investigate. After a few tests, he was told that the interference went from 20MHz to 50MHz and the cause was, of all things, computerised phones. Hard luck, breaker, can't do nowt — didn't want to know, in other words. This made me think, I get a mysterious S3 hash signal myself. I wonder how many other people are getting computer-generated interference of one form or another.



**Are British Telecom's high-tech telephones causing interference? Merlin thinks so. (See letter above).**

### Ticket Temptation

*Breadman, of Accrington, disagrees with another Back Chatter. . .*

Did Martin Wright get out of the wrong side of the bed before sending that amazing letter to 'Back Chat', or is he bitter and twisted for some other reason?

Whilst he is correct that, as yet, the proposed standards have no legal basis, they must surely have before long. I can understand his feelings about the present arrangements, but to suggest as he does that the remedy is to allow unfettered use of the whole of frequencies ranging from 26 to 28 is just asking for trouble. Whether he likes it or not, there are such things as licences and conditions, limiting though they may well be to those who want to be unsocial, and use large linear amplifiers, massive aerials, and sets which in their own right, put out rather more than the legitimate 4 watts.

FM in Britain today was never intended to be anything other than a medium for local copies, but man being what he is, more than somewhat

curious, all sorts of experimentation has taken place, and it does not take a genius to discover that, if you drive up to a high point (out of sight, of course), you can not only use illegal linears, but also erect aerials which would certainly cause comment at home. The results are naturally far better than anything one could obtain at home, especially if the operator has SSB facilities at his disposal.

Once they have tasted forbidden fruits, then giving up can be very hard — I say *can* be, because they have an ideal answer, which would give them far, far more than they could ever have operating illegally. Quite simply, if they are so devoted to long distance communication, then why don't they take their ticket? Quite honestly, I am wondering if it is the illegality angle which draws them, rather than the radio itself.

Stupid restrictions about aerials, Mr Wright? Perhaps if you knew a little more about the subject, you wouldn't make such statements. You would find out that something like a "Big Mac" isn't the be-all and end-all of radio communications, and if one is unfortunate enough to have a poor home base taking-off point, then buying massive aerials and linears is so much wasted money — you will get slightly better results, but at the definite cost of upsetting not only your neighbours, but fellow breakers, who, wishing to remain QRP stations, suddenly find that "So and So" is on the air again, thereby making it impossible to use their sets. Perhaps Mr Wright does not think that they should have as much right as he has to broadcast?

About the only thing we possibly agree on is the fact that, when we do eventually fall in line with the FCC frequencies, there will be colossal interference on FM from SSB-ers on the Continent. When propagation conditions are good under present allowances, then we *do* get hassle from Italians and so on, which will only get worse if the UK stays on FM — a great pity, in my estimation. Just for the record, I am convinced that, one day in the future, FM will be so crowded, that AM/SSB will be inevitable, but as yet the legal requirements limit lawful breakers to 4 watts, and a radiator of 1.65m.

As I said earlier, one does not have to be a genius to take one's ticket, and if one has a tutor like "In Frequent Trouble" (bless him), then it is perfectly possible to do the course inside three months, with little prior knowledge of the subject. It has always puzzled me that many SSB-ers, who are very well versed technically, should not seek to go even further in their quest for distance. Believe me, when a VK appears out of the blue, it makes it all very worth while.

**Letters should be addressed to: Back Chat, Citizens' Band, 1 Golden Square, London W1R 3AB**



the car. If you intend to do so with the batteries still fitted to the rig you must first arrange matters so that when the charging lead is in use, the supply from the Ni-Cads to the rig switches off. All the extra circuitry you need consists of a resistor and diode in series.

You do not tell me the total voltage of your Ni-Cads, so I cannot be specific about the value of your resistor but, for example, when I wanted to charge 9 Volt Ni-Cads by this means I used 220 ohms. The resistor ensures the necessary voltage drop, whilst the diode makes certain that no current flows back along the line in the case of a discharged car battery.

I must emphasise that this is a very slow means of recharging Ni-Cads and that the voltage of the car battery must exceed that of the Ni-Cads themselves. By this means it is perfectly safe to charge whilst the car is in motion, when the rate of charge will be slightly higher than at rest. In fact a 12 volt car battery will deliver no charge to 12 volt Ni-Cads unless the engine is running.

Ideally, the rate of charge should be in the region of 30mA.

### Yet more SWR Queries

Arne Berghansen, over in Oslo, was interested in our recent suggestion that VSWR should be measured as close to the antenna as possible. The more so when an American publication



Morph is suffering with poor TX on his Shogun (see second letter).

told him "You won't learn anything of value by making the connections at the rig end of the coaxial cable."

**Q** I have always used an SWR meter and have taken it at face value, as the Gospel truth. Yet now both Citizens Band and the CBer's Handy Manual from America tell me that the bridge should be connected close to the antenna. Since this would mean I need a pair of binoculars in order to read the result I would appreciate a more detailed explanation.

**A** The purpose behind placing the VSWR meter as close as possible to the antenna is to create as near a perfect 50 ohm load as possible by reducing to the barest minimum any reactance. For the best possible results

the feeder length should be measured in the following manner, so that it does not affect the overall impedance of the circuit.

Because the "velocity factor" of coaxial cable is some 66.6% that of air the current on the cable will travel at two thirds the normal speed of light. Therefore the length of cable used should equal two thirds of any number of half wavelengths. For example at 11 metres it may be necessary to use a minimum of, say 20ft of cable in order to connect rig and antenna. Since two half wavelengths equal 11 metres, this figure should be divided by 66.6% giving an optimum length of 7.26 metres, assuming that good quality cable of the correct impedance has been used. (Not all "50 ohm" cable has a true 50 ohm impedance.)

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# Mack Chat

Mack the Hack offers some thoughts on frequency allocation



**R**adio communication is big business these days, and some people must be making lots of money. There is only one radio spectrum and frequency allocation is at a premium. If you look around at the top of tall buildings in our towns you will see, excluding TV and CB, antennas of all sorts and sizes for the many frequencies. Many more vehicles seem to have sprouted ears, radio telephone, PMR of all description, and of course the new cellular radio. Then you have these kamikaze motor cyclist despatch riders, pedal-cycling messengers, and I have even seen people on roller skates or on horseback; you see it all in London town.

They all have one thing in common; radio communication. With their UHF or VHF mobile or hand-held transceivers, many of the frequencies are shared because there is not enough to go round. Yet everybody wants radio communication. Aircraft, boats, buses and taxis all want to know what is going on or who is doing what, and radio is the answer for these business users, and believe me it costs them plenty for the privilege. Most of the aforementioned use the realitively short range VHF or UHF, and it could be considered local communication compared to the world-wide range of the HF or short-wave. If you listen to these HF frequencies on a decent communications receiver with a good antenna system, you will soon realise how crowded they are.

With all this communication going on, it means employment and wages for all the people concerned, from the operators to the people who fix it when it goes wrong. CB is a hobby and we should consider ourselves very fortunate that the powers-that-be have allowed us a small part of the radio spectrum to play with.

Over the last few months, letters have been received and some have been published by this magazine from some people who are claiming that we CBers should have this or that part of the frequency to use as we like. Why? Why should we be given any more? Many of you know, and at times have said, that we don't or can't use properly

the bits of the frequency we already have. Most of the time it is, as you well know, abused and I can't think of any reason why the powers-that-be should give us other bands. To the people that say that we should be allocated some of the precious frequency space for intercontinental communications on single sideband, I could give the big dummy's answer which is if you want to play real radio, go get an amateur licence. I don't know why, but there is a difference between amateur and CB DX. I confess I have done both in the past and I know which I preferred. It was naughty but nice, but I have learnt to live without it. Some of the people that are illegally using the sidebands at present say that we should campaign to get SSB operating legalised. I for one would be ashamed to approach the DTI with cap in one hand and petition in the other, because they would reply with a sneer 'You citizens can't use the FM that we gave you in a correct manner', and who would argue with them or with what would you argue? An age limit and some form of exam some of you say. Well you're back to the RAE again.

The only pinhole of hope I can see is that, as you know, because of the CEPT, the DTI have been forced to change the 934 frequencies and now they are doing the same with the 27. We shall be going to the old FCC channels on FM and after a transition period the present 40 27 FM channels will go back into the hat. We will not, as some people believe, have both. How they hope to enforce this is beyond me. In some countries around the world SSB is legal, so maybe one day world powers will recommend that SSB becomes part of a legal world-wide CB system. But then, oh what fun, Delta keyers, the international pop music charts, verbal abuse in hundreds of different languages and, no doubt, political propoganda. No thank you, not for me. You people that want to play SSB would be better off doing it as you do now — illegally.

Once upon a time not so long ago, some of you were asking where can you get an alarm system to protect against theft of antennas. I replied that I had seen such devices and I would

attempt to find out about them for you. I searched high and low and the occasional CB shop without success, yet one licenced amateur who had designed and built such a device for himself jealously guards his secret and won't tell how it's done. So, to this amateur, I say eat your heart out, who needs you because, dear friendly CB people, I have found the answer in a device that is known as 'The Black Knight Nailer'. This alarm system will fit in your mobile or it can be adapted to protect your home-base antenna (especially useful if you live in a block of flats, as I have heard many stories of how these antennas have gone 'walkies' during the night. The Nailer measures 2½ x 2¼ x 1¾ inches and is a solid-state, totally encapsulated unit with just three wires and co-ax complete with PL259 attached emerging from the unit, and an SO 359. The comprehensive simple instructions describe the unit as 'An alarm system that works off your 12 volt battery and protects your CB radio and antenna system. One of the special features of this unit is that you install and forget it. No more trying to remember to use an extra key or switch to turn on your alarm system, just get out of your car and the Black Knight Nailer is on the job. When the PL259 connector is removed or the ground broken, your car horn or auxiliary alarm system is set off. The ground connection is broken to activate the alarm. That means that it will only work with some antennas and these are of the type where the loading coil is tapped to ground, such as most of the older GPAs home-base and mobile antenna specialist, Binatone, Amstrads, some Oscars, SMC, and others. So if the co-ax is cut, the antenna removed or the PL259 unscrewed from the rig, the alarm is activated and if you can run faster than the thief you can recover your antenna after capturing the villain! If in doubt whether or not the Nailer is compatible with your CB system, contact the distributor who is selling the Black Knight Nailer. The cost of this device is only £2.99 (yes you read it right, two pounds ninety-nine pence!) plus post (80p) but hurry as there is only a limited number available from City Communications Ltd.

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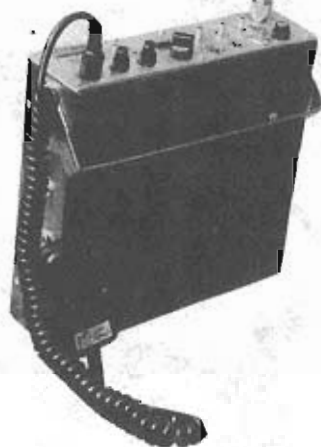
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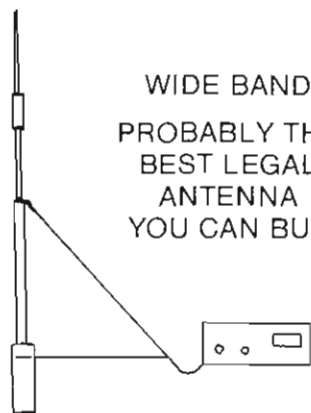
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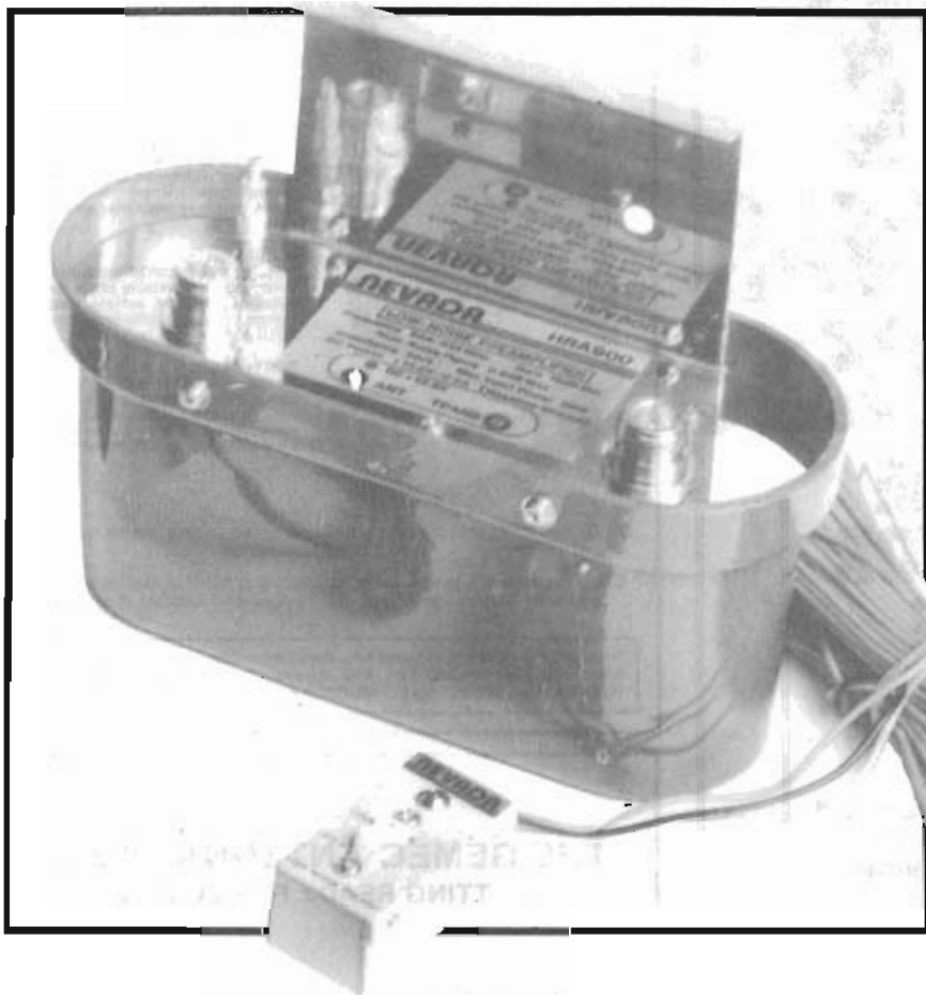
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# ON TEST: NEVADA



With the ongoing boom in 934, Chris Peterson checks out a pre-amp from the Nevada range.

something about the antenna.

Having made the decision, a quick trip to see my good friends at Rickmansworth Communications Centre with some green folding stuff secured a Nevada home-base co-linear which promptly went up on my roof. For the moment I am using the RG8 feeder that was already in place for my 27 MHz antenna. 'N' type connectors had to be fitted at each end, but the system was soon up and working. At some time in the future I intend to replace the RG8 with H100, but for the moment the RG8 is adequate.

**T**he recent boom in accessories for the 934 MHz band has finally persuaded me to do something about my UHF installation. At the time, I bought my Reftec rig, the only antennas available were those supplied by Reftec. The original installation was a rather half-hearted affair intended primarily for local work whilst carrying out reviews for the magazine. Although adequate for this purpose, the installation was rather inconvenient for regular use and the four-element beam, being fixed pointing towards London, tended to limit my contact to fairly local stations in any other direction.

I hadn't purchased a co-linear when I bought my rig for several reasons. My mast was already occupied by a vertical 27 MHz antenna and, having just spent over £200 on a rig, the Reftec co-linear seemed a bit overpriced at nearly £100!

However, competition is a wonderful thing, and when Telecomms announced their entry into the UHF field, there was a dramatic fall in the price of antennas, accompanied by a dramatic improvement in their quality!

Certainly the quality of the accessories they supplied for us to have a look at last summer were of an order of magnitude better than anything we had previously seen.

Most recently, Les Wallen has also introduced a range of UHF antennas and accessories, although I haven't actually seen any of these yet. If they are as well made as his 27 MHz bits and pieces, there will be quite a bonanza for UHF enthusiasts.

For some time I have been growing increasingly disillusioned with the 27 MHz band. The level of general wallying around my location, along with the drastic overcrowding of the channels, meant that even if I could find someone worth talking to, he would probably be so close that I could shout to him as easily! The level of background noise on 27 MHz has meant that in my area I was achieving considerably better range on 934 than I could ever hope to manage on 27 MHz!

With this in mind, I decided around Christmas time to take down my 27 MHz antenna, and commit myself totally to UHF. I already had the rig, but to have an effective and convenient installation meant that I had to do

The Nevada co-linear is a beautifully made antenna. Every part of it oozes quality, and it should give many years trouble free service. A quick check of the SWR showed negligible reflections on the line, and I was soon chatting away to many old friends on the band, and contacting new ones that I was unaware existed previously!

Indeed, I was so impressed with the Nevada antenna that a week or two later I was back buying the mobile version to clamp to the family car. This also works admirably with negligible SWR though, like many thick gutter-mounted antennas, it tends to whistle a bit at speed. Also a recent drive to visit 8H172 in Weybridge revealed that it has a little bit too much gain for use in a convoy situation! The poor old Reftec was wilting under the unaccustomed signal levels it was being asked to handle! I am going to experiment with a smaller antenna to fit the Nevada gutter-mount for use in convoys and motorway driving, and save the co-linear for mobile DXing! Watch this space!

It soon became apparent with the new set up that stations could hear me when I couldn't hear them. Also having

# 934 MHz PRE-AMP

the Commtel on the test for a few weeks emphasized that the Reftec is not as sensitive as its more modern counterparts.

A few months ago, when Telecomms sent us a bundle of accessories for review, amongst the other bits and pieces was a masthead pre-amp. At the time, we were unable to try the pre-amp out as my original installation would have made connecting it into the feeder rather difficult. However, my new installation made fitting the pre-amp relatively easy, so I retrieved it from the Editor's goody cupboard and waited for the ice to melt off the roof.

Perhaps it might be wise to pause at this point and consider what a pre-amp does, and why it should be an advantage on 934 MHz, when they are usually more of a hinderance than a help on 27 MHz.

The limiting factor for reading a signal is not the absolute signal level at the antenna, but the signal-to-noise ratio at the speaker. In other words the more noise that is generated internally in the receiver, the more signal will be required at the antenna to overcome it. Now all receivers generate noise internally, and each stage of the re-

ceiver contributes a bit of noise as the signal progresses through the receiver. It can be shown that the most critical stage for noise contribution is the first stage of the receiver. The noise contributed by the first stage in the receiver will be amplified by every succeeding stage, whereas the noise generated in the penultimate stage will be amplified only by the final stage.

So from this we can see it is crucial that the first stage of a receiver should generate the least noise. Things will also improve if we use less gain after this stage. However, to maintain the overall sensitivity, we must increase the gain of the first stage to compensate.

To summarise then, for the best signal-to-noise ratio at the receiver, the *first* stage of the receiver should have as much gain as possible whilst contributing the least noise. The amount of noise contributed by a stage is called its noise factor or noise figure. The noise factor is defined quite simply as the signal-to-noise ratio at the input divided by the signal-to-noise ratio at the output. This is usually expressed as a ratio in decibels, in which case it is known as the noise figure.

Now all this assumes that the amount of noise at the antenna is negligible compared to that generated within the receiver. Unfortunately, on 27 MHz, this is far from the case. Usually, the level of background noise from both local and distant stations not, to mention 'atmospherics' or 'static', means that any noise generated in the receiver is negligible in comparison. Furthermore, most of the bleedover problems experienced on 27 MHz are as a result of the receiver overloading with excessive signal levels which a pre-amp will only make worse!

In contrast, the 934 MHz band is very quiet electrically. There is virtually no atmospheric noise at all, which means that the noise generated internally in the receiver is significant. Furthermore, the relatively sparse population on UHF means that receiver overload is seldom a problem. Under these circumstances, a pre-amp of some kind can lead to improved reception.

Having decided that a suitably designed pre-amp can be advantageous, the next question is where to put it. Although installing it at the receiver end of the feeder is easiest,



there are definite advantages to be gained in placing it close to the antenna on the masthead.

Taking my own installation as an example, the 50 feet (approximately) of RGB coax between the antenna and the rig will attenuate the signal by about 3 dB between the two. That means for 8 watts out at the transmitter (a bit optimistic in the case of a Reftec!) only 4 watts will reach the antenna. Similarly, any received signal will be attenuated by about half, between the antenna and rig. Earlier, we pointed out that the important factor is the signal level compared to the noise generated in the amplifier. Now the noise generated in the amplifier will be the same whether it is installed at the rig end of the feeder or at the masthead. However, the signal will be twice as strong as the masthead as it is at the rig end, yielding a 3 dB improvement in the received signal to noise figure. Obviously this is a very real improvement, and is in addition to any improvement caused by the extra gain in the system.

In the case of the Nevada pre-amp, the gain is at least 18 dB, with a noise figure better than 0.8 dB. This all adds up to a very real improvement in performance in my particular installation. I opened our sample up for a quick peek inside — not recommended for the general public as this might well reduce the efficiency of the weather seal! The workmanship inside is excellent, and I was pleased to note the use of very high-quality coaxial switchline relays. The relays automatically drop out, bypassing the pre-amp, when transmitting to prevent damage to the pre-amp transistor. The relays also dropout if the power fails, so it is in theory impossible to damage the pre-amp if you accidentally break the power feed to it!

When I first took delivery of the pre-amp, it was in the middle of the severe weather we had just after Christmas. Being rather reluctant to climb up on the roof with all that ice about, I initially installed the pre-amp immediately behind the rig on the dining room floor. There was an immediate improvement in the reception abilities of my Reftec, with stations that were previously only audible with difficulty now quite clear. However, the ambient noise in the system was now sufficient to bring all five signal LEDs on continuously, even when there were no signals present on the band! I should add at this point that the signal strength metering on Reftecs varies enormously from one example to another. Mine will light up all five LEDs on a weak and noisy signal, and two or less is totally unworkable. Occasionally, one will light up just on ambient noise!

When the weather finally cleared, the pre-amp was installed directly under the antenna on the mast. Connection between the antenna and pre-amp was made by a couple of feet of H100 cable. One slight criticism I have of the Nevada pre-amp is the necessity of running an extra power lead up to carry the DC power supply. Admittedly

only one wire is required, the earth return being via the coax feeder, and they do supply plenty of it! However, I do feel that a more practical approach would have been to feed the power up the coax inner, as is the generally accepted practice in amateur and TV applications. As it is I had to struggle to get another 50 feet of wire up to the roof, and try to keep it tidy by wrapping it round the feeder! Anyone at Telecomms care to comment?

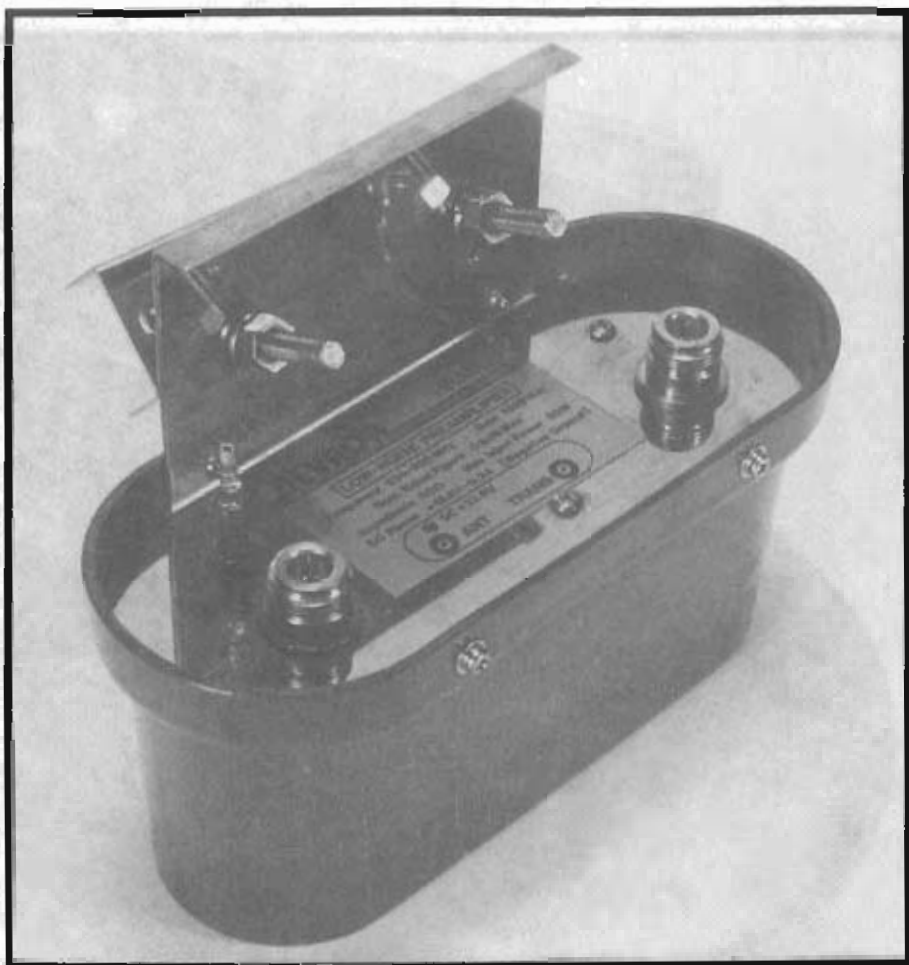
Having installed the pre-amp in its intended position, the improvement in reception almost defies description! Stations that were previously *totally* unworkable (not even a glimmer on the signal LEDs!) now come in crystal clear with five lights showing. It really has brought the Reftec to life! I reckon in my case that installing the pre-amp must have doubled the number of stations I can now work! So far, there have been no detectable ill effects whatsoever in terms of swamping or adjacent channel effects. When switched on, the pre-amp betrays its presence slightly on my rig by bringing up one or two signal LEDs even on empty channels. In practice, this is slightly re-assuring, as it is an indication that all is operating properly!

To give some idea of the advantages to be gained by using this pre-amp, I offer the following comparisons. In my case (good, high mounted antenna, but long feeder) I reckon that the Reftec *with* the pre-amp is slightly

more sensitive than a Delta 1 or Commtel *without* a pre-amp. As with any pre-amp, the receivers that will benefit most are the ones that are slightly deaf to start with. In other words, Reftec owners will benefit more than Delta 1 or Commtel owners. If you are using a Delta 1 with four feet of H100 to the antenna, you are unlikely to gain much by fitting a pre-amp. However, if you are using a Reftec, you can expect a dramatic improvement by using a pre-amp. Even Delta 1 and Commtel owners will benefit if, like me, they have a long cable run between the rig and antenna. The pre-amp will more than compensate for the losses in a long cable run, and these can be considerable at UHF.

The only slight drawback I have now is that there are a number of stations I can hear clearly, but who cannot hear me because they are using Reftecs, long feeders and no pre-amps...

Finally, a passing thought. As pointed out earlier, on a 50 foot cable run, nearly half the signal can be lost between rig and antenna. This applies just as much when transmitting as receiving. Logically, the transmitter output stage should be located at the masthead to minimise such losses. Who is going to produce the first base station rig where the transmitter final stages and receiver front end are mounted in a little tin box at the masthead...?





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## More QSL club news from David Shepherdson

# COMMUNICATION THE QSL WAY

I'll start off this month's column with news of a few Club's price increases. First to hand is the Antequera QSL club of Spain. This excellent Club has increased its UK joining fee from £7 to £8, but I understand if you join with a form marked £7, you are asked for the extra £1. For your £8 you get your unit number two certificates, mounted stamp, Spanish postage stamps, view-cards and coins, club stickers, 'Q' & '10' codes etc. One nice touch is the poster included. The other two are both UK clubs, the Galaxy and the New Big Ben (1985). Both of these now cost £5 to join with five *personal* cards. For your £5 Galaxy fee you get your unit No, ID card, 25 club cards, mounted stamp, stamp ink pad, stickers etc. The forms marked £4 were also marked 'valid' until end of June 1985 only. For the NBBC your £5 gets you your unit No, ID card, certificate, 20 + exchange cards, invites, mounted stamp, 10 club QSLs, stickers, view cards, DX tips, roster, tourist info and quite a bit more. Also, as it is part of the Dragonrider Club, membership of the DR's if not already a member.

A request from Christina (Lucky Lady) of Leeds who asks me to apologise to anyone who has been waiting for a reply from her. Christina has been in hospital quite a bit of late and has been unable to answer her post. All the best, Chris. A few names now, then some news of the rip-off club called the 'Dutch Trucking'. From Northern Ireland hails Robert and Teresa (Hot-Rod and Foxy Lady) who want a mention and promise to QSL 100%. Graham and Mary (Camera Man and Mary Rose) write from Wolverhampton with their new Ensign Cards and best wishes. Some new "double size Currie" cards have turned up from Dennis (Applejack) of Consett and from Troon in Cornwall hails Laith (TB 121) who asks for a mention.

Okay, at the time of writing, I've just received a letter from the Dutch Trucking "club's" Vice President. This "club" has been owing people here in the UK money for about two years

now. It was recently sold to two youngsters who in fact have just sold it again! But, and I quote, "There is one problem, I don't have his address, when I have it, I let you (DR 1) know", unquote. I have had letters from some people who have been ripped off to the tune of £12 each by the original president, and who have been in touch with this couple and the package promised, *not* given, just promised, was to say the least, pretty appalling. Anyway, I'll quote the reason they give for passing on the club: "The point is we have sold the Dutch Trucking because we have got too much trouble with the people about this club. Maybe you know my father is Zwaantje and he don't want any trouble with the people about the Dutch Trucking", Zwaantje by the way runs another Dutch Club. So, to me, this just means that they are too young to have a club, especially one with such a bad reputation and have now passed the buck to someone else!

A request from Brian of the Whiskey Mike DX Group asking for the new AD of this London club to be passed on. It's at "The Royal", Boston Manor Road, Hanwell each Tuesday at 8pm. Everyone is welcome to come.

An American club people keep recommending to me is the Sierra Delta Radio & QSL Club. For \$9 (US) and 10 personal cards you can expect to receive your unit no, colour certificate, roster, applications, club stamp, 10 club cards, ID card, exchange cards and invites, viewcard, photo, etc. This club is six years old and has many members all over the world. A UK club that also gets quite a few recommendations is the Sierra Charlie DX & QSL Club of Southport. For only £2 (UK) and 10 personal cards you receive your SC No, ID card, certificate, 15 club cards, exchange cards and invites, etc. A club stamp is available for £3 and club cards at £4 per 100. A complete package is available for £5 which includes the stamp, stickers and a car sticker. In addition, a club cloth patch is also available for £1 in the UK.

The first free membership club mentioned this month is the Roman City DX/QSL Club of Co Durham. For only five personal cards and a SASE (Self Addressed Stamped Envelope) you can expect your RC No, ID card (XYL free), stickers, exchange cards and invites. One point I have been asked to make here is that when joining a club, any club at all, is that you should use your personal QSL cards, and not some other club's cards. This is considered by many to be an insult. Club and stock cards are perfectly acceptable when used to fill out your own QSL packets when *accompanying* your own cards. After all, people like to collect cards and like these to be individual, not a large amount of identical club cards because someone cannot be bothered to consider personal ones. I know that these are not cheap, but neither is the postagel Shop around, there are many firms specialising in QSL cards. You can get quality collectable cards from as little as £15 per 1000 (Curries) to £18 per £100 (£6 2nd 100 etc) from Ensign. Look around at other people's cards, if you like one particular type, ask them where they had them printed, how much they cost, and what they feel about the firm. If the firm is any good they will be recommended to you and get re-orders.

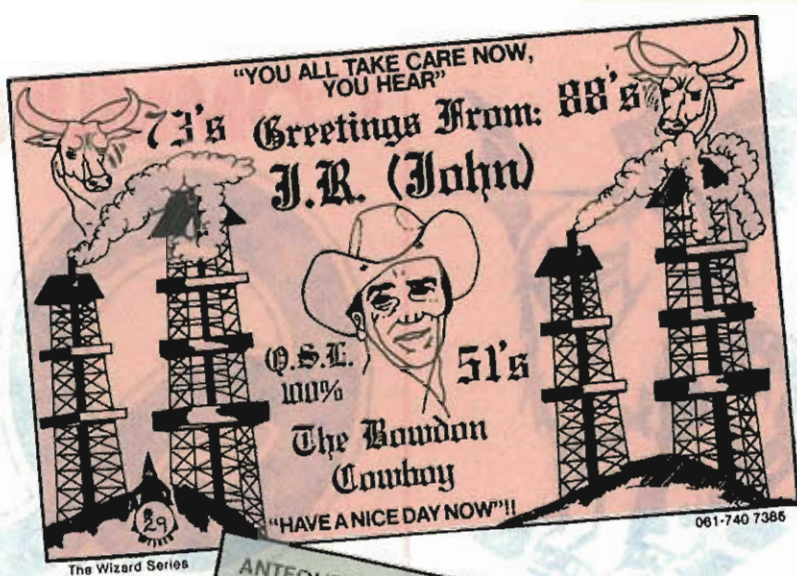
Right, I've a pile of letter and cards in front of me which have been sent up via the mag so I'll go through these. If you'd like a mention, drop me a line and I'll see what can be done. One point though, please do note, I have nothing to do with the "Club News" spot elsewhere in this mag.

Okay, from Robert (TA 109) of Newcastle upon Tyne comes a request for a mention as he will QSL anyone who QSLs him, from June and Sue (Pebbles and Burgandy) of the Weymouth Radio Group comes the request for a mention as QSL swappers. They also swap cloth badges and spoons etc. A bundle from Bruno in Zurich with some colourful cards based on a

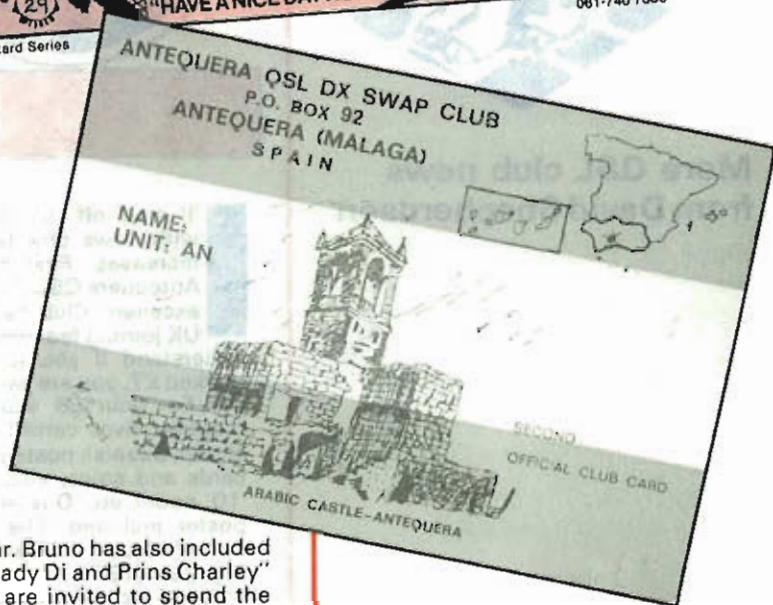
motorsport car. Bruno has also included a card for a "Lady Di and Prins Charley" who, I think, are invited to spend the weekend (if I'm not here next month, write c/o the Tower of London). A long letter from Chris (White Rock) who has been in hospital with a broken leg and asks for a mention. Hops the leg is healed by now, Chris. Lastly from the pile is 10-year old Aileen (Goffy) of Annan with a Currie Club card. Some more which came direct to my home

20 include from Stanley, where the Big Meeting of 1985 was held hails Mary (Liberty Belle) who writes that she enjoys receiving your cards and would like to hear from you. From Scarborough Ray (Countryman) asks for a mention, as does David (LT 150) of Wigan who writes with a few club cards and his own Jumping Jack card. From Co. Donegal's Inishowen Peninsula writes Robert (Milky Bar Kid) of Culdaff with a note on chain letters. As I said Bob, these things are *not* a part of good QSLing and should be destroyed.

I mentioned the Antequera Club of Spain earlier and I've just come across a letter from Manolo, the Secretary of the Club. Thanks to Peter (AN 355) of Grimsby, who visited Spain and took a couple of copies of the mag with him; Manolo has read and enjoyed these pages. Sorry Peter, but I don't have your AD. Manolo has asked me to pass on the regards of the club to all UK QSLers and hopes that you may like to join. As I've already said, this is a genuine club which a lot of people recommend. Outside of Spain, the UK has the highest "AN" membership numbers. One point I would like to raise here is that most overseas clubs do not accept UK cheques/P.O.'s, but cash only. For safety I do suggest you consider using Registered Post for sending cash abroad, and always pack your notes between a couple of cards securely.



The Wizard Series



### QSL Addresses

Christina (Lucky Lady)

Robert & Teresa (Hot Rod & Foxy Lady)

Graham & Mary (Camera Man & Mary Rose)

Dennis (Applejack)

Laith (TB 121)

Robert (TA 109)

June & Sue (Pebble & Burgandy)

Chris (White Rock)

Bruno (Opel Ascona)

Mary (Liberty Belle)

Aileen (Goffy)

Ray (Countryman)

David (LT 150)

Robert (Milky Bar Kid)

2 Ashlea Gate, Bramley, Leeds, W Yorks.

PO Box 13, Newtownards, Co Down, Northern Ireland.

PO Box 189, Wolverhampton, West Midlands.

PO Box 5, Consett, Co Durham.

PO Box 6, Camborne, Cornwall.

103 West Avenue, Westerhope, Newcastle upon Tyne.

PO Box 18, Weymouth, Dorset.

38 Highcroft, Stevenage, Herts.

Tolli/79-f, PO Box 7564, CH-8023 Zurich, Switzerland.

10 Rose Avenue, South Moor, Stanley, Co Durham.

Hannah Dairy, Cummertrees, Annan, Scotland.

19 Dale Garth, Sandybed, Scarborough, N Yorks.

13 Carmill Road, Billinge, Nr Wigan, Lancs.

Redford, Culdaff, Co Donegal, Ireland.



One UK club that's been around for just over one year now is the Northampton-based Headache Control. To join this club costs £5 and 10 or more of your personal cards and, as it is also a souvenir swapping club, a souvenir spoon or similar if you wish to collect and swap these. For your £5 you can expect a package consisting of your "Headache" No. ID card, certificate, rubber stamp (a big one at that!), five club QSL's, five club envelopes, exchange cards and invites, roster, frequency lists, 'Q' codas and tips, Tourist info with XYL/M free and if you included a swap souvenir, you will get one in exchange. Extras available include 50 club QSL cards at £2, 25 envelopes at £1 and stickers at £1 per 100. As I said, the club is just over one year old now and to mark this occasion, Fred (Headache 001) has obtained a new stamp for the club. This is available for £2.50 mounted, or £1.30 unmounted. For details of the stamp or for details of the club in general, please send you request to Fred with an SASE. In fact, when writing to any QSL club or firm, always enclose return postage to assist with their reply.

I've had a letter from Alex (The Wizard) who is the designer and printer of the Wizard series cards, which my old mate 'JR' uses so much. Alex has let me know that due to ill health he will no longer be printing any more of these cards. So, the Wizard series is definitely going to be a real collectors' series now! All the best Alex, I know many people will miss you. The Atlantic Breakers Club has taken over the entire stock of Wizard cards and any queries should be sent with a SASE to John (JR-ABC). While mentioning the ABC Club, membership to this very good club costs £6 with 10 QSL cards. For this you can expect you ABC unit No. ID card, certificate, club stamp and cards, RST, 'Q' and phonetic codes, club stickers and exchange cards and invites. Also a bi-monthly newsletter is available for £2.50 per year. This includes the infamous "Buck Fuzby" with his outspoken comments; well worth getting!

I've been asked to let you know that the Sniper DX/QSL Club has moved to 5 Plains Field, Crassing Road, Braintree, Essex. Also, membership now

costs £5 with 25 personal cards (not club QSLs it says here). In return you get your Sniper No. certificate, roster, 100 club cards, club stamp, stickers, invites and exchange cards.

Okay, forthcoming events now. Well, the only info on these this month is from the Country CB Club of Scarborough who are planning a Giant Eyeball from the 27th to the 30th of September. However, all applications



### QSL Club Addresses

- Antequera QSL DX Swap Club PO Box 92, Antequera (Malaga), Spain.
- Atlantic Breakers Club 14 Priory Road, Bowdon, Cheshire. PO Box 14, Brighouse, West Yorkshire. PO Box 105, Northampton.
- Galaxy Radio Group
- "Headache" Control QSL Swap
- Roman City DX-QSL Club 5 Ernest Terrace, Chester-le-Street, Co Durham. PO Box 27, Southport, Merseyside. PO Box 5038, Long Beach, CA 90805, USA.
- Sierra Charlie DX & QSL Club
- Sierra Delta Sideband Club
- Sniper QSL DX Club
- Dragonrider One, Via DR/NBBC Clubs 5 Plains Field, Crassing Road, Braintree, Essex. 3 Tarn Villas, Cowpasture Road, Ilkley, W Yorks.

### Contact Addresses for Meeting:

- Country CB Club PO Box 36, Scarborough.

### QSL Printers' Addresses:

- Curries 89 Derwent St. Blackhill, Consett, Co Durham.
- Ensign 58B Market Street, Ashby-de-la-Zouche.

When writing to any QSL club, always try to enclose return postage to assist with their reply.

for this have to be in by August 1st. The details seem to suggest that because the venue is The South Bay Holiday Village, you appear to be expected to use one of the village's caravans, for which the costs are £21 per weekend for a standard caravan, or £24 for the more plentiful de-luxe models. It starts on Friday evening and runs through to Sunday evening and the entertainment will include discos, bands, games and displays. There will also be a traders' market and sideshows on the Saturday. Please note, for details you must get in touch with the Secretary of this club, but don't forget a suitable (9" x 5") SASE.

Well, out of space again, just room to remind you if you want a mention, for yourself, a club or a forthcoming event, drop me a line, either via the mag or direct through the Dragonrider Club. If it's for a mention, don't just tear a scrap of paper out of a spiral notebook, try to include one or two of your personal cards; you'll have a better chance that way. If you want a reply, don't forget to put in a SASE please, but one thing to bear in mind, whatever you write to me about, try to keep it short, but do give me full details without going into four and five page essays. I've just had a letter from a new International Secretary of a club, and I've no idea what the club is! That's it, take care until the next time, all the best.

# SIGNAL PROPAGATION

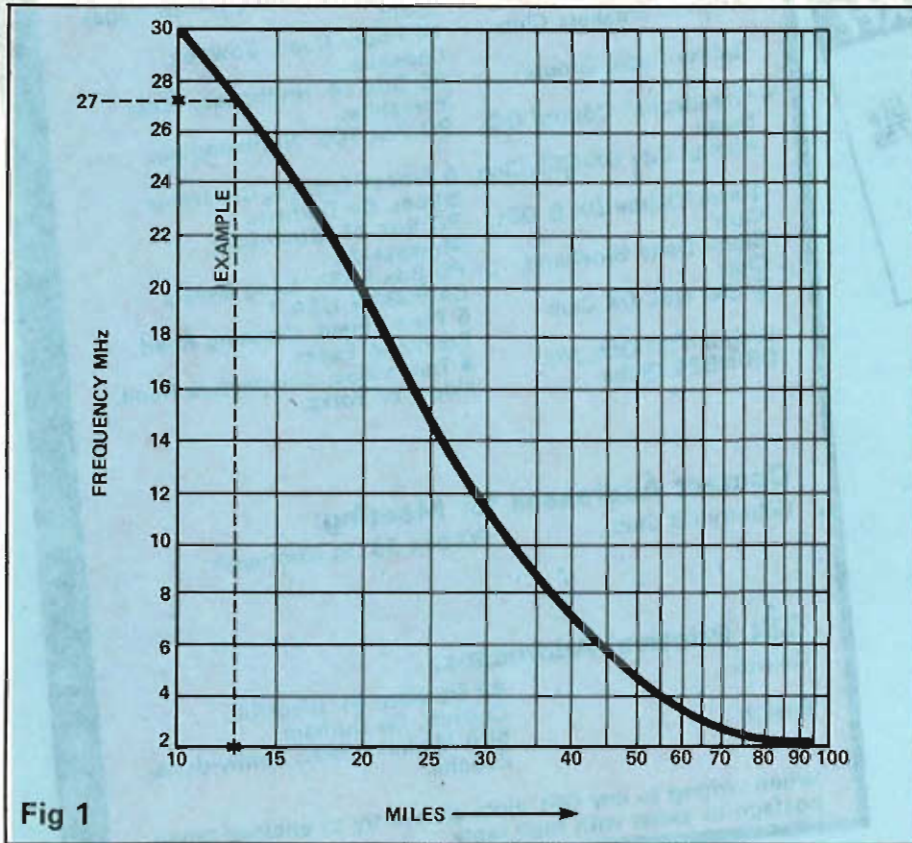


Fig 1 Ground-wave coverage distances in relation to frequency of transmission. Note as example indicates, the range is averagely very short for 27 MHz.

The first part of this article dealt with radio wave propagation over long distances (DX) by a mode usually known as 'skywave' but more technically as 'ionospheric' propagation. Radio waves also travel close to the surface of the earth in different ways, some of which involve relatively little actual contact with the earth itself. The choice of nomenclature in this respect

## F. C. Judd discusses different forms of signal propagation

can therefore be somewhat confusing, although the common term for these modes of radio wave propagation is 'ground-wave' and applies to waves that do not otherwise reach the place of reception via the ionosphere. In

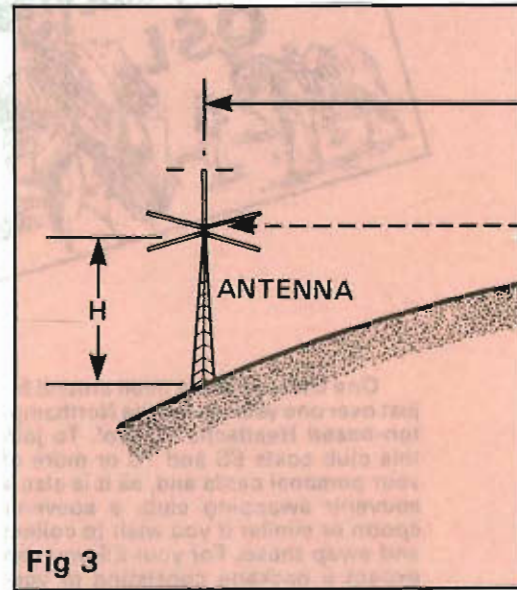


Fig 3

The distance  $D$  to the horizon from an antenna height ' $H$ ' is given by the formula in the text. The maximum 'line-of-sight' distance between two high antennas is the sum of the distance of each to the horizon.

certain instances however, a radio wave can travel to some point a relatively short distance from the place of transmission by simultaneous ground-wave and ionospheric propagation, although this does not occur at frequencies as high as 27 MHz.

## The Surface Wave

A wave that travels in actual contact with the ground is known as a 'surface wave' and may provide propagation up to distances of 160 kilometres (approximately 100 miles) or more in the lower frequency range (e.g. those

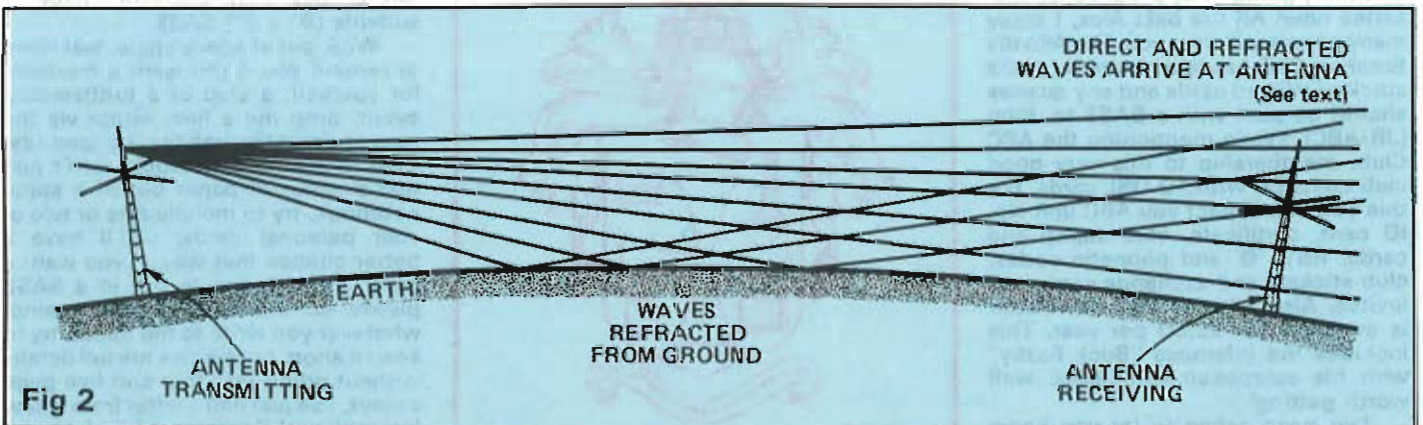
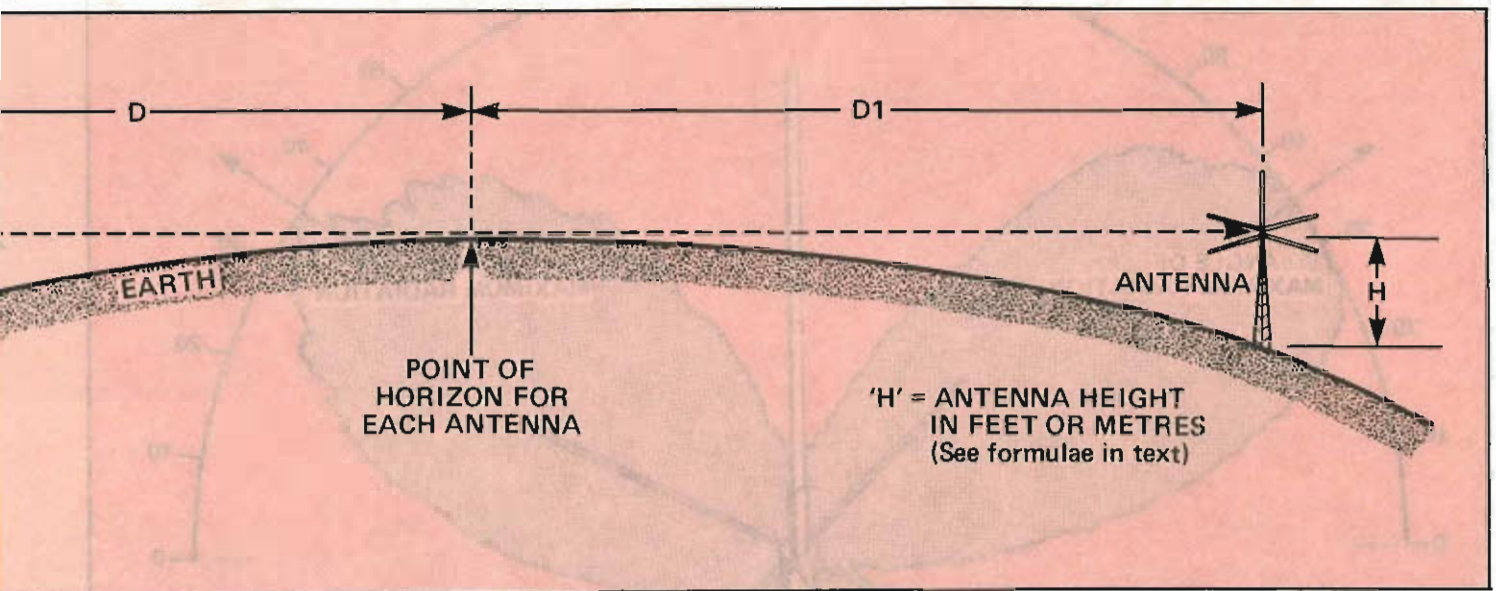


Fig 2 The speck-wave principle. Radiation from the transmitting antenna may take two paths. One direct and the other via earth from which it is refracted at an oblique angle. Differences in phase between the direct and refracted waves at the receiving antenna can cause variations in the strength of the received signal (see text).

# PROPAGATION AT 27 MHz



used for long and medium-wave broadcasting). Attenuation of the radiated wave with this mode of propagation is fairly high so the strength of the transmission falls off fairly rapidly with distance. Such attenuation also increases as the frequency of transmission becomes higher. Useful, but limited ranges are possible at frequencies between about 2 and 4 MHz. Surface wave propagation is used to some extent for the radio amateur bands of 1.8 to 2 MHz and 3.5 to 3.8 MHz. The graph, Fig. 1, shows the average ground distance possible at frequencies ranging from 2 to 30 MHz and from which the limitation at 27 MHz can be readily seen.

A surface wave must also be vertically polarized to achieve maximum ground distance i.e. the antenna employed should ideally be vertical. Horizontal antennas radiate a horizontally polarised wave and are used mainly for ionospheric propagation, although efficient vertical antennas are also used for this mode, since the polarization of the wave is invariably changed during ionospheric propagation. Obviously, when surface wave transmission is made with a vertical antenna, the receiving antenna must also be vertical to obtain maximum signal strength.

## The Space-wave

This is usually referred to as ground-wave propagation because the wave travels near to the ground but not necessarily in contact with it. Over a clear "line of sight" distance, a space-wave suffers less attenuation but this condition is only fully realised at frequencies above about 30 MHz. It would be the normal mode of propa-

gation for the 934 MHz CB band for instance. Nevertheless, at 27 MHz space-wave propagation can take place providing both the transmitting and receiving antennas are very high above ground on high masts, or the tops of very tall buildings or on very high ground, such as mountain tops and of course more or less within line-of-sight of each other. The so-called line-of-sight range is actually greater than the purely optical distance as even very high frequency waves tend to follow the curvature of the earth but only for a limited distance.

True space-wave propagation does have a particular drawback in that some of the radiation may travel in a downward direction i.e. toward earth and be refracted at an angle the same as the angle of incidence. The result is that the wave takes two paths, one direct and one slightly longer via the ground refraction path as illustrated in Fig. 2. The refracted wave can arrive at the receiving antenna in-phase with the direct wave in which case the signal is greater as waves *in phase* add to each other. On the other hand the direct and refracted waves could arrive *out of phase* or partially so, in which case the waves will tend to cancel completely, or partially, resulting in virtually no signal at all, or signals with strength depending on the phase relationship. This occurrence is quite common at very high frequencies e.g. above 100 MHz but can happen if the right circumstances prevail, at 27 MHz.

The foregoing explanation is of necessity simplified and there are other practical aspects that can modify it. For example, there is some loss of radiation if the wave meets ground in which case the refracted wave may suffer some loss before it reaches the receiving antenna. The reduction in

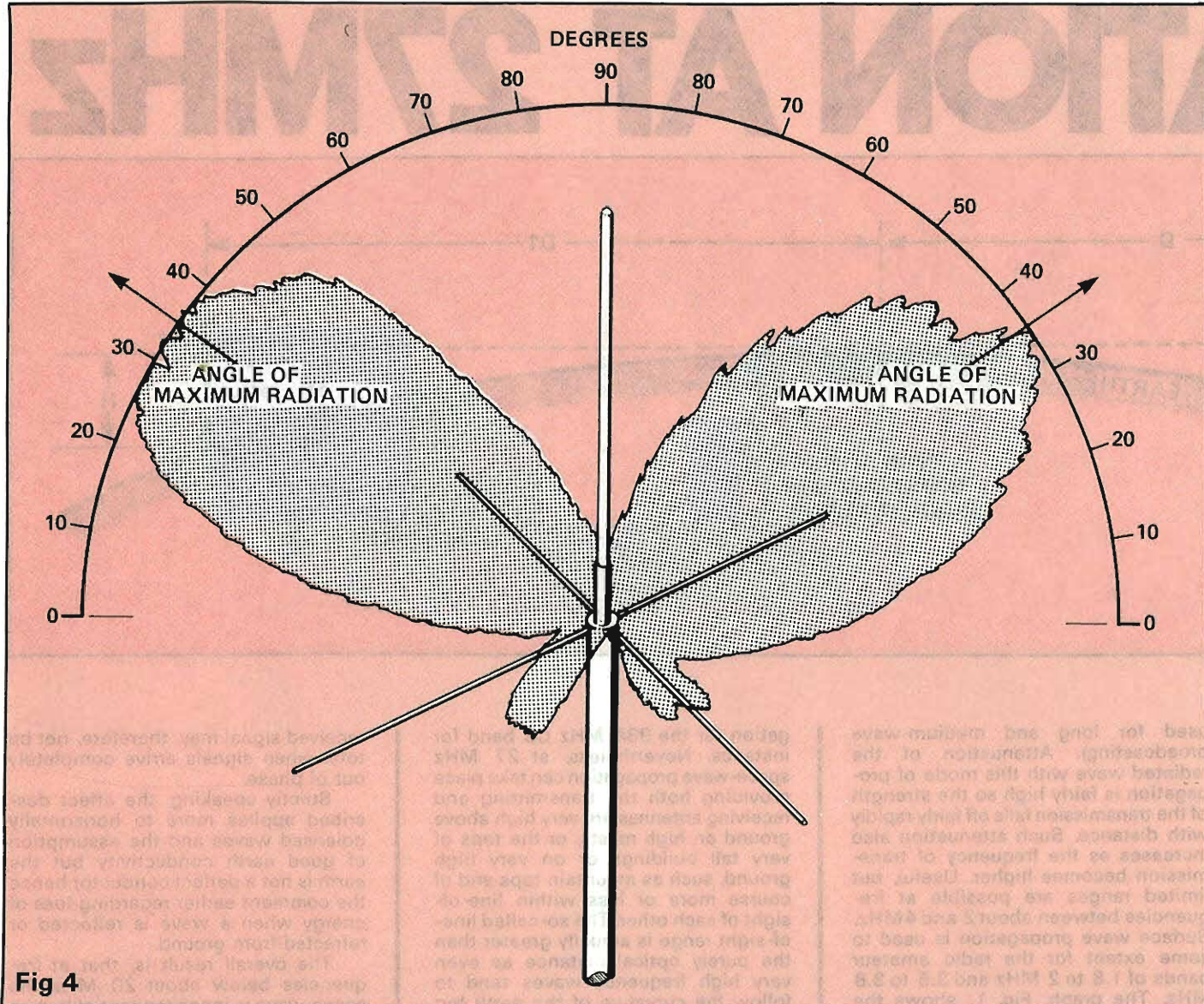
received signal may, therefore, not be total when signals arrive completely out of phase.

Strictly speaking, the effect described applies more to horizontally polarised waves and the assumption of good earth conductivity but the earth is not a perfect conductor hence the comment earlier regarding loss of energy when a wave is reflected or refracted from ground.

The overall result is, that at frequencies below about 20 MHz the space-wave is inconsequential but, as the frequency is increased, this mode of propagation becomes more effective but can only prevail at 27 MHz if the antennas are very high.

## Line-of-Sight Propagation

Although this mode applies mainly to VHF and would be the normal mode of propagation for the 934 MHz CB radio band — it could also prevail at 27 MHz but again only if the antennas are very high. It is however, worth mentioning for the benefit of those who use, or may at some time use, the 943 MHz allocation. It has already been mentioned that the term *line-of-sight* does not mean optical distance from one point to another as radio waves at very high frequencies tend to follow the curvature of the earth, at least for some part of the overall distance covered. On this basis, the line-of-sight distance from the transmitting antenna to the horizon is given by:-  
Distance (miles) = 1.415 H(ft)  
Where H is the height of the antennas above ground in feet  
The formula for antenna height in metres is:-  
Distance (Kilometres) = 4.124 H (Metres)



**Fig 4**

The high angle radiation common to short antennas operating with a ground-plane. The angle of maximum radiation is raised by phase interference due to radiation from the ground-plane elements. The pattern shown is that plotted from a 27 MHz antenna constructed to the Home Office specifications.

The formula assumes that the path over the earth is perfectly smooth to the horizon and that there are no large obstructions in the path (e.g. tall buildings, or high ground). If the receiving antenna is also raised in height, the maximum line of sight distance is equal to  $D1 + D2$  as illustrated in Fig. 3. The heights of both the transmitting and receiving antennas must be taken into account as illustrated. For instance with the transmitting antenna at a height of 60 feet and the receiving antenna at a height of 40 feet, the line of sight distance would be in the region of a little over 20 miles.

**Conditions for ground-wave propagation at 27 MHz**

As a space-wave (or ground-wave) travels in an essentially straight line from transmitter to receiver, maximum radiation from the transmitting antenna should be at a 'low angle' i.e. at an angle virtually parallel to ground. If maximum radiation is at a high angle

the receiving antenna will pick up very little signal. Unfortunately the specified 27 MHz CB antenna of 1.5 metres physical length operating with a ground plane has an average vertical angle of maximum radiation of about 30 to 35 degrees as in Fig. 4, so a considerable amount of power is lost in travelling upward. Also antennas of this nature, whether for fixed station or mobile operation, have to be inductively loaded to obtain resonance. Because of inductance resistive losses antennas of short length are, by comparison with a normal half-wave antenna operating at 27 MHz, notoriously inefficient, more so in view of the inherent high angle of radiation. It is doubtful whether more than about 50% of the power supplied to such antennas is actually radiated and a further percentage of this is lost at high vertical angles (relative to ground), as illustrated in Fig. 4. This applies to similar types of antennas and for mobile operation.

In any case if really low angle, parallel to ground, radiation were

achieved and the radiation efficiency of the antenna increased to around 80 to 90% (which is possible with specific types of antenna) the working distances with ground-wave propagation would not be increased very much because so much radiation is absorbed by the ground along the path of the wave (refer to Fig. 1) at frequencies as high as 27 MHz.

Finally it must be emphasised that short distances between fixed station to fixed station, or to mobiles, cannot be covered by any other mode of propagation i.e. other than by ground/space-wave mode. Also the normal ionospheric E layer *does not reflect or refract radio waves except those below about 3 MHz. The E layer at a nominal height of 100 Km, plays no part whatsoever in propagation at 27 MHz.* Only Sporadic E (Es) ionized clouds can propagate waves in the high and very high frequency region as described in part 1. The formation of these is spasmodic and predominant mainly during the summer months in the U.K.





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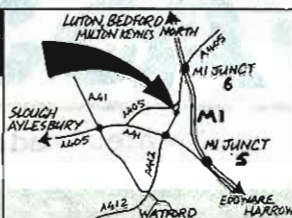
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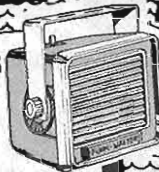
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Today, certain frequencies are allocated by almost every country in the world for use by amateurs. In the UK alone, over 25,000 people hold a transmitting licence to enable them to operate a transmitting station. There are two classes of this licence, renewable annually at £12. Amateur Licence A, Amateur Licence B and, in some cases, a special Amateur Marine licence permitting operation on sea-going vehicles (although with restricted frequencies).

Amateur Licence A covers all the available bands and all specified modes of operation including morse code, teleprinting, facsimile, data and, of course, speech. Amateur Licence B does not permit the use of frequencies below 144MHz, and thus enables use of the VHF, UHF and microwave bands only. Furthermore, it does not permit general use of morse code, although limited morse may be transmitted for training purposes.

Amateurs have often provided an efficient emergency service operating in conjunction with the British Red Cross, St John Ambulance, County Emergency Planning Officers and the police through the Radio Amateurs Emergency Network (RAYNET). Just as REACT is useful for local emergency communications, it could be said that RAYNET have the advantage that they can provide national or even worldwide scale coverage, although their operators need to be licensed, while anyone can operate within REACT.

## Treaty

Its supporters claim that the hobby must surely be the only one to formally be defined by an international treaty drawn up by 150 nations. This happened at the World Administrative Conference held in 1979 in Geneva, at which amateur radio was defined, or rather redefined as a "telecommunication service for the purpose of self training, intercommunication and technical investigations carried out by amateurs, that is by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest."

If you were to ask any amateur to define the hobby, they would probably say, more simply, that it is the practise of two-way radio communications pursued as a spare time hobby for

pleasure, derived from an interest in radio technique, construction and operation to the aim of ensuring friendships with like-minded people throughout the world. Whilst defining these terms it should be mentioned that there are many thousands of individuals who follow the hobby by not transmitting, but merely from listening; these short-wave listeners (or swls) monitor the wavebands and send reception reports to stations they hear.

The requirements for obtaining the necessary transmitting licence needed before any transmissions may take place are straight-forward. Subjects need to be over 14 years of age, obtain tuition as required to pass the two-part City and Guilds Radio Amateurs Examination, and, if applying for the A Class licence, to have passed the Post Office morse code test at twelve words a minute. This examination may be taken at the Department of Transport in London, British Telecom Coast Radio Stations and the Marine Radio Surveyor's Offices.

## Speed

The present fee is £15 and this is not refundable so it is advisable to ensure that the twelve words a minute speed has been attained before sitting the test. It is also advisable to take the City and Guilds examination beforehand because if more than twelve months elapses between passing the morse test and sitting the City and Guilds examination, a further morse certificate will be required.

The City and Guilds examination is conducted at local centres three times a year, usually in March, May and December. The syllabus covers the elementary theory of radio communication, knowledge of radio operating procedure appropriate to a radio amateur. Subjects including electrical theory, solid-state devices (transistors and semi-conductors), radio receivers, transmitters, propagation and aerials as well as interference and measurement are all covered.

The paper comprises two parts, Licencing Conditions and Transmitter Interference and Operating Practices, Procedures and Theory. The first is for one hour and the second for one and three quarter hours. There are 35 and 60 questions respectively, all of a multiple-choice type with four options

to choose from. It is not essential to pass both parts together, and the failed section alone may be re-taken at the next sitting.

Various forms of study can be undertaken as an aid to achieving the necessary results. Home study by reading the appropriate text books is a good method for those with a basic grasp in electronic theory already. However, a more rigid form of study may be preferred and to this end several technical colleges, adult education classes and indeed private class tuition schemes operate. For details contact your local Area Education Authority.

Certain correspondence courses are available, although these tend to be quite expensive as there are a lot of administrative costs to bear. Many of these advertise in the specialist press and it is worth contacting several to ensure that the course is sufficient to fill the blanks in your knowledge.

A wonderful idea is penetrating from the United States; this involves a colour video course. The tapes are lent at a fee and can be used until a sufficient level of achievement has been attained. The tape is then returned and the next in the series arrives. The final tape is a revision one ready for the examination. The great advantage here is that any part not understood at once may be repeated and re-run in conjunction with the course notes if necessary.

Having the pass certificates a licence is obtained from the licensing authority in Chesterfield and, typically, this takes about a week for the paperwork to be created on the computerised system. Long delays used to build up after the publication of the exam results although the new computer seems to have solved most of the problems.

## Callsign

A callsign will be issued, in strict rotation according to the licence applied for (A or B). Every callsign includes an international prefix. In England this is G and as "sub-section" Wales is GW, Scotland GM, Ireland GI, Jersey GJ, Guernsey GU and the Isle of Man GD. In some countries the callsign also includes a district or region of the country, typically a state. The current "series" means that the first figure can be determined, this is 1 for



A modern, compact setup from Trio.

Class B and O for Class A, there then follows three letters issued in alphabetical order from AAA through to ZZZ for each series.

When the station is operated away from the address quoted on the licence, on holiday for example or at work perhaps, a suffix must be added to indicate this fact. Similarly, this is the case for mobile and pedestrian portable operation as well. If operating in an overseas country, the appropriate variation to the licence must be obtained and a separate callsign will be issued by the country concerned.

The changing face of the hobby is the fact that, at one time, almost all the equipment was home-built or commercial equipment which was modified. Today, increasing use is made of factory-made transceivers, whereas once receivers were in separate cabinets from the transmitters. Many amateurs still partake in home construction and even design equipment and take great pride in this, avoiding the mass of imported factory-built rigs.

## Running

Having received the callsign, normally an event which involves running to greet the postman, around the due date, and rifling through the letters to look for the official-looking envelope. The precious piece of paper allows the use of high-powered transmitters, up to 400 watts on over 20 wavebands throughout the entire radio spectrum using any size of antenna, space permitting. This is a moment all amateurs cherish for a long while.

The facets of the hobby are varied, be it experimenting with new frequencies, low power communication, data contacts, satellite working or trying to work all the countries in the world.

Speech is today the most commonly used system, yet there is still considerable interest in morse code (cw) by holders of the Class A licence, because it is particularly effective for communication over long distances under difficult conditions, with low power. Contacts with foreign stations who speak no English is also simpler with morse code using the agreed code of abbreviations, cutting the time it takes to send messages. Many contests are held on cw as a means of improving speed, although gentlemanly conduct prevails and the speed should always be that of the slower station.

On both VHF and UHF frequencies, amateurs make considerable use of radio-teleprinting (rtty) where the messages are typed out on a keyboard, converted into tones which are decoded at the other end and re-appear on either a converted teleprinter or a VDU. Slow scan television is also used to exchange still images, and some are equipped for fast-scan, high-definition transmission and reception. Others take their enjoyment from bouncing their high-power signals from meteors or by reflecting the signal path off the moon with Earth-Moon-Earth working, thereby making long distance contacts possible on frequencies that would otherwise not be suitable.



A Yaesu hand-held 2m unit.

Those who work mainly from a car use the string of repeater stations set up around the country to aid mobile and portable stations to make contacts. Situated on high points, they receive signals and re-radiate them on another pre-determined frequency; making use of their good location it is possible for stations to make contact where 'direct' communication would not have been possible. Because of their nature they are used only on UHF and VHF frequencies, although in America there are 10 metre repeaters, but then the country is larger!

A permanent record of contacts must be kept in the form of a log, and this invariably proves to be a useful record of contacts, and enables repeat contacts to be noted. It is essential that the log be made available in case of any complaints relating to interference. Columns are normally provided to indicate the receipt of and reply to QSL cards. These little postcards signify the details of a conversation and are often used to decorate the walls in the radio shack. These cards are sent through international collating bureau to the recipient who has to lodge stamped addressed envelopes for the collection of the cards. These cards will need to be produced to claim any of the awards made available, and, to that end, have a dual purpose.

Don't be put off by the thought of studying for the licence, it's a once-only thing and the conditions of the licence are not that imposing, although certain topics may not be discussed; amateur radio is not intended for business communications or as a propaganda medium for the local community. For more details contact the body representing amateur radio, formerly the London Wireless Club, founded in 1913 and now the Radio Society of Great Britain at Cranborne Road, Potters Bar. They have a wide selection of free leaflets and publications. These publications may be available for loan from the local library.

Certainly, amateur radio is not an alternative CB, although there are similarities and anyone seriously interested in CB should find amateur radio most rewarding. There are many areas to explore; it is hoped that a further frequency will be allocated soon, and that this may become available to the Class B operators, perhaps allowing contacts to America. At present they are restricted to Europe, if working directly, because they are not allowed onto the HF bands which are shared with other radio users including ship-to-shore distress users.

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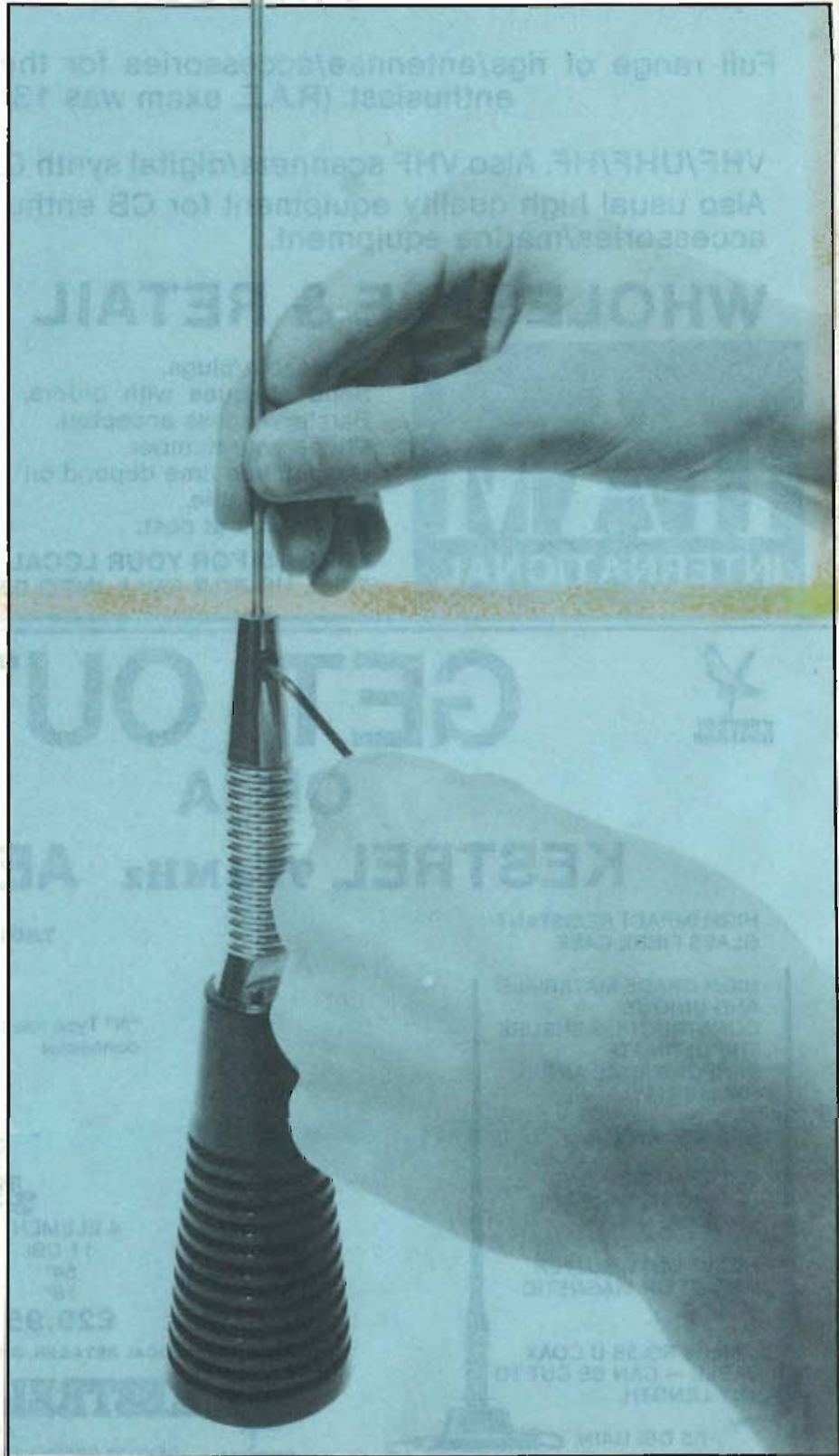
# TWIG TALK

With the myriad of antennas on the market today, Keith Townsend helps you choose

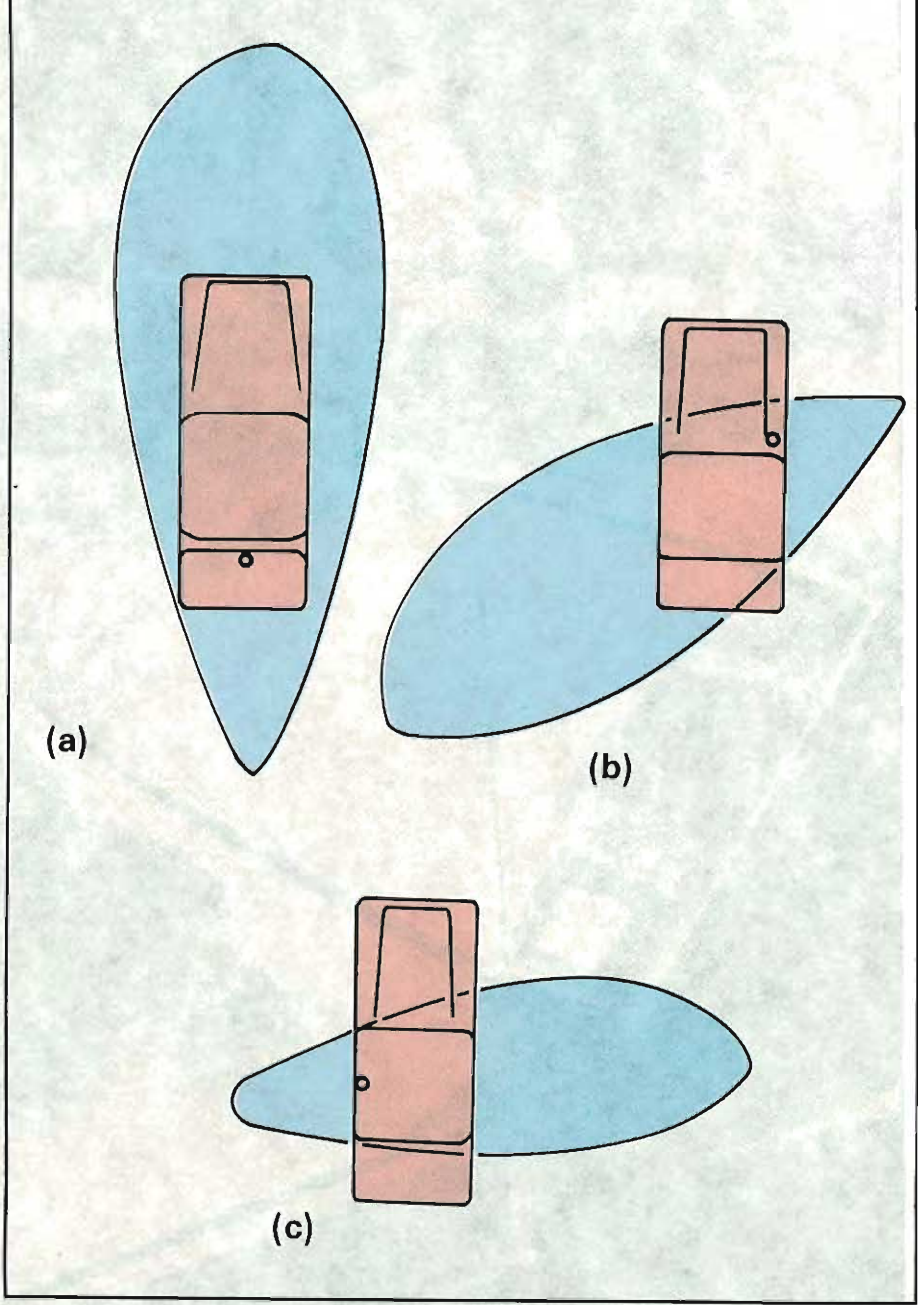
**A**lthough there are many excellent models on the market, choosing a CB antenna is very much a matter of personality. Nowhere else in the world are the restrictions on what types of aerial we use so Draconian as here in Britain and, were we to conduct a survey, I doubt whether we would find many outside official circles in support of such rigid regulation. The original specification, which permitted only the use of base-loaded antennae with a radiating element of 1.5 metres or less has, thank goodness, now given way to a slightly more liberal one in which the use of all antennae which do not exceed 1.65 metres long is allowed, but this represents only a very minor concession on the part of the authorities. Such restriction is made the more difficult to comprehend when you consider the fact that each and every one of the circumstances cited in support of the restrictions exists in every other country where CB is a part of everyday life, yet nowhere can I find even the suggestion that this has given rise to problems in France, Australia, or the USA, where half and three-quarter monopoles are the norm and where even the occasional multi-element directional beam is to be seen.

Nowhere else can be found a direct comparison with the British insistence that where an aerial is sited more than seven metres above ground level, the radiated power must be reduced by a stringent 10dB, regardless of situation or terrain. For example, a station sited high on a hill, with an antenna mounted at rooftop height may radiate an unattenuated signal over many miles, whilst another, having identical equipment but lying on the floor of a deep valley, is not permitted to overcome this handicap by raising his antenna without the need for attenuation, despite the fact that, even with full power, he would be most unlikely to equal the performance of the more ideally sited station.

So, how do we choose? The eventual location of the aerial will obviously have some bearing on the decision. There is little point in buying a full-length antenna if it is to be fixed up in a confined loft space, or inside a flat. Neither is there much benefit in choosing one with large ground plane radials if the amount of space available is severely restricted. The first consideration must be to ensure that whichever antenna is chosen is constructed to the highest possible standard. Most aërials will have to put up with the vagaries of the British climate over a number of years, so be



SWR adjustment is crucial in good antenna performance.



Radiation patterns of (a) trunk-mounted, (b) wing-mounted and (c) gutter-mounted antenna.

sure to select one produced by a reputable manufacturer, who will have expended considerable time, effort and cost in ensuring that his products meet the highest possible standards.

Although the original base-loaded type of aerial remains very popular, centre loaded types offer the slight advantage of a lower angle of radiation, with the result that a greater percentage of the radiated signal is directed toward the receiving station, with less wasted on the atmosphere. Centre-loaded antennae are, in most cases, also shorter than their base-loaded equivalents and therefore less conspicuous. One significant change which resulted from the relaxation in specification has been the large number of continuously wound aerials now being produced for the base station operator. Many an experienced breaker will have fond memories of the Firestik, from pre-legalisation days and those new models

which I have seen appear to work well and to be extremely sturdy. I am, though, somewhat surprised at the fact that top-loaded antennae do not appear to have made a significant impression on the British market.

**“Any antenna is only as good as its installation . . . ”**

In terms of performance, there will be little to choose between two aerials of similar design and, though many operators favour the use of dipoles and various other types of antenna not covered by the licence terms, they are, in fact, gaining only a marginal advantage. A CB antenna properly constructed for use with your radio will have a characteristic impedance of 50 ohms and, although a dipole may be regarded as having some 3dB gain over a loaded whip, much of this extra power cannot be used to advantage because it is swallowed up in overcoming the higher impedance characteristics of the antenna, unless an impedance matching transformer is used.

In mobile operation there are a number of factors to be borne in mind when choosing an aerial. For instance, most mobile antennae come complete with a length of coaxial cable moulded into their base and, since replacement in the event of damage can be very difficult with some types of antenna, it is wise to ensure that the original cable is of high quality. Many a breaker knows only too well the problems that can be caused by repeatedly trapping the feeder cable of a mag mount between the door and pillar. Whilst we are on the subject of mag mounts, make sure that yours is fitted with a good strong magnet and think about the effect of high speed slipstream before haring off down the nearest motorway. I know one breaker who did not and found himself staring at a bill for over £400 for coachwork repairs to his new Mercedes.

**Theft**

Mag mounts have the advantage that they can easily be removed from the car to prevent theft but a gutter mount provides a far stronger fixture, whilst still permitting removal of the antenna. One point worth bearing in mind is that just a few inches variation in siting can have a dramatic effect upon you SWR, so try the gutter mount in different places before finally deciding to lock up the screws.

The antenna's position on the car can also have a significant effect upon your signal. Because mobile installation relies upon the car's bodywork in order to develop a ground plane, the greater amount of signal will be radiated in the direction of the highest proportion of car. Mount the antenna on the trunk lid and most of the signal goes forward, which is why the majority of regular motorway users prefer this configuration. Mounting the antenna to either side of the car will mean that the best signal is developed toward the opposite side of the vehicle. Don't even consider the use of twin truckers' antennae on anything smaller than the largest of wagons. Co-phased aerials, although creating the desired, highly directional, signal can only work efficiently with a distance of at least a quarter wavelength (2.75 metres) between them. Place them much closer together and the radiation pattern becomes severely distorted.

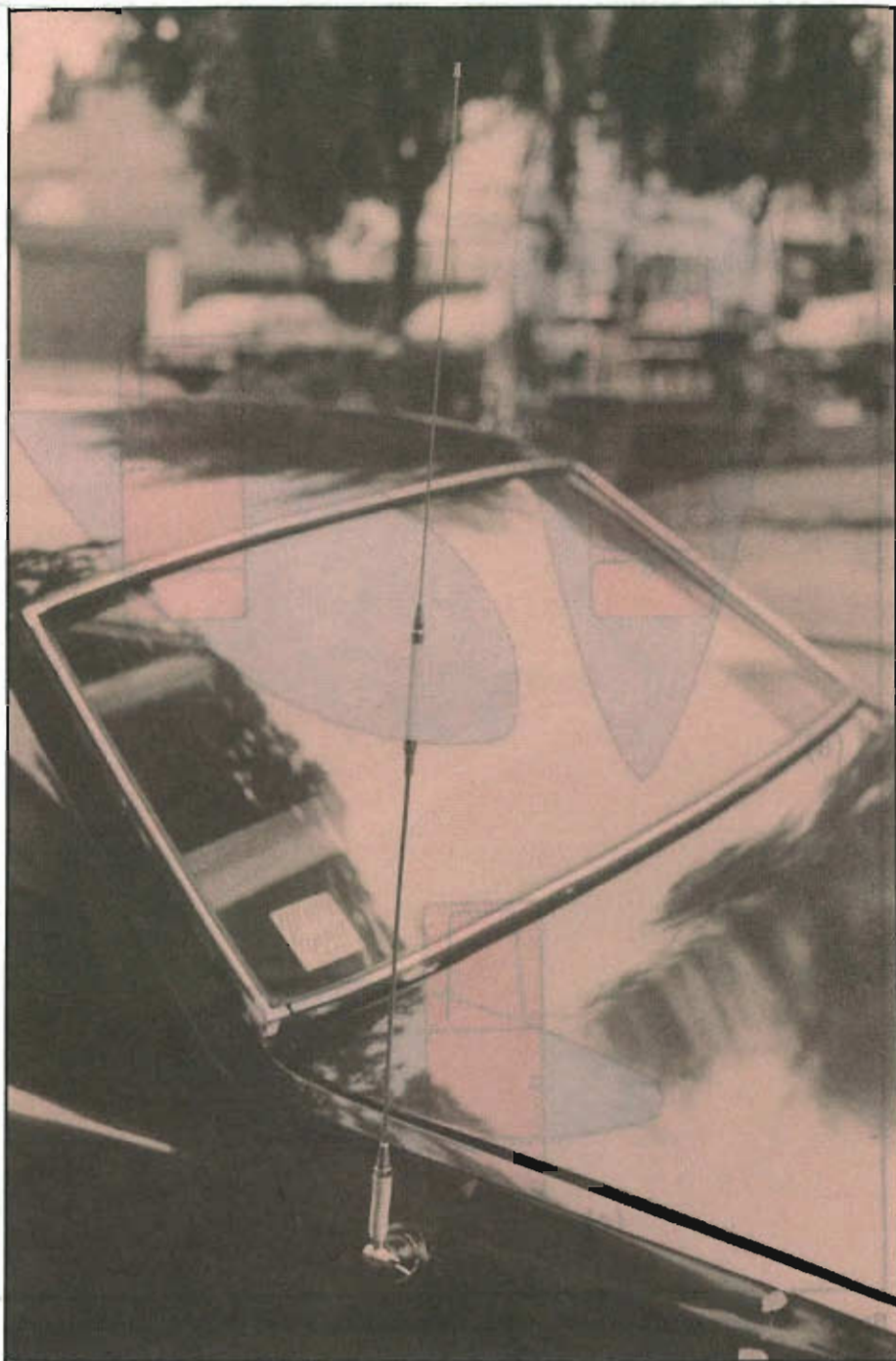
A few years ago, telescopic antennae, often top-loaded and usually electrically extended, were very popular, mainly because to the casual observer they looked exactly like any ordinary car radio antenna. Their popularity was, however, short-lived, for a number of reasons. Most of them contained a diplexer, in order that they might double as a broadcast reception antenna, with the result that they did neither job efficiently. A far worse problem was the fact that as they grew older and their electric motors became worn they developed a nasty habit of failing to extend to their full height, with the inevitable result that their resonant frequency increased and the SWR shot up dramatically. Although a few may remain, tucked away among the old stock in a few CB shops, it has been a number of years since I have seen one in use.

## Improvement

It is now almost four years since the first British CB licences were issued. Four years during which manufacturers such as Les Wallen, Freeman and Pardoe and Marksman Products have taken the time to develop the art of antenna manufacture to the point at which one begins to wonder whether any real improvement remains possible, whilst companies such as South Midlands Communications, with years of past experience of the amateur radio market, Knight Communications and Telecomms are all distributing a wide range of very high grade products for the CB enthusiast.

Boat and caravan enthusiasts face special problems when it comes to installing CB radio but the manufacturers have not forgotten them, either. Perhaps the best known range of fibreglass antennae come from the Allgon stable but, with the steady growth of CB, both on the water and in recreational vehicles, there are other fine examples on the market, with some equally good products from Valor and, yet again, Telecomms.

So far we have only considered the extremely wide range of aerials available for 27MHz CB and although its UHF counterpart at 934MHz was considerably slower in making its impact felt, manufacturers have been no less eager to take advantage of the more liberal specifications provided by this frequency. Given the wider choice to produce colinears, multi-element whips and even small beams, they have responded with some excellent products. Again Les Wallen Manufacturing are in the thick of things, with both base and mobile colinears as well as a very natty little  $\frac{5}{8}$  over  $\frac{1}{4}$  wave for mobile use, whilst Kestrel Electronics offer both mag and gutter mounted whip aerials, as well as a fascinating range of beams, some of which might appear to contain slightly more element than provided for by the specification but all of which offer excellent performance. Another good buy in the 934 field is the AX934 colinear, from Crestbyte.



A centre-loaded, wing-mounted antenna.

So, faced with such a wide choice, what is the average breaker to make of things? Like I said before: you pay your money and you take your choice. There is no magic formula for the ultimate in performance but with the wide variety of first class aerials currently available you should have little difficulty in finding the right one for your station. Never be afraid to experiment with different models from the various manufacturers and importers and remember that whatever your final choice, any antenna is only as good as its installation. Fix it up incorrectly and you are bound to be disappointed. Set it up right and it should give good service for a long time to come. Although we do come across occasional examples of CB antennae which are grossly overpriced, by far the majority of those in the shops today represent

excellent value for money and, with a little care, will perform well.

One last point worth noting is antenna maintenance. Imagine how you would feel if you were left outside the whole year round and subjected to extremes of heat, cold, wind and rain, yet still expected to give of your best performance. However we attempt to prevent it, clamps will rust, coaxial plugs will take in dampness and, if the winds of this last winter are anything to judge by, rods, poles and elements will bend. Never assume that because your antenna was working fine yesterday it will do the same today and an occasional Saturday morning spent checking over the system will reap its own rewards.

Good hunting, and here's to that last ounce of performance.





## Gismo goes to Glasgow — and finds more wallies

I recently made a trip to Scotland, the main purpose of which was to get myself several hundredweight of seed potatoes! Is Scotland full of wallies? Are there any decent breakers there? I had three drops in Glasgow, two of which were new to me. Approaching Glasgow on the M74, I tried to get someone to give me directions. One breaker did actually try to speak but there must be more wallies, bucketmouths, mike keyers, music players and general idiots on CB in Scotland's big cities than anywhere else in the world. Even Turkey Town (Leicester) isn't a patch on them! One breaker was shouting for someone so continuously that even if the other breaker could hear him, he could not possibly have got in to answer as the other breaker was shouting his handle every second or so.

The next day found me in Dundee, where I was stopping overnight. There were two youngsters on channel, whose ages I would estimate to be about six or seven, bucketmouthing continuously for an hour using language that a seven-year old ought not to know.

I returned over the two bridges and through Edinburgh and, again, there was nothing but imbeciles on the one-nine. Scottish truckers are the best in the country for using the CB. They give out good 10-13s and every smokey they see is reported. Mind you, that Tartan Track (the A74) has given them good instinct. Please, Scottish readers, can we do something about this sorry state of affairs? Can you not get your CB clubs to contact the RIS?

Next on my list of subjects is the cafe versus the truckstop saga on Dock Road at Bootle. You remember the fence in my previous articles? Well, the owner of Blanches Cafe nearly got arrested! Someone had put up illegal No Parking signs on the fence. He removed one and about a dozen smokeys arrived and tried to arrest him. Eventually, an Inspector arrived and the whole matter was dropped. He *could* have been arrested for removing the signs but no action was taken. Apparently, a passing motorist had called the police. The signs are now painted out so let's wait and see what happens next in this little friendly competition for the benefit of truckers in Dock Road.

Tiny Tears at Birmingham, as well as monitoring the one-nine and nursing a sick husband for seven years is now secretary of a committee for a coffee bar type of club for the unemployed and other youngsters at Castle Vale. Tiny Tears is not asking for help — but I am! Would any CB clubs or truckers like to help with either money or gifts — perhaps secondhand sporting or entertainment equipment? My own club, East Coast Truckers, are donating some blank tapes. They are looking for things like a jukebox. Can anyone get hold of things like this fairly cheap? Please write to Castle Vale Teenage/Unemployed Coffee Bar, Farnborough Road, Castle Vale, Birmingham.

April was a good month for truckers, although Truckfest '85 was spoilt by the typical Easter weather. There were hundreds of trucks immaculately turned out which eventually couldn't parade in the ring because they were stuck in the mud. Let's hope next year's weather is a little kinder for the organisers.

Three thousand made their way to Brands Hatch for the truck-racing grand prix a fortnight later. The finish order at the final race was the same as at Donnington Park last year. The Italian Gaudenzio Mantova won a faultless race in his Scania 142. Second place went to Richard Walker in his Roadtrain, this time with a Rolls power unit. Battling with Walker to the point of knocking his own mirror off was the Dutch driver Beend Bos in his bonneted 142. Sales of Scania's and Leyland Roadtrains should rise after that! Bos averaged 66 mph to win the silver salver for the fastest lap. There was a lot of controversy over other entries — one Ford was disqualified for leaking fuel and refusing to pull up.

The Great Gonzo from Ashford, Kent sent me his eyeball card and I have never seen anything like it in CB circles before. He asks me to mention some lady monitors in his part of the world. Big thank-yous go to Duchess (Margaret) of Ashford and Sugar Puff (Gwen) of Maidstone who got up early in the morning during the winter to help keep those big wheels rolling with their excellent 10-13s. He also wanted a mention for Babycham (Jill) on zero-six. What, I wonder, happens on this channel! Thank you, Gonzo. Sorry I didn't bump into you at Truckfest. You probably got stuck in the mud!

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FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 50 W

L. RADIANTE RADIATOR L. LONG. RADIANT: 1.170 mm.




**DV-27XN**

TIPO TYPE: 1/4 λ red.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 40 W

L. RADIANTE RADIATOR L. LONG. RADIANT: 920 mm.




**DV-27**

TIPO TYPE: 1/4 λ red.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 80 W

L. RADIANTE RADIATOR L. LONG. RADIANT: 1.385 mm.



**TAGRA-LOG T-40**


TIPO TYPE: 1/4 λ red.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 250 W

GANANCIA GAIN: —

L. RADIANTE RADIATOR L. LONG. RADIANT: 935 mm.



**GP-27B**

TIPO TYPE: 1/4 λ

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 50 W

GANANCIA GAIN: —

L. RADIANTE RADIATOR L. LONG. RADIANT: 2.205 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 650 mm.



**GP-27RF**

TIPO TYPE: 1/4 λ

FRECUENCIA FREQUENCY: 27-31 MHz

POTENCIA POWER: 500 W

GANANCIA GAIN: —

L. RADIANTE RADIATOR L. LONG. RADIANT: 2.600 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 670 mm.



**F-2**

TIPO TYPE: 1/2

FRECUENCIA FREQUENCY: 27-29 MHz

POTENCIA POWER: 1.500 W

GANANCIA GAIN: 3 dB

L. RADIANTE RADIATOR L. LONG. RADIANT: 5.260 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 720 mm.

Regulación de bobina en base. Regulable base coil. Regulation de la bobina en la base.



**F-3**

TIPO TYPE: 5/8

FRECUENCIA FREQUENCY: 27-29 MHz


POTENCIA POWER: 3.000 W

GANANCIA GAIN: 3,5 dB

L. RADIANTE RADIATOR L. LONG. RADIANT: 6.380 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 1.450 mm.

Regulación de bobina en base. Regulable base coil. Regulation de la bobina en la base.



**DV-27 CN**


TIPO TYPE: 1/4 λ red.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 80 W

GANANCIA GAIN: —

L. RADIANTE RADIATOR L. LONG. RADIANT: 1.075 mm.




**DV-27 LCN**

TIPO TYPE: 1/4 λ red.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 150 W

L. RADIANTE RADIATOR L. LONG. RADIANT: 1.980 mm.



**DV-27 HN**


TIPO TYPE: 1/4 λ red. Helicoid. Helicoid.

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 250 W

GANANCIA GAIN: 0,8 dB (1/4), 1,6 dB (1/2), 2,0 dB (5/8)

L. RADIANTE RADIATOR L. LONG. RADIANT: 1.040 mm (1/4), 1.370 mm (1/2), 1.620 mm (5/8)



**TRADE ONLY**

**BT-210 RINGO**

TIPO TYPE: 5/8 λ Ringo

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 2.000 W

GANANCIA GAIN: 5,5 dB

L. RADIANTE RADIATOR L. LONG. RADIANT: 8.330 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 2.600 mm.



**BT-V3**

TIPO TYPE: 1/4 λ


FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 800 W

GANANCIA GAIN: —

L. RADIANTE RADIATOR L. LONG. RADIANT: 2.550 mm.

L. RADIAL RADIAL S.L. LONG. RADIAL: 2.800 mm.



**BT-104**


TIPO TYPE: 3/4 λ

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 2.000 W

GANANCIA GAIN: 6,5 dB

L. RADIANTE RADIATOR L. LONG. RADIANT: 6.270 mm.



**BT-101**

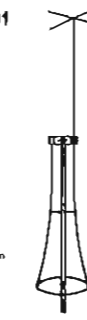
TIPO TYPE: 5/8 λ

FRECUENCIA FREQUENCY: 27 MHz

POTENCIA POWER: 2.000 W

GANANCIA GAIN: 4,5 dB

L. RADIANTE RADIATOR L. LONG. RADIANT: 6.560 mm.



**AH-03**

TIPO TYPE: 1/2 λ

FRECUENCIA FREQUENCY: 27 MHz

N.º Elementos N.º of Elements: 3

Potencia Power: 1.000 W

GANANCIA GAIN: 8 dB

Polarización Polarisación: Horiz. o Vert.

L. Larguero Boom Length Long. Axe Central: 2.475 mm.

L. Elemento, Max. Elements L. Max. Long. Elements. Max.: 5.725 mm.



**AH-04**

TIPO TYPE: 1/2 λ

FRECUENCIA FREQUENCY: 27 MHz

N.º Elementos N.º of Elements: 4

Potencia Power: 1.000 W

GANANCIA GAIN: 9 dB

Polarización Polarisación: Horiz. o Vert.

L. Larguero Boom Length Long. Axe Central: 3.790 mm.

L. Elemento, Max. Elements L. Max. Long. Elements. Max.: 5.875 mm.



**BT-122**

TIPO TYPE: 1/2 λ Cruzada

FRECUENCIA FREQUENCY: 27 MHz

N.º Elementos N.º of Elements: 5

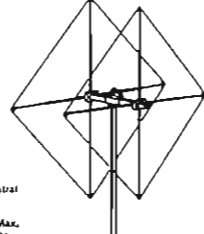
Potencia Power: 2.000 W

Polarización Polarisación: Horiz. o Vert.

GANANCIA GAIN: 17 dB

L. Larguero Boom Length Long. Axe Central: 5.490 mm.

L. Elemento, Max. Elements L. Max. Long. Elements. Max.: 4.180 mm.



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# LADY BREAKERS



## Filly goes on safari to deepest Devon

**T**o hear my husband talk, you'd think we've just been up the Amazon, or across the Gobi Desert. In fact, we've just returned from the west country.

"Water's quite safe down there", he tells people. "Different, a funny colour, but quite drinkable. . . Honestly, you've never seen anything like the roads they build, the Romans did a better job. . . Wasn't easy understanding them at first, peculiar lingo they've got down there, don't speak like us at all. . . Took a while to get used to the food. . ." And so he goes on.

When I first suggested a week away from it all down in Devon, he reacted with horror. What's wrong with England, he wanted to know. I pointed out that Devon was in England. Huh! he muttered, Clacton's always been good enough before, what did I want to go journeying to outlandish parts for?

In the end, I managed to rouse his sense of adventure, and off we set in the Mini, safari hat, CB radio and all. He sat in the passenger seat, growling.

"Well, you won't need that, for a start", he said, scowling at the rig. "They won't have heard of CB down there. Can't shear a sheep with a CB radio."

## Groused

He groused for the first 50 miles or so about me not letting him drive, and I was forced to remind him that the reason we were travelling in the Mini and not in his Capri was that he had driven it through someone's hedge the week before. Finally, out of sheer boredom (he scorned reading the map, that was woman's work), he turned on the radio and amused himself with listening in on the various conversations we encountered as we crossed Wiltshire.

"Listen to this lot," he exclaimed after a while. "Talking about cows, and things! We're not there yet, are we?" No, I explained, they did have farms in counties other than Devon. He looked unconvinced and continued to listen.

"Watch out!" he shrieked after another few minutes, making me jump out of my skin. "What is it?" I gasped. "An accident ahead? Sudden fog?"

"Roadworks on the motorway", he

informed me importantly, listening intently. "On the M4. Everyone's warned to get off if they can."

"We already are off", I said, patiently. "We're on the A4. Hadn't you noticed?"

Needless to say, he isn't really that thick. It was all part of a campaign to annoy me into letting him drive. His pride couldn't stand being seen in public in a car driven by a female. By the time we reached Somerset, he'd succeeded. He took the steering wheel with an air of 'now things'll be done properly' and I sat listening to the radio.

## Accents

He continued to be fascinated by the changing accents on the airwaves, though, to the extent of doubling up with laughter the first time he heard the word "furrtilizer".

"They really do say it!" he cackled, slamming on the brakes rather sharply as a lorry loomed in front of us. I told him to watch the road.

We reached Devon and turned off the main road, plunging into a network of unbelievably tortuous lanes. I asked for directions over the air.

"That's no good", he muttered, "they won't have heard of anything so modern as Citizens Band down here. And if they had, they'd be too busy milking the cows to use it".

He was interrupted by a voice with a beautiful Devon burr giving us precise instructions to find Torrington. "They've been colonised!" he said, turning right as instructed and stopping hastily to allow a sheep to make its leisurely way across the road.

He was even more impressed when we actually came across a lady monitoring the airwaves around Holsworthy, whose sole concern seemed to be to direct lost tourists skirting the fringes of Dartmoor. His expression suggested that he wasn't so cut off from civilisation as he'd thought. And when he found that the farm where we were staying housed the organiser of the local group of breakers, his remaining doubts seemed to vanish.

Or almost.

"Yes", I heard him say to the farmer's (experienced breaker) son, "but whereabouts on the plough do you put the antenna? . . ."

The farmer's son told him.

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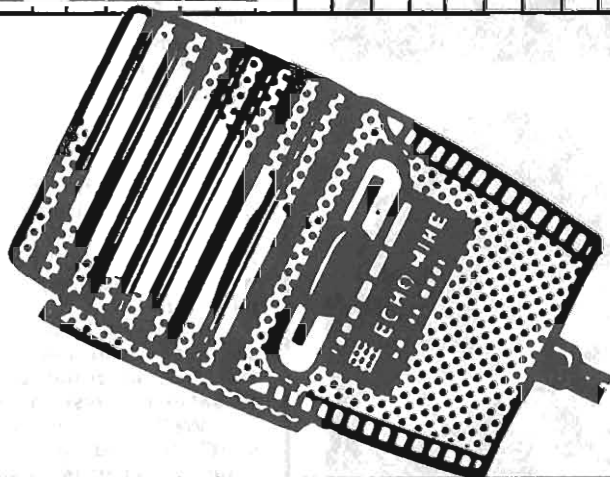


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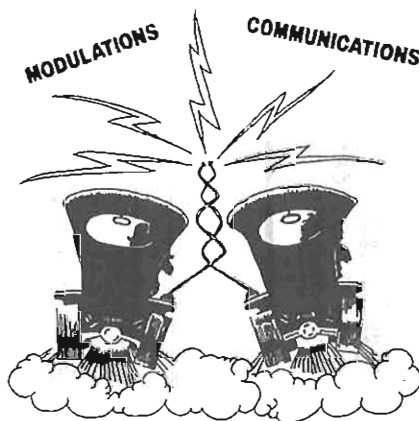
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# CB Citizens' Band

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June 1984	Scanning and Telephone supplement
July 1984	Walkie talkie round-up
August 1984	Audioline 341
September 1984	AR2001 scanner
October 1984	Cybernet 934 MHz.
November 1984	CTE antennas
December 1984	Panoramic CB scanner
January 1985	SWR survey and Breaker's Basics
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June 1985	Catcall rig

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# FM RIG CHECKLIST



NAME	MODEL	RETAIL PRICE	NO. OF CHANNELS	SUPPLY VOLTAGE	SQUELCH	NB SWITCH	ANL SWITCH	MIKE GAIN	RF GAIN	tone control	S/RF METER	S/RF LED R/O	HI/LO OUTPUT	PA FACILITY	EX. SPEAKER JACK
AUDIO LINE	341	£60	40	13.8VDC	•			•	•	•	•	•	•		
AUDIO LINE	340	£40	40	13.8VDC	•			•		•					
AUDIO LINE	342	£115	40	13.8VDC	•					•	•		•		
COLT	295	£49.99	40	13.8VDC	•				•	•	•	•			•
COMMTEL	GT858	£30	40	13.8VDC	•							•			•
COMMTEL	GT868	£35	40	13.8VDC	•				•			•	•		•
COMMTRON	CB40F	£70	40	13.8VDC	•							•			•
COMMTRON	CXX	£69.95	40	13.8VDC	•				•				•		•
COMMUNICATORS	NI-440DX	£50	40	13.8VDC	•				•	•	•	•	•		•
CYBERNET	BETA 1000	£70	40	13.8VDC	•							•	•		•
CYBERNET	BETA 2000	£85	40	13.8VDC	•				•	•		•			•
CYBERNET	BETA 3000	£100	40	13.8VDC	•				•	•	•	•			•
INTERCEPTOR	INTERCEPTOR	£80	40	13.8VDC	•				•	•	•	•			•
INTERCEPTOR	TC400	£95	40	13.8VDC	•		•	•	•			•			•
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JOHNSON	JOHNSON	£50	40	13.8VDC	•				•			•	•		•
LAKE	MANXMAN 850	£32.50	40	13.8VDC	•							•	•		•
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MAGPIE	AUTOSCAN 5000	£120	40	13.8VDC	•			•	•			•	•		•
MAXCOM	4E	£50	40	13.8VDC	•							•			•
MAXCOM	6E	£48	40	13.8VDC	•				•			•			•
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This listing includes most of the rigs available for FM CB. Some rigs are still not on the market, but may be picked up second-hand or may be found in old stock at some shops. The prices quoted are recommended retail prices or typical price — they may vary considerably from shop to shop and area to area.

# MOBILES

TX IND. LIGHT	RX IND. LIGHT	CH 9 SWITCH	MIKE POSITION	COMMENTS	ADDRESS	NAME
●	●		SL		Telecomms, 189 London Rd., North End, Portsmouth	AUDIOLINE
●				Report Feb '82		AUDIOLINE
●	●					AUDIO LINE
●			FL		K B & Co Ltd., 202 Cheetham Hill Rd., Manchester	COLT
			SL		Globe, 168 Brooker Road, Waltham Abbey, Essex	COMMTEL
			SL	Dimmer Switch Features		COMMTEL
●		●	FL		Roger D, 831 Mansfield Rd, Notts	COMMTRON
●			FL			COMMTRON
●	●	●	FL	Roger Beep Feature		
			SL		Goodmans Loudspeaker Ltd., Downley Rd, Havant, Hants PO9 2NL	CYBERNET
●	●		FL	Report May '83		CYBERNET
●	●	●	FL	Report September '83		CYBERNET
●	●		SL		Telecomms, 198 London Rd., North End, Portsmouth	INTERCEPTOR
●	●		FL			INTERCEPTOR
●	●		FL			INTERCEPTOR
			FL	Great GT868 chassis	Star Warehouse, Chalk Farm Rd, London	JOHNSON
			FL		Roger D, 831 Mansfield Rd., Nottingham NG5 3GF	LAKE
			FR	Report April '83		LAKE
●	●		FL	Report March '83	Lowe Electronics, Matlock, Derbyshire	LOWE
●	●		FL	Report November '82	Maggie Electronics, PO Box 35, Andover, Hants SP10 2LG	MAGPIE
●			FL		AM House, BA Old's Approach, Tolpits Ln, Watford, Herts	MAXCOM
●	●		FL			MAXCOM
●	●		FL			MAXCOM
●	●		FL			MAXCOM
●	●		FL			MAXCOM
●			FL	Report Jan '84		MAXCOM



# REFERENCE



NAME	MODEL	RETAIL PRICE	NO OF CHANNELS	SUPPLY VOLTAGE	SQUELCH	NB SWITCH	ANL SWITCH	MIKE GAIN	RF GAIN	STONE CONTROL	S/RF METER	S/RF LED R/O	HI/LO OUTPUT	PA FACILITY	EX. SPEAK
MERCURY	10 40	N/A	40	13.8VDC	•				•		•	•	•	•	•
MUSTANG	CB1000	£49.95	40	13.8VDC	•						•			•	•
MUSTANG	CB3000	£59.99	40	13.8VDC	•				•	•	•			•	•
NATO	40M	£69.95	40	13.8VDC	•			•	•	•	•			•	•
NATO	2000	£189.95	40	13.8VDC	•	•	•		•	•	•	•		•	•
OSCAR	OSCAR I	£85	40	13.8VDC	•						•			•	•
OSCAR	OSCAR II	£49	40	13.8VDC	•						•			•	•
ROTEL	RVC 220	£50	40	13.8VDC	•						•			•	•
ROTEL	RVC 230	£70	40	13.8VDC	•				•	•	•			•	•
ROTEL	RVC 240	£90	40	13.8VDC	•			•	•	•	•			•	•
SIRTEL	SEARCHER	£40	40	13.8VDC	•						•			•	•
TANDY	TRC2001	£80	40	13.8VDC	•						•			•	•
TANDY	TRC2002	£70	40	13.8VDC	•						•			•	•
TANDY	TRC2000	£100	40	13.8VDC	•			•	•		•			•	•
TANDY	TRC1004	£79	40	12VDC	•						•			•	•
TANDY	TRC2003	£130	40	13.8VDC	•						•			•	•
UNIDEN	UNIACE 100	£69.95	40	13.8VDC	•						•			•	•
UNIDEN	UNIACE 200	£89.95	40	13.8VDC	•			•	•	•	•			•	•
WESTERN	COMPACT 40	£34.50	40	13.8VDC	•						•			•	•
WESTWARD	P.T.2	£169.95	40	13.8VDC 240V	•						•			•	•



NAME	MODEL	RETAIL PRICE	NO OF CHANNELS	SUPPLY VOLTAGE	SQUELCH	NB SWITCH	ANL SWITCH	MIKE GAIN	RF GAIN	STONE CONTROL	S/RF METER	S/RF LED R/O	HI/LO OUTPUT	PA FACILITY	EX. SPEAK
AUDIOLINE	345	£139.95	40	240VAC	•			•	•	•	•			•	•
COMMTEL		£85	40	240/12V	•						•			•	•
HAM INT.	JUMBO	£254	40	240VAC	•		•	•	•		•			•	•
HAM INT.	CONCORDE II	£164	40	240VAC	•	•	•		•		•			•	•
HARVARD	H401	£149.95	40	240VAC	•			•	•		•			•	•
HARVARD	WT44		40	BATTERIES	•						•			•	•
KAISER	CBX40	£80	40	BATTERY	•						•			•	•
MAXCOM	7E	£49.95	40	BATTERY	•						•			•	•
TANDY	TRC1001	£119		BATTERY	•						•			•	•
UNIDEN	UNIACE 300	£149.95	40	240VAC	•			•	•	•	•			•	•
WESTWARD	P.T.2	£159.95	40	240V/12V	•						•			•	•

# MOBILES

TX IND. LIGHT	RX IND. LIGHT	CH 9 SWITCH	MIKE POSITION	COMMENTS
●	●		FR	Report July '83
●	●		FL	
●	●	●	FL	
●			FL	
●			SL	Report January '83
		●	FL	Cybernet 134 chassis rep. April '82
			FL	Report Oct '83
●			FL	Cybernet chassis
●	●	●	SL	Cybernet chassis
●			SL	Cybernet chassis
●			FL	
●	●		SL	
●			SL	
●			SL	
●			—	
			SL	Report Nov '82
●			SL	Report Sept '82
●	●		FL	Report Feb '83
●	●		SL	
			FL	Report Nov '83

ADDRESSES	NAME
E.M.S. Communications, Grove St. Wantage, Oxon LX21 7AD	MERCURY
K.B. & Co Ltd, 202 Cheetham Hill Rd. M/cr.	MUSTANG
	MUSTANG
Roger D, 831 Mansfield Rd, Nottingham NG5 3GF	NATO
	NATO
S.M.C. Runbridge St. Totton, Hants SO4 4OP	OSCAR
	OSCAR
Rotel Hi-Fi, 2-4 Erica Rd, Stacey Bushes, Milton Keynes	ROTEL
	ROTEL
	ROTEL
	SIRTEL
Tame Way, Tower Bridge St. Walsall, Staffs	TANDY
	TANDY
	TANDY
	TANDY
	TANDY
Cravenminster Ltd, Unit 8, Ind Est, Llandudno Junct, Gwynedd	UNIDEN
	UNIDEN
Western Electronics, Fairfield Est, Louth, Notts	WESTERN
Westward Electronics, The Mill House, Westward Tuckenhay, Totnes, Devon 086423 336/370	WESTWARD

# BASES & PORTABLES

TX IND. LIGHT	RX IND. LIGHT	CH 9 SWITCH	MIKE POSITION	COMMENTS
●				
			FR	Report December '83. Also comes with telescopic antenna
			SL	
	●	●	FL	
			FL	
				External antenna facility
●				
●				
			FL	Reviewed August '83
			FL	Report Nov '83

ADDRESSES	NAME
Telecomms, Portsmouth and Globe, Essex	AUDIOLINE
	COMMTEL
	HAM INT.
	HAM INT.
	HARVARD
Globe, 168 Brooker Road, Waltham Abbey, Essex	HARVARD
Telecomms, 189 London Road, North End, Portsmouth	KAISER
A.T.M., AM House, 9A Old's Approach, Tolpits, Lane, Watford, Herts	MAXCOM
Tame Way, Tower Bridge Street, Walsall	TANDY
Cravenminster Ltd., Unit 8, Industrial Estate, Llandudno Junction, Gwynedd	UNIDEN
Westward Electronics, The Mill House, Tuckenhay, Totnes, Devon 080423 336/370	WESTWARD

# ANTENNA CHECKLIST

The D.T.I. specs for CB antennas are now more liberal than those originally in force, with the base loading restriction removed to permit any type of loading as long as the antenna is 1.65m in length (or less) and no more than 55mm in diameter. This revised checklist now includes the many new antennas released after this change of heart.

### Name

Lists antennas by name and model number and gives you, where possible, the name and address of the manufacturer or distributor.

### Construction



The majority of home base antennas are made of aluminium and mobile antennas from stainless steel, but fibre glass can be

NAME	ADDRESSES	MODEL	CONSTRUCTION	LENGTH	MAX POWER	TYPE	LOADING	MOUNT	PRICE RANGE
AERIAL SUPPLIES	Aerial Supplies (Redditch) Ltd. 6 Widney House, Bromsgrove Road, Redditch, Worcs. (0527 62620/60107)	Silver Star	AL	1.5	100	B	B	Pole	D
		Silver Arrow	AL	1.5	500	B	B	Pole	C
		Javelin	AL	1.64	500	B	C	Pole	C
		Javelin Dipole	AL	1.64	500	B	C	Pole	C
ALLGON	Communications, 10 North Street, Strood, Kent.	Various	FG SS AL	Various	Various	B M	T C B CW C/P	Various	A-H inc.
		466	SS	1.4	10w	Marine		Mast/Cabin	F
ARMSTRONG	Stateside Trading Ltd. Audley Avenue, Newport, Shropshire	SAM 10	SS	1.06	1000	M	B	Surface	F
		SAM 20	SS	1.06	1000	M	B	Spring Surface	F
		TAK 10	SS	1.06	1000	M	B	Boot lip	F
		TAK 20	SS	1.06	1000	M	B	Spring Boot lip	F
		MAG 10	SS	1.06	1000	M	B	Mag.	G
		MAG 20	SS	1.06	1000	M	B	Spring Mag.	G
		BDY 20	SS	1.06	1000	M	B	Side	G
		PEC 20	SS	1.06	1000	M	B	Side, Fold over & Quick Disconnect	G
ARCHER	Tandy Corp. Tamsway Tower, Bridge Street, Walsall, West Mids.	21-904	SS	0.6	50	M	B	3/8" thread	D
AVANTI	CB Radio Centre Ltd., 337 Kenton Road, Harrow, Middlesex	AV 241	SS	1.22		M	B	Stud	D
		AV 241T	SS	1.22		M	B	Trunk	E
		AV 241M	SS	1.22		M	B	Mag.	E
		AV 241MM	SS	1.22		M	B	Mag.	G
BANDIT	Telecomms, 189 London Road, North End, Portsmouth	B10	SS	1.42		M	B	Mag.	G
		B15	SS	0.81		M	B	Mag.	F
		B15	SS	1.22		M	B	Mag.	F
		B20	SS	1.42		M	B	Mirror	F
		B30	SS	1.42		M	B	Drill Thru	F
		B30	SS	1.22		M	B	Drill Thru	E
		B40	SS	1.42		M	B	Various	D
		B40	SS	1.22		M	B	Various	D
		B50	SS	1.42		M	B	Various	D
		B50	SS	1.22		M	B	Various	D
BREMI UK LTD.	Unit 6, Innage Park, Holly Lane Industrial Estate, Atherstone, Warks.	B27S	SS	1.62	1000	M	B	3/8" thread	C
		C27S	SS	1.38	1000	M	C	3/8" thread	C
		HB27S	AL	1.65	1000	B	T	Pole	E
CB SERVICES	97 Crab Lane, Harrogate, North Yorks	Bullwhip Knuckleduster	SS AL	1.5 1.5		M B	B B	Various	C D
COMMTEL	Near Third Drove, Fengate, Peterborough	Rocket	SS	1.5		M	B	3/8" thread	
		Shuttle	FG	1.5		M	B	3/8" thread	
		Starlight	SS	1.5		M	B	3/8" thread	
		Shuttle Star		1.5		B	CW	Clamp	
		Signal searcher	AL	1.5		B	B	Pole	
		Messenger	SS	1.5		B	B	Clamp	E
Signal keeper	SS	1.5		B	B	Tripod	F		
FREEMAN AND PARDOE	Tything Road, Arden Forest Ind. Est. Alcester, Warks.	Invader	AL	1.5	250	B	B	Pole	E
		Thunderpole II	AL	1.5	500	B	B	Pole	F
		Thunderpole III	A1	1.66	500	B	C	Pole	F
GAMMA AERIAL PRODUCTS	Lye, West Midlands. (0384 881132/691474)	Skybreaker	AL	1.6		B	B	Pole	D
		Avenger	AL	1.6		B	B	Bracket	C
		Lofty	AL	1.5		B	B	Bracket	D
		Skybreaker II	AL	1.66		B	C	Pole	E
		Avenger II	AL	1.66		B	C	Bracket	E
		Lofty II	AL	1.66		B	C	Bracket	E
Firefly	SS	1.66		M	C	3/8" thread	E		



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