THE BEACON HUNTER'S HANDBOOK

Edition 2.2
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Compiled by
Alan Gale G4TMV

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Compiled by: **Alan Gale G4TMV**
E-mail: hunter@beaconworld.org.uk
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KAT – Katoomba NSW, Australia. picture courtesy Dales Hughes ©

WOL – Wollongong, NSW, Australia.
picture courtesy Dale Hughes ©

INTRODUCTION:

A number of different types of radiobeacon are used throughout the world, though to the listener or Dxer these differences may not be easily recognised or understood. In this opening section I have attempted to explain the meanings behind all the various definitions and modes that are in regular usage by pilots and mariners, and hopefully this will offer some enlightenment when trying to make sense of some of the terminology used in official publications. In later sections you will find information on how to go about learning the Morse code, as well as a few tips to help the budding beacon Dxer. For UK Dxers there is a list of UK and Irish beacons included just to help you get started.

This publication comes in four separate parts, each covering a different aspect of the hobby. **Part One** - "A Look at Radiobeacons and Navaids" - takes a general look at NDBs and the other types of Beacons which are out there, how they operate, where to find them, and the equipment required to hear them. This is always a "work in progress", and new section will be added, either when I think of them, or in response to requests from readers – this edition contains several new section added as a result of such suggestions. In **Part Two** we find the "Beacon Datafile", and this section covers the many and varied beacon related resources, publications, clubs and websites, all vital tools for any serious beacon chaser. **Part Three** covers the multitude of codes, acronyms and jargon, which make up a very large part of this hobby. In the final part (so far) **Part Four** looks at how the beacon scene looked a number of years ago, and before all of the recent closures, and changeover from Marine Beacon chains, to individual beacons, and later to the DGPS systems.

Each part now carries "hyperlinks", which will take you straight to the section you want, just click on the appropriate link and away you go. At the head of each part you will find another list of links to the separate section that each part contains. Again, clicking on the 'hyperlinks' (in blue) will take you straight to the required section. As this publication gets longer and longer, some form of navigation system seemed like a good idea, after all, not much point writing a publication about Navaids without adding a few of our own is there?☺

PART ONE : A LOOK AT RADIOBEACONS AND NAVAIDS:

In this first part we will take a look at what types of beacons are in operation, the modes they use, the terms used to describe them, beacon idents, offsets, QSLing, "UNIDS", Abbreviations and much, much more:

SECTION ONE: TYPES OF NDBs CURRENTLY IN COMMON USAGE:

You will come across a number of different terms when referring to NDBs. The table below gives a list of those most commonly used, and is followed by a brief explanation of what they all mean.

CAL	=	Calibration Beacons
DGPS	=	Differential Global Positioning System
LOC	=	Locator Beacons
Lctr	=	Locator Beacons (as above)
LIM	=	Locator Beacon at Inner Marker
LMM	=	Locator Beacon at Middle Marker
LOM	=	Locator Beacon at Outer Marker
NDB	=	Non-Directional Beacons
RC	=	Radiobeacons - (symbol shown on charts to indicate NDBs)
VOR	=	VHF Omni-directional Range

AERO BEACONS: Usually located near to Airfields, and also found on Oil Rigs in the North and Irish Seas, and International Waters.

MARINE BEACONS: Usually located around the coast, e.g. At Lighthouses, or on Light Ships, though very likely to disappear completely over the coming years and be replaced by DGPS systems. Some are still operational in countries like Spain and France, but sadly their days are all numbered.

You will also come across the terms 'En-route', or 'Waypoint' beacons too, and this usually refers to the beacons that are located away from airfields. For example, if an aircraft is travelling from one airfield to another, a Waypoint or En-route beacon may be situated somewhere in between for the aircraft to navigate towards. On long journeys several of these may be used on a particular flight path. In official publications such as Aerad these are often denoted by just being listed with the two letters of the country's ICAO code (e.g. - Epsom, UK - EPM on 316 kHz is listed as 'EG' (EG is the ICAO code for the UK), whereas the nearby airfield at London's Heathrow is 'EGLL = EG (UK) + LL (London Heathrow).

SECTION TWO: THE MODES OF OPERATION PRESENTLY USED BY NDBs:

The various different types of beacon in use, and what these differences actually consist of have often confused many Beacon enthusiasts. A brief explanation would be that most radiobeacons are very similar technically, with the main differences being the modes that are used, and the frequency of the identification signals. Beacons used for Marine navigation generally sound different and offer a longer carrier for DF purposes, generally using mode A1A. Aero beacons on the other hand, use mainly A2A or Non A2A modes. There are exceptions to this rule however, and as will be seen, a large number of the Aero NDBs operating in France use only the A1A mode. At first glance this may sound a bit confusing, but for the beacon Dxer this can actually be quite helpful, since this can offer clues as to country of origin when finding an unlisted beacon during your searches. We will take a further look at the various types of ID signal patterns later in this chapter.

A number of beacons are listed in the 'official' publications with titles such as 'Locator beacon', these are basically the same as standard NDBs, but will also have a specified 'Instrument Approach' procedure as well (usually listed in Aeronautical Flight Supplements), which may be used by pilots when making an approach to the airfield. These are provided as an additional approach aid during the notified hours of operation at a particular airfield, and as such may only be operational at certain times of the day (though this varies from airfield to airfield). The terms, **LOM, LIM, LMM** generally refer to the location of the locator beacon in question - eg. **LOM** - at the 'Outer Marker' position on the approach to the runway, **LIM** - at the 'Inner Marker' position, and **LMM** the 'Middle Marker' position. To the radio enthusiast these differences will to all intents and purposes be irrelevant, though as you can no doubt appreciate, this difference will be of considerable importance to the pilots, who may well be heavily reliant on these aids for getting the aircraft safely on the ground.

As I said previously, most Marine Beacons use Mode A1A, though some countries (France and a number of Eastern European countries for example) also use this mode for a number of their Aerobeacons. Knowing this can prove to be of great assistance when trying to identify unknown signals. The majority of Aerobeacons will generally be of the A2A or Non A2A variety though, and you will find that some of the idents just send the callsign over and over again continuously (usually at around 7 words per minute) without any sort of long 'dash' or 'gap', whilst others send the ID once and then follow it with a 5 or 7 second dash (though these lengths may vary from beacon to beacon, and in the case of Marine beacons be up to 47 seconds. See following section on station idents for more on this subject!

Calibration Beacons - with the demise of the Marine Beacon service these are becoming increasingly rare. Basically these beacons are provided for the specific purpose of calibrating and aligning a ship's DF equipment. The calibration Beacon will generally be co-sited with another beacon, but will operate on a completely different frequency, and only be activated when requested by a ship - in many cases only when accompanied by a small payment. The range of these stations is usually only around 5 nautical miles, and hours of operation during the daylight period - this is one of the reasons that reception of these beacons is very rarely ever seen in radio hobby publications. A few still remain, but the chances of hearing one in 2002 are becoming increasingly smaller.

MODES OF OPERATION:

Below is a brief explanation of the different modes used for radiobeacons.

A1A	On-off keying of the unmodulated carrier - requires **BFO** to be switched to the **'ON'** position all the time (if your receiver doesn't have a BFO it should be switched to the **'CW'** position).
Non A1A	Operates in much the same way as **A1A** (tends to be rarely used nowadays!)
A2A	On-off keying of modulating audio frequency during the identification period, when the carrier is either continuous or keyed with an audio frequency and the **BFO** switched off. There is a modulating audio frequency on the carrier during the DF period, when the **BFO** may be switched on or off.
Non A2A	Continuous carrier with on-off keying of a modulating audio frequency. Similar to **A2A** mode except that the receiver must have the **BFO** switched off during the identification period, and on during the DF period .

SECTION THREE: A FEW WORDS ABOUT STATION IDENTS:

Station Idents: Listeners will quickly become aware of the fact that not all beacons sound, or identify themselves in exactly the same way. In the case of many of the Marine Beacons you will notice that the beacon identifies itself twice and then transmits a 'long dash'. The reason for this is that the current recommended method for a marine beacon identification consists of a 'long dash' of approximately 47 seconds, followed by the call letters repeated at least twice over a 13 second period. This cycle should be repeated every minute throughout the beacons' operating period.

Prior to the major re-organisation of the marine beacon system on the 1st of April 1992, a different system was in operation. This system consisted of a 22 second period during which the Callsign was repeated 3 to 6 times, followed by a 'Long Dash' lasting approximately 25 seconds, another Identification Period of 8 seconds**,** and finally a 'Silent' period of 5 seconds. Most beacons should be found to use the new system, but it's possible that from time to time you may still come across the odd beacon still operating with the older system.

In the case of Aero Beacons it will be found that the majority of these use the Non A2A mode with Double Side Band, and in most cases all you will hear is the beacon's station Callsign being repeated continuously. The reason for this is that to **'DF'** (Direction Find) the signal, the onus is on the user to switch his receiver's **'BFO'** to the **'ON'** position and then use the heterodyne from the transmitted carrier to obtain a null. In the case of an **A2A** transmission, an audio tone or 'Long Dash' will be transmitted on the carrier in between idents, and the user can then attempt to **'DF'** the signal during this period.

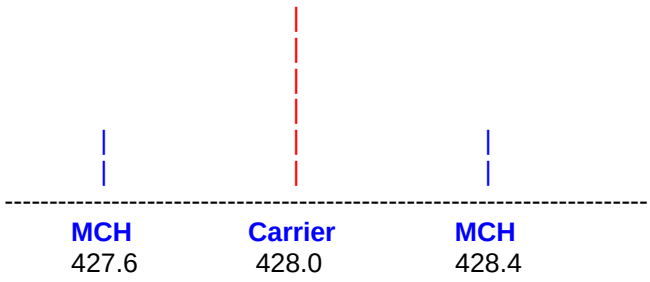
In the case of Marine Beacon it will also be noted that most only use a 'Two Letter Callsign', usually bearing letters which are similar to the name of the beacon's operating location. A couple of good examples of these were: **'SB - South Bishop, Wales - 290.5 kHz'** and '**BY - Baily, Ireland - 289.0 kHz'** (sadly both have now departed along with most of the other UK and Irish Marine Beacons in early February 1999!). As you can see, in the case of names with more than one word, the first initial of each word may be chosen, whilst in the case of names of just a single word, the first and last letters are often used. This is not a hard and fast rule though, but in the event that you are trying to identify an unknown signal this can prove to be very helpful to your investigations. Please note though, that many Marine Beacons have recently departed, and it's highly likely that most of the remaining ones will cease transmitting in the next few years!

Pitches and Offsets: It will often be noted that when you tune in to an Aero beacon using a receiver set to the SSB or CW position, the actual CW Ident will appear to be slightly off frequency. This is because in the case of most aeronautical beacons, Mode A2A or Non A2A is used, which is in effect AM or Double Sideband. If the receiver you are using has a narrow enough IF filter fitted you will be able to hear the carrier (i.e. a loud audio tone) on the listed frequency (centre frequency), and the actual CW ident at a set distance above and below this carrier. In the case of stations in the UK and Ireland, it is generally traditional to use an offset or pitch of 400 Hz, which in the case of my local beacon - MCH on 428 kHz - means that the carrier will be heard on 428.0 kHz, and the CW ident at 427.6 and 428.4 kHz. If you happen to be listening to the beacon on a receiver which is set to AM or DSB though, chances are all you will hear is the callsign superimposed onto the AM carrier, even when you are tuned dead on 428.0! To make things even more complicated, some other countries will use a modulated tone of 1020 Hz (Germany and Spain for example), and if you just happened to be using a very narrow filter and were tuned in to Spanish NDB **'MNF'** on 428 kHz using this offset, you might well hear idents on 426.98 and 429.02 kHz as well. As you can see from this, in the event of beacons of differing pitches sharing a channel it is very easy to assume that one station is slightly higher or lower in frequency than the other, when in fact most official publications would only show the same carrier frequency of 428 kHz.

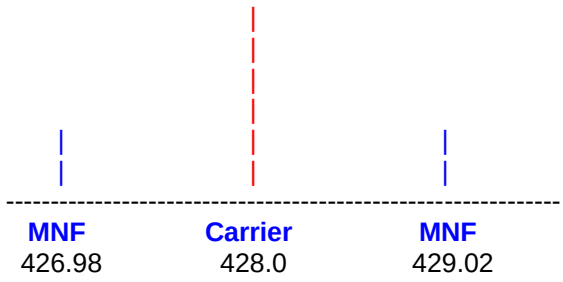
Why is all this necessary you may ask? Well, a look back at the description of the different modes used on Page 2 shows that for direction finding purposes the aircraft would use the AM mode to tune in the beacon ident (necessary to know which beacon they are tuned to, and where it is located), and, in he case of Non A2A transmissions, the BFO would need to be switched in (or the CW position selected) to give a constant carrier, which would shows minimum signal strengths when attempting to take a bearing with the DF equipment. Some types of beacon will use mode A2A, which is often tone modulated to allow the bearing to be taken whilst still switched to the AM mode. As if all that isn't complicated enough the majority of Aerobeacons in France (and nearly all of the marine beacons) use mode A1A (or Non A1A) and can only be tuned in properly when the receiver is set in the CW position. These show no offset, and the ident (and a tone of between 15 or 47 seconds) will appear on the actual (listed) carrier frequency and are not offset in any way.

To give a more graphic example, the French Mode A1A Aerobeacon CTX at Chateauroux on 428.0 kHz would give an audible ident and tone only when the receiver was set to the CW position and tuned to 428.0 kHz. Confusing isn't it, no wonder so many people find it difficult to know what frequency they should be

tuned into, even when they have a top quality receiver with a very good digital readout. I hope the above information helps to clarify this situation a little, and I have added a few simple illustrations below to help explain the point more easily:

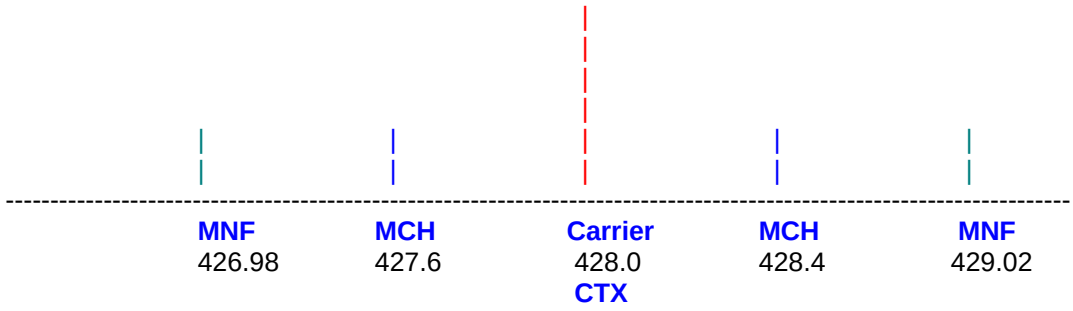


1.) **MCH - 428 kHz 400 Hz offset**



2.) **MNF - 428 kHz 1020 Hz offset**

3.) **CTX - 428 kHz Zero Hz offset**



4.)

How the three different beacons would appear as you tuned across the band from 426 to 430 kHz.

Note# (A French mode A1A beacon with zero offset such as CTX - Chateaureux would only appear with its Ident exactly on 428.0 kHz, and may be masked by the carrier of the other two beacons - see the Paragraph about DSP and Analogue Filters in Section Four for details about how to deal with this problem!)

As can be seen from the above examples, signals which are actually on the same channel can appear to be on different frequencies because of the different types of offsets that are in use. In **Figure 1.** you can see that the 400 Hz offset of the UK aerobeacon **'MCH'** on 428 kHz would cause the ident to appear at 427.6 and 428.4 kHz, whilst those of **'MNF'** in Spain **Figure 2.**, which uses a 1020 Hz offset, would appear at 426.98 and 429.02 kHz. **Figure 3.** shows that a typical French NDB with a 'zero' offset and its ident appearing exactly on the carrier frequency would be sharing the same frequency as the carrier from the other two beacons**. Figure 4.** shows how the idents would appear to the listener as they tuned across the band of frequencies between 426 and 430 kHz (assuming both beacons were audible that is).

This may seem complex enough to grasp, but can be even further complicated, because another beacon operating on a higher or lower channel may obliterate one of these sidebands with its own ident offsets, and may leave only one of the original ident sidebands audible. If you happen to be using a narrow IF Filter with a bandwidth of around 250 or 500 Hz the two idents may make the signals appear to be operating on separate channels, whilst in AM mode it only appears the once. In reality both idents are coming from the same beacon operating off the same carrier frequency, it's just the method used for reception which makes this appear as two signals.

For a more detailed look at the workings of pitches and idents I would strongly recommend reading a copy of Sheldon Remington's excellent publication **'On The Art of NDB Dxing'**, (available from the Long Wave Club of America website) details of which can be found in the 'Datafile' in Part Two of this publication.

Two and Three Letter Callsigns: With Aero Beacons you will find that in the majority of cases a Three Letter Callsign is used, again with letters that are often similar to the beacon's location. A few examples here are: **'MCH - Manchester, England - 428.0 kHz'**, and **'PIA - Piacenza, Italy 440.0 kHz'.** This is not always the case, and there are many beacons with Two Letter calls, or letters that seem to bear little resemblance to location. This can be misleading since the letters may be a reference to the local name of the airport. A good example of this is the Aerobeacon '**KIM**' on 365 kHz, this is located near to Humberside International Airport but doesn't initially appear to bear any relationship to the name of the airfield. A look at the address of the Airfield quickly shows the answer: "Humberside International Airport, **KIrMington**, South Humberside DN39 6YH, England". It now becomes clear that **KIM** is related to Kirmington, which is the name of the area in Humberside where the beacon is situated. I've also noticed a tendency amongst some of the French NDBs to use letters relating to two towns rather than just the one, with a good example being CVT on 347 kHz, which stands for **C**halons/**V**atry.

Doing a little research into things like addresses or 'local' Airport names can be helpful in assisting with the identification of an unknown station or callsign. This is not a hard and fast rule, and despite your best efforts many calls will bear no relation whatsoever to anything immediately identifiable, and may prove very frustrating to your attempts to gain a definite ID. This is where having a good selection of publications, maps, charts, atlases and other information sources will prove very fruitious to your efforts. Being a member of radio club with a newsletter covering both Marine and Aero Beacons, or a specialist beacon reflector such as the 'NDB List' or the 'Lowfer' reflector can prove to be a great asset here.

Hours of Operation: This is an oft neglected but very important point, and one, which can be easily overlooked. Many of the larger airfield and waypoint beacons will often be left switched on for full 24 hour operation, but in the case of a small or private airfield, landings may only be permitted during certain hours and the beacon may only be switched on during those periods, usually on prior request from the incoming aircraft. Many dxers have also noticed that a number of the Oil Platforms in the North Sea don't leave their beacons on all the time, and the Aeronautical Information Publication (AIP) produced by the Civil Aviation Authority, also contains some very interesting information about this in section 'ENR 1.15 Off-Shore Operations'.

The following piece was extracted from **Section 5.1.4**:

"**NDBs on both fixed and mobile installations generally operate on shared frequencies.** NDBs that share frequencies should only be switched on if requested by the helicopter pilot, and then only after the frequency has been monitored by the pilot and found to be vacant immediately prior to switching on. The pilot should advise the NDB operators as soon as they no longer require the use of the NDB. When no longer required the NDB should be switched off. Additionally, in order to assist helicopters in transiting fields a small number of NDBs on fixed installations have been assigned frequencies that enable them to operate as close to H24 as practical. Pilots may find these NDBs already on and that they remain on after they have advised the installation that they no longer require their use."

To find out more about the workings of oilfield beacons I would recommend a visit to the NATS website where you can download a copy of the AIP in .pdf format. http://www.ais.org.uk

As you can see from the passage above, hearing some of these beacons may be more a matter of luck than planning, though with a lot of patience and persistence it's certainly not impossible. One option may be to leave your receiver 'parked' on one of the listed channels for long periods and hope for some activity, another is to make frequent checks of all the oil platform beacon channels at regular intervals, and this is the method that has worked best for me in the past. If your receiver has lots of memory channels, it's well worth programming all of the Oil platform beacons into a memory bank and tuning through them as often as possible. The same tactics can also be employed for many of the 'limited hours of operation' beacons.

If the beacon is a 'daytime only' operator, but is within a reasonable distance of your location, daytime reception may well be possible, and checking for them during their listed hours of operation should produce results. Again, a good selection of official publications can provide essential information about hours of operation at specific airfields, and as I've said previously it's certainly well worth investing in copies of these. Many of these 'daytimers' change their operating hours slightly during the winter months, when hours of daylight are shorter. Hours can also change when daylight saving ends and clocks go back or forward in March and October, and the beacon may be switched on or off an hour sooner or later than expected.

Of course, for many people who have to go out to work for a living, daytime listening opportunities may be very limited, and other demands such as family, sports, gardening, shopping, other hobbies etc. may prevent you from having much opportunity for daytime dxing. All is not lost though, and I have noticed that on the odd occasion one of these restricted hours beacons has been left switched on all night. Whether this was deliberate or accidental I couldn't say, but it does pay to make regular checks of frequencies where restricted hour beacons are listed, you may just get a very pleasant surprise one of these nights. My preferred method of doing this is to compile a 'most wanted' list, and check these frequencies at as many different times of the day as possible and whenever spare time permits. You can quickly scan through these channels in 5 or 10 minutes, and can often squeeze a short session somewhere into a busy schedule.

Below is a list of terms often found in 'official' publications to show the hours of operation:

H24 - Operates 24 hours a day.
HJ - Operates during the daytime.
HN - Operates during the night.
HO - Operates during times to meet operational requirements.
HS - Operates for scheduled services.
HX - Operates at no specific hours.

Be aware that callsigns do change from time to time and often for a wide variety of reasons. In recent years there seems to have been a tendency for many beacon callsigns to change to IDs which 'tie up' with local airfield, or place names, and if you do come across a 'new' beacon, or a callsign which you haven't heard before or can't find listed anywhere, you would be well advised to check all the airports with names that might match the call to see if it is an existing beacon which has just changed frequency to avoid interference, but has retained its existing 'descriptive' call letters.

Emergency Beacons: What do I mean by 'Emergency Beacons'? Well, for a start, I'm not talking about the flashing things found on the top of Fire Engines and Ambulances, these 'Emergency Beacons' are the back up systems found with many of the normal NDB transmitters. Often when reading reports you may come across references to these, or see logs showing the normal call letters followed by a small letter (e) in brackets. The reason for this is that many NDBs will consist of two transmitters, the main one and an emergency back up system (dual transmitter). You can imagine that in the event of a NDB transmitter going faulty, or even failing altogether, pilots and aircraft depending on these systems for an accurate airfield approach might well be put at risk. In this event the secondary, or 'back up' transmitter will take over, and in many cases (but not all), the back up transmitter will add an extra letter 'E' after the main ident to show that there is a problem, and alert the beacon's operator, or nearby airfield Navaid Technicians to the problem. You can usually tell when a beacon is operating in this mode because the 'e' will have a slightly longer space before the letter, and this shows that it is not just a part of the normal ident. One UK beacon, which is often reported with an extra **(e)** is **LUT** from Luton Airport, this often sounds like **LUT e . _ . . / . . _ / _ .**

If this beacon was reported as **LUTE** it would cause confusion, and to the ears it just wouldn't sound like the word **LUTE**, it would sound like **LUT E**. With me so far? To avoid this sort of confusion many NDB enthusiasts would report this as **LUT(e),** which in itself could lead to confusion since the ID heard didn't send any 'bracket' characters in Morse code along with the original ident. I must admit that I am so used to reporting the extra (e) in that way that it never occurred to me to give an explanation of why this is done. My thanks to Ugo Lazzarini of Italy for bringing this important point to my attention.

That isn't the end of the story though, and although adding an extra (e) might be a common practice in the UK and a number of other countries, there are other methods of showing that a transmitter may be malfunctioning, and I think it is only right that I should give a brief description of the other types that I've come across so far. In Canada for example, most beacon idents have a long dash of approximately 6 seconds after the main ID, and in many cases if a transmitter develops a fault and switches to the back up transmitter this will change to a longer 12 second dash. One other type that had me confused for a while was I believe, very common with some of the older 'Soviet' built systems. I heard the beacon **'POZ'** from Pozarevac in Yugoslavia during the winter of 2001/2002, and one night it was sending its ident with offsets of plus and minus 400 Hz, and the next with its more 'normal' 1020 Hz offsets. After a bit of head scratching and the re-reading of a few old articles, I eventually discovered that this was done deliberately to show which of the transmitters was in use. I should think that to a pilot monitoring the beacon in the AM mode very little difference would have even been noted. I'm sure that things like this must have caused confusion to many dxers over the years, a 1020 Hz offset might be hidden behind a local beacon and never or rarely heard, yet when the 400 Hz signal appears and it is on a clear frequency it appears to be a 'new' beacon. If

you have come across any signals like this you might well have been hearing some sort of back up NDB transmitter at work.

I'm sure that there are probably other methods used to show that a beacon is faulty, the ones above are just the ones I've discovered so far. If anyone out there knows of any other types please do let me know, I'd be more than happy to include them here in the next edition.

What the experts have to say: Below are some extracts from what some of the major beacon manufacturers say on this subject on their websites.

From top US manufacturer **'Southern Avionics'**:

Transmitter shuts down when power falls below an adjustable value, or when VSWR rises above an adjustable value. With a dual system a shutdown signal initiates a transfer from the primary transmitter to the secondary transmitter. http://www.southernavionics.com

European manufacturer **'Pharos Marine'** has the following in their beacon specifications:

Automatic changeover to standby transmitter if output power drops below pre-set value. Current consumption increases above pre-set value. Temperature increases above 80°C on heat sinks. Automatic changeover to standby mixer if Output signal drops below pre-set value. Automatic changeover to standby Morse clock/coder board if Morse code disappears. http://www.pharosmarine.com

And the top UK manufacturer **'Fernau Avionics' has** a very informative description on their website:
The Fernau 2060 NDB is normally supplied in the dual configuration, providing two completely dualised transmitters. The standby transmitter is automatically started in the event of failure of the main transmitter. A system control unit on each transmitter monitors the respective transmitter and according to the limits set, will initiate a changeover in the event of failure. VSWR, Power, Synthesiser Lock and modulation are monitored by the system control unit. The Auto Changeover unit allows selection of either main or standby transmitter. http://www.fernau.com

Ident Harmonics: Another great source of confusion, and thankfully one that isn't too common. Some beacons with 400 Hz or 1020 Hz offsets might on occasions send out harmonics at multiples of these offset frequencies. In the case of a 400 Hz offset this would appear at plus or minus 800 Hz, 1200 Hz, 1600 Hz etc. above or below the listed 'carrier' frequency, and with 1020 Hz offsets at plus or minus 2020 Hz, 3030 Hz, 4040 Hz etc. If you have a powerful 'local' beacon in your area it may well produce some ident harmonics, most of which are probably only a few milliwatts in strength and not even noticeable to anyone listening in the AM mode. With the use of the CW Mode, a very narrow IF filter, and a very sensitive or 'large' antenna array, it can easily become an extra source of QRM for the enthusiast to deal with. There is probably nothing wrong with the transmitter's setup, and the beacons may well be operating well within specification, the problem is often caused by the way that NDB enthusiasts choose to listen to the signals.

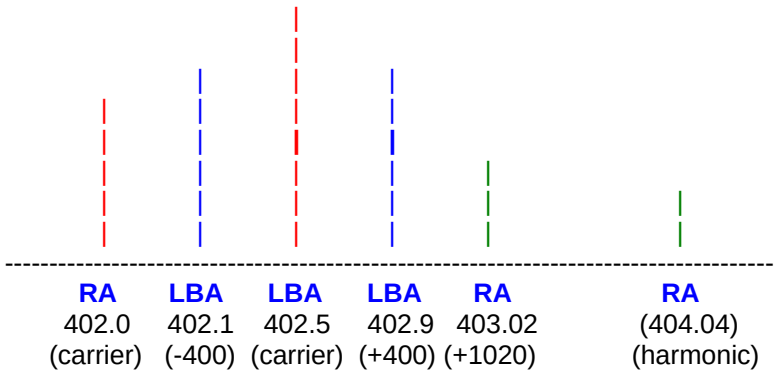
There are two ways of looking at these signals, either as a great asset to the enthusiast, or as an extra pest. First let's look at them as an asset:

One of the 'regulars' that I've heard sending an ident harmonic is the Czech military beacon '**RA'** at Ceske Budejovice in the Czech Republic. This operates on 402.0 kHz with an offset of 1020 Hz. The upper sideband ident would normally be audible at 403.02 kHz using my usual method of listening, unfortunately for me, I have a 'powerhouse' local beacon operating from Leeds Bradford Airport some 26 miles (42 km) to the east (**LBA 402.5 kHz**). This beacon has an offset of 400 Hz, and its (very strong) upper sideband appears on 402.9 kHz - even with a very narrow filter I'm hard pushed to separate this signal from RA's ident on 403.02. On the other hand, when RA is sending out an ident harmonic at +2020 Hz this is audible on a clear frequency of 404.04 kHz! I would be hard pushed to hear this beacon on its upper sideband otherwise, in this case the harmonic is a clear asset to my dxing. Now let's look at them as a pest:

Another powerful 'local' is **BPL** on 420.0 kHz from Blackpool Airport, some 36 miles (56km) to the west. This beacon has 400 Hz offset harmonics, which are audible here at plus and minus 400/800/1200/1600/2000 Hz, and can easily block out any weak signals over a 4 kHz section of the band. In this instance they are most definitely a pest as far as I'm concerned, but as the frequency of 420.0 has some 30 beacons listed as operating on it in Europe, to a more distant listener its harmonics might offer the only chance of ever hearing it. No doubt some dxers in the Czech Republic feel just the same way about **RA** as I do about **BPL**!

The fact is that beacons are not put there for the benefit of radio enthusiasts, so I doubt that any airport navaid technicians will be too worried about what does or doesn't make our lives hard or easy. Unless the beacon is operating out of specification, or causing problems for pilots, complaining about them might not do any good at all. The tactful way to approach these operators might be to casualty comment on it when you send them your very friendly reception report letter! ☺

Below is a graphical example of all the above just in case it still doesn't make much sense:



How the two different beacons would appear as you tuned across the band from 402 to 404.5 kHz.

As can be seen from the above drawing, RA would stand a better chance of being heard on its harmonic frequency of 404.04 kHz at this QTH.

SECTION FOUR: A FEW TIPS FOR THE BUDDING BEACON ENTHUSIAST:

If you were planning to use these beacons for Navigation or **'DF'** purposes, then the previous instructions would need to be followed in order to get an accurate reading. In the case of the beacon enthusiast this is not quite so critical, and you will often find that you can tune in to most beacons using the **SSB (USB/LSB)** positions on your receiver. This will enable you to 'Zero Beat' the carrier, and therefore help reduce any interference from beacons on adjacent frequencies.

Receiver Choice: A good receiver for winkling out beacons will be one that preferably has good 'Selectivity'. By this I mean one that has a good selection of IF Filters fitted, hopefully with one of them being a good quality 'narrow' filter, of less than 1 kHz - preferably **500 Hz,** or **250 Hz** (or even less if you have the capability!). This will help you greatly when it comes to separating the idents, since on this band channel bandwidths are usually only 500 Hz wide! Many 'old' or near vintage sets such as the AR88LF or other ex-military receivers of that ilk can provide good selectivity for not too great a price, unfortunately, they suffer from other drawbacks such as size, serviceability, and the lack of a digital readout to help make channel identification easier. I'm pleased to say though that many modern receivers - the WJ1000 and NRD 545 being ones that immediately come to mind - they do now offer the Dxer digital IF filter stages which can be continuously varied down to a very low bandwidth - often with a choice of over 50 different positions or more going right down to 50 Hz or less. Do remember that if you are really serious about chasing very weak and distant beacons, choosing a receiver with very good IF filtering will greatly assist your efforts.

Converters: A number of equipment manufacturers used to make VLF converters – these would convert the range 0 to 500 kHz to a higher range – usually 28 to 28.5 MHz, or 4 to 4.5 MHz, but sadly the only company that still seems to do this is LF engineering (see Datafile section). Converters are very useful for listeners with deaf receivers, or who don't have sufficient LF or VLF coverage. Right is a small picture of my old Datong VLF Converter (check eBay for 2nd hand ones):

DSP and Analogue Audio Filters: If you are stuck with a set which doesn't have particularly good IF Filters (and unfortunately many of us are), then a useful tip is to use an outboard 'Audio Filter' (like the Datong FL3, Timewave and MFJ DSP Filters etc.). This will enable you to achieve very narrow audio bandwidths, often as low as just 15 Hertz. This can aid you greatly when it comes to 'digging out' many of the weaker signals, which may be masked by the Non A2A's AM carriers. Another advantage of these filters

is that they often also include a 'Peak & Notch' facility, and this can assist greatly in the removal of unwanted audio tones or interfering carriers. If you do have good IF Filters it's still worth adding one anyway, since it will be yet another tool to aid you in the search for weaker 'DX' beacons. 'Noise Reduction' is yet another option offered with the DSP filters, this can also prove useful for the weak signal chaser.

Recently I have been fortunate enough to add an MFJ-784B DSP Filter to my shack, and this has proved a real godsend to my NDB dxing. As I mentioned in the previous sections, many channels will have a French 'A1A' beacon operating on the same channel as an A2A or Non A2A beacon's carrier, usually with a very loud whistle from the hetrodyne shattering your eardrums (very painful if you wear headphones for your dxing). A rare catch might well be being obscured by this whistle, and without a notch filter you probably wouldn't even be aware that it was there. Short of waiting months (or even years) for the beacon to go off air for servicing and leave the channel clear, you may never get a chance to hear it unless you can employ some other tactic, and this is where the DSP filter's many functions may start to come in handy.

On my filter a very useful 'auto notch' filter is included, and this has proved to be very effective at nulling out these large carriers, and leaving the French NDB idents just audible underneath. In the first 6 months of usage this technique had netted somewhere in the region of 30 first time catches. Not only has this worked with the French A1A beacons, but has also proved very effective at sorting out the 1020 Hz offset idents from the carriers too. With the audio bandwidth set to around 20 Hz and the auto notch switched in, I've been able to hear a lot of very weak and distant idents that were previously masked by these carriers. I don't want to sound like a salesman for MFJ, and I'm sure that all the other makes of DSP filter are probably just as effective (if not moreso). I'm just trying to point out that the large outlay of cash required for buying these devices can be well worth making if these are the sorts of results that you are looking for. My DSP filter is now an essential part of all of my beacon dxing sessions.

One piece of advice for users of the MFJ-784B - I discovered that my 'auto notch' didn't work when the filter was switched into 'CW' position, though the 'manual notch' did. I found this could be overcome by switching to the 'BP' position on the mode switch, and setting the bandwidth using the 'low' and 'high' knobs. The downside of the DSP notch is that it is so good that it can be 'too effective', and completely remove everything. This is useful when you are listening to SSB, but counter productive when digging beacons out from under a carrier. I discovered that I could deal with this problem in one of several different ways, firstly by using the DSP Filter in the 'CW' position and switching in the 'noise reduction' button instead of the notch filter, this didn't remove all of the hetrodyne, but did get rid of enough to make hearing anything left underneath still possible. The second method, and the one that I ultimately chose, was to connect my Datong FL3 analogue filter in series with the MFJ (output of the FL3 to Input of the MFJ) filter. By using a combination of the 'by-pass' buttons, and the Datong's analogue 'auto notch', I was able to reduce the carrier enough to hear what was left underneath, and then use the MFJ's 'noise reduction' to clean up some of the remaining noise. On rare occasions and under really desperate conditions both filters have been used at the same time, usually with both 'peaked' for maximum, though this can of course get very complicated. Nevertheless, if you have just purchased a DSP filter and don't know what to do with your old analogue filter, the above solution is well worth trying. Don't throw your old filter away or mothball it, analogue filters do still have some advantages over the newer DSP variety. This method should also work well with other types of DSP filter than the MFJ variety, though not having had any personal experience with them I can't give any assurances that they will.

Aerials: When it comes to aerials a directional aerial such as a 'Loop' or 'Frame' system is a very useful tool to have, since this will enable you to 'null out' some of those unwanted signals by rotating it away from the interfering station. If you aren't sure how to go about making a Long Wave Loop, or you would like to know where you can buy a ready made one just contact me for details, or refer to the **'Beacon Datafile'** in **Part Two** of this publication.

Good results can also be obtained using one of the many 'active' antennae, which are readily available in the radio market. A number of US companies specialise in making active vertical aerials especially for the **LF** enthusiast, and these are reported to give excellent results. There are also a number of UK companies manufacturing antennae which also give excellent results and my own personal choice is to use A Large Aperture Active Magnetic Loop, (with a Loop aperture of approximately 40 metres circumference), mounted outdoors well away from the household QRM sources. I also use a smaller 1-metre diameter outdoors Broadband Active Magnetic Loop, which is mounted on a rotator at the far end of the garden, and calibrated for use as a direction finding antennae. Both of these aerials were manufactured by a UK company called **Wellbrook Communications**, and details of the company can be found in the Datafile in Part Two.

Below are some shots of my aerials, including my Wellbrook ALA1530, which looks like it is rapidly becoming engulfed by encroaching Jungle! ☺

Of course many enthusiasts are quite happy with, and achieve excellent results just using fairly simple (and cheap!) aerial such as the good old 'Long Wire', though it has to be said that in our modern electrically 'noisy' environments these may well be more susceptible to interference generated by Colour TVs, Computers, Light Dimmers, Water Softeners and a whole host of other appliances. As always with aerials, the general advice given is to try and get the best system that you can, and to try and locate it as far away from all these sources of interference as you possibly can.

Above: *ALA1530 1 Metre Loop*

Below: *Wellbrook ALA100 Wide Aperture Loop*

In recent years one antenna system which has become very popular amongst NDB enthusiasts is the K9AY antenna, first invented by Gary Breed K9AY, and now available commercially from various sources (see the Wellbrook Communications section in the Beacon Datafile in Part Two). The big advantage of this type of aerial is that it has excellent directional properties, and with a suitable number of loops and control unit, can be switched to a single direction e.g. North or East from the user's radio shack. Unlike a bi-directional LW Loop, signals from the opposite directions such as South or West can be greatly reduced, or even nulled out. This can be a great asset when trying to eliminate 'local pests' which block out whole channels, or work out the direction of an unidentified beacon.

The Library: When it comes to books about the radio hobby I just can't get enough of them, and I think a well-stocked library is a very useful tool to posses when you are searching for dx signals. Once you have heard the beacon the battle is often only half won, and frequently I will spend more time searching for the ID, location or QSL address than I did actually hearing the callsign. For such a specialist hobby as beacon dxing, actually finding out where to obtain this type of information or publications which contain them can be very difficult, and again I would refer you to the datafile in Part Two for an up to date list of useful sources.

NDB Reflector: For dxers with access to the Internet, a new e-mail reflector specially dedicated to the hobby of beacon dxing now exists, and this provides a forum where beacon dxers can exchange news and loggings, and compare notes with each other. Details of how to join the **NDB LIST** can be found in the datafile.

And Finally: Dxing low power radiobeacons is a great challenge for the radio enthusiast, and since many of these stations may only run power levels of around 50 watts and in many cases, levels of well under 10 watts, very challenging indeed. Successfully receiving these tiny signals over vast distances can provide quite a thrill for the recipient, and during the hours of darkness, particularly during the long dark winter nights, hearing stations from great distances can be very satisfying. Reception of Trans-Atlantic NDBs and DGPS beacons is possible, and catching a new one can be every bit as exciting as hearing any of those Trans-Atlantic Medium Wave stations. If you use this publication as a guide to help yourself set up a good beacon listening post who knows what you might hear!

SECTION FIVE: DON'T FORGET THE BIT AT THE END – IMPROVE YOUR AUDIO!

Many listeners will spend a lot of time and money working on, and improving their aerial systems, buying top quality receivers and pre-amplifiers, preselectors, Aerial Matching Units (ATUs) etc. but then completely neglect the audio that actually comes out of the loudspeaker. This is an area where great improvements can also be made, and these can greatly enhance your listening capabilities, not to mention help to bring very weak signals up out of the background noise.

In previous sections I mentioned that the use of a good audio filter can make a great deal of difference, but I didn't cover how this can be done, or other ways that a listener can make the most of their received audio. Several readers commented that they would like to know more about this subject, and hopefully the answers and information given in this section will help them to do this.

From speaker to earhole .....

After you have shelled out a lot of your hard heard Pounds, Dollars, Euros etc. on your super-duper new all singing and dancing radio, connected up your aerial, and then switched on in anticipation of hearing lots of exotic and interesting catches, what really happens? Well, if you're using one of the many popular commercially designed receivers you'll probably find that your hard won signal has now made its way through a state of the art RF stage, several IF stages (depending on the choice of IF filters fitted), and is now squeezing itself out of some cheap and nasty two inch tinny sounding speaker located on the top or bottom of the receiver - just right for sending your hard won audio down onto your desktop, or up to the ceiling! If you're very lucky the small speaker will be situated on the front panel and pointing straight at your face - a perfect set up if you're happy to keep your head permanently turned sideways, or happen to have your ears mounted next to your nose rather than on the side of your head!

If you don't believe that this makes a big difference just try moving your head into different positions and see if the sound quality changes at all. By the wonders of evolution Mother Nature fitted us out with one ear on each side of the head - stereo sound is very useful if you need to hear a variety of sounds coming from a number of different directions - the human race wouldn't have survived for very long if we'd only been fitted with one ear on the front of our face, predators would have soon learned to approach us from the rear. Ever seen a wild Rabbit or Hare standing on its rear legs with its long ears pointed vertically, and swivelling around to detect the approach of anyone fancying Rabbit Pie for their dinner?

As can be seen, sound is better heard when the ears are pointing towards the sound source, a concept that many radio designers either don't seem to be able to grasp, or are unable to do anything about due to the presence of cost conscious "Bean Counters" standing over their shoulders and making sure that no money is spent unnecessarily.

Anyone who has ever been to a cinema fitted with stereo surround sound will know that the sound is much cleaner and sharper than it is in an older cinema with an old mono speaker stuck behind the screen somewhere. The easy way to put this theory to the test is to compare what you hear when you are wearing a pair of headphones with what you hear from the loudspeaker - not only is the ambient background noise greatly reduced, but the signal is much easier to read now that the sound is going directly into the ear, and not via a reflected path off the walls of your radio shack. Many top Dxers will always be found wearing headphones during their DX sessions for this reason, though even with a good set of headphones, audio quality can still be greatly improved with a little bit of effort.

Unfortunately we live in the real world, and in a competitive market place many radio manufacturers will not spend additional money on improving the audio output if it means that a competitor can dominate the market by selling his products at a lower price, even if it doesn't ultimately perform anywhere near as well. To this end we must assume that unless there is a massive public demand to change things, and all manufacturers jointly decide to do something about the problem, we will just have to make the best of what we can by our own devices. This can be done, and not always at great expense to the listener, the following paragraphs will list a number of ways that audio can be improved, or made the most of.

Loudspeakers:

Let's assume that after reading the above bit you've now decided that attaching an external speaker would be a good idea, and would help to improve your sound quality. It seems to be almost too obvious to state that you should acquire the best speaker possible, but in the case of beacons (and other SSB and data signals), what would be considered a good speaker system on a hi-fi unit would not necessarily be a good speaker for giving the best enhancement of the type of signals we want to listen to. This may seem strange, but if you've ever connected a top quality hi-fi speaker to a radio and then listened to the actual sound it produces you will probably have been very disappointed with the result and understand why I've brought this up. Why should this be? Why doesn't a speaker that gives great results when you're listening to your favourite music do the same thing when used on your beloved communications receiver?

I'm sure there is a very complex and technical answer to this question, but since I'm just a simple bloke and not a budding Brain Surgeon, I will try to give as simple an answer as possible - it's the frequency response!

What do we mean by frequency response? Well in the case of a hi-fi system you would ideally want a speaker with a very wide frequency response, so that you could hear the full range of frequencies. By this I mean the low "Bass" frequencies, the mid range, and the higher frequencies. If you're into Led Zeppelin and Ozzy Osbourne you will probably want a speaker with a good Bass response, if classical music is your thing

a good high frequency response (Tweeter) will be desirable so that the strings and other 'high' frequency sounds can be better heard. Compare this with the type of thing we listen to on HF or LF, Morse code with a pitch of around 800 Hz, and SSB with a range of below 3 kHz. A lot of bass may be desirable for Ozzy, but for CW it sounds pretty awful. The high frequency ‘Tweeter’, which makes Mozart and Beethoven sound so nice, sounds very hissy when used with SSB and CW. So what then is the ideal response for our purposes?

I can only speak from personal experience here, but I've had many of my best results when using proper "communications" speakers, which have a response tailored to suit the frequency range used by SSB and CW, usually with a cut off in response at around 4 kHz. A number of Amateur Radio dealers do stock these, and they're not too expensive. I've often come across them at Radio Rallies (hamventions) selling at just a few pounds, and now have quite a few of them spread around my shack. Another very useful source were the Public Address type "powerhorns", which used to be stocked by Tandy (Radio Shack), and these were tailored for the best voice frequency response, and could be picked up at their high street shops (alas Tandy sold all its UK shops to a mobile phone chain, but some new franchises are now appearing again under the Radio Shack name). Several years back Grove Enterprises used to make an excellent speaker, which came with all kinds of high and low pass filters built in, and this was great since it allowed the listener to tailor the audio to suit the signal they were listening too, sad to say that this unit no longer appears to be manufactured, but some may still turn up on the second hand market from time to time.

Technology has taken a hand here though in the past year, and a UK company is now marketing a new "DSP Speaker", which offers promising results for the radio enthusiast, the company is called "BHI Ltd", and further information about their products (along with a few reviews), should be found at their website at:

http://www.bhinstrumentation.co.uk

I don't own one of these speakers so I can't say for certain just how effective they are for serious beacon dxing, but I did recently have the chance to try one out at a friend's QTH, and the results on both SSB and the FM and AM signals on his scanner were quite impressive, background noise levels were reduced considerably when attached to the radio's speaker socket. I believe that this same group of speakers is now being marketed in North America under the name "GAT", and a review of this appears in the May 2003 issue of Monitoring Times. These units can be obtained in North America from MT publishers Grove Enterprises, and details and prices should be found at: http://www.grove-ent.com

If you already have a nice speaker set up and are reluctant to discard this in favour of a DSP speaker, BHI now offer another solution, which may give you the best of both worlds. The NEIM-1031 Noise Eliminating In-Line Module gives the same kind of noise reduction as the DSP speaker, but fits between your receiver and own speakers, and allows you to have a little more control over your final output. Again, details can be found at the BHI website: http://www.bhinstrumentation.co.uk

Yet another player enters the DSP speaker market, and this time one with a lot of experience in this field, the US company - SGC World http://www.sgcworld.com/products/ADSP2/ADSP2Noise.html - with its ADSP range of DSP speakers and modules. When I saw the advert for this product in a UK radio magazine I was intrigued by the fact that unlike its BHI opponent, it was designed for CW and data usage. It is available in a variety of options, either already built into a loudspeaker (very similar in appearance to the BHI speaker shown above), and also in two modules – one with a low output, which is designed to be built into the receiver (as of May 2004 a number of UK radio dealers are selling popular receivers like the AOR7030 with these pre-fitted), and also a higher powered module (up to 5 watts OP) for building into a loudspeaker, or feeding your own existing speakers (see the SGC World website for more information about these).

With my current system of using several speakers configured in parallel, the external module seemed like the obvious solution, though in practice this did throw up a few problems. Anyway, I broke open the Piggy Bank and duly ordered one from the UK supplier and eagerly awaited its arrival. Several days later, and the unit came through the letterbox, and I immediately set about getting this set up, and fitted into my receiving system. Because I have a MFJ-784B DSP Filter, and Datong FL-3 operating in series together, it was in my mind that the best place to put it would be in line between the two existing filters, thus allowing me to continue taking my filtered headphone and filtered line output to the PC for data decoding from the MFJ filter. Alas this wasn't possible, since the module arrived with strict instructions that the speaker output mustn’t be connected to ground, and feeding it through the MFJ, with its grounded sockets wouldn’t allow this. After a re-think I found that there was no option but to fit it at the output of the MFJ filter, though this meant having to take off an additional output via a variable resister to take advantage of the post filtering when using the headphones and line outputs. Except for the fact that I can switch and feed several different receivers through my receiving set up, in hindsight, and if only one receiver is used in the shack, a better

option might have been to go for the internal low powered module fitted in the receiver option (not a DIY job for the inexperienced though!).

In the end I decided to build my unit into a separate ABS plastic case, and with the addition of a Double Pole Double Throw switch, can now by-pass, or switch the unit into line quite easily as required. Below is a picture of my unit showing the module mounted into the plastic case (plastic was used to avoid grounding the output sockets).

Left: *The SGC module seen here mounted inside an ABS plastic box.*

So how does this unit perform then? Well, as anyone who has used a DSP filter will tell you, DSP noise reduction can be pretty impressive, but it does have a strange affect on the recovered audio, which is not to everyone's taste. When used on noisy AM or voice signals the noise reduction really can make quite a difference, but the recovered audio is definitely not for the ear of the purist or hi-fi nut. It's difficult to describe the sound of DSP filtered audio, but 'burbly' is probably a not too accurate definition that comes to mind, as always there is a trade off to be made, but with stepped reductions of 13 and 26db the loss in audio quality is more than made up for in increased intelligibility. Anyway, I didn't buy my unit for the improvement it offers to SSB and AM/FM signals, I bought it for the CW and Data performance, and here I was quite pleased with the results achieved.

Before I go in to my results with this module, first let's take a look at the specification:

High Power ADSP2 Installation Technical Specifications:

		Low OP:	High OP:
Physical Size:	=	1.7 X 1.475"	2.645 X 1.475",
Weight:	=	0.6 oz	1.1 oz
Audio Limits:			
Min Input :	=	10 mv RMS	100 mv RMS
Max Input:	=	150 mv RMS	5 volt RMS
Max Output:	=	.5 v RMS	9 v RMS
Power Output:	=	5 Watts RMS	
Current Consumption:	=	idle 80 mA	110 mA,
Full output:	=	80 mA	500 mA
Noise Reduction:	=	13 dB, 26 dB	
Time Delay:	=	6.5 ms, 13 ms	
Tone Rejection:	=	-50 dB, -65 dB	
Filters (3dB Bandwidth):			
Voice:	=	300-2100 Hz	
CW Wide:	=	400-900 Hz	
CW Narrow:	=	600-700 Hz	
Out of Band Rejection:	=	-45 dB	

With all other filters switched out of circuit and the 7030's IF Bandwidth set at 300 Hz, switching the filter between the voice, CW Wide and CW Narrow positions was immediately noticeable, with a considerable drop in background noise, and a noticeable increase in "loudness" of the filtered beacon audio. I didn't find too much need to use the two noise reduction settings when operating in these modes, and the results were almost as impressive as those from the MFJ, when set at it's narrowest bandwidth. I would have to say that

it is probably overkill to have both units, but personally I do like being able to make the choice of which one to use, and to have the extra options is required. I would say that if the MFJ filter seems far too expensive for you, then the SGC module would probably be a much better option for half the price. There is a downside with this unit though, for example, if your receiver does not have a Notch Filter (the basic 7030 doesn't and a very expensive audio module has to be added to get this), then running the SGC module alone will leave you without any means out notching out the hetrodynes from beacon carriers, which is something that I would find very difficult to live with, and which would cost me a lot of catches. Many receivers do have inbuilt Notch Filtering however, and if yours has then this will not be a problem. One cheap solution that appeared during my tests with the various filters was a combination of the analogue Datong FL-3 Audio Filter, with its excellent "Auto Notch" facility, and the SGC module, both could be purchased for well under the cost of the MFJ DSP Filter! I like the tunability of the MFJ unit, but without this the SGC ADSP2 will certainly give you an impressive improvement on the audio coming out of your radio's loudspeaker.

To sum up, if you are proficient with a soldering iron then modifying your module the way I have won't be a problem, but if you don't feel able to do this then it would be better to shell out a few more pounds/dollars on the speaker with the built in module instead. One complaint about this speaker though, it doesn't have any sort of headphone or line output socket built into it, and whilst adding one of these wouldn't be too big a job, it would be better if it was sold with one already fitted for the benefit of the non-technical types. Another negative point is the actual control buttons are very small, and you have to keep pushing these to select the option you require. I quickly got used to them, but I have to say that I don't like them very much.

Left: *The outside view of the box I mounted my SGC module in. You can see the small push buttons near the lower left-hand side. The green LED shows that the power is on, and the switch is a DPDT type for bypassing the unit.*

As I said previously, some radio dealers now pre-fit these modules into their receivers, and no doubt the choice of the small push button switches was made so as not to require the drilling of very large holes into expensive new receivers. I can see the logic of this, but again, you should visit the SGC website and study their data sheets thoroughly before shelling out your hard-earned cash on one of these units.

DSP Speakers are not a cheap solution, but I would expect this sort of 'DSP' technology to become very popular in the coming years, and it's quite possible that before too long we might find the BHI and SGC modules fitted into receivers as a standard feature. Then again, who knows what features the next generation of these units will have to offer us!

The Timewave DSP-599zx:

Probably the "Bees Knees" of all DSP Audio Filters is the Timewave DSP-599zx. This is quite an expensive unit, but offers all kinds of really interesting features, not least of which is the fact that the bandwidth can be varied right down to just 10 Hz – a real boon if you are trying to separate a 1020 Hz offset from a carrier just 20 Hz away. You really have to try doing this with this unit just to appreciate how good it is at doing this. I'd like to say that I was able to afford to buy one of these units, but at well over 400 US Dollars, or 380 UK Pounds it just isn't possible at the moment. I was very fortunate though in having a very good friend who does one of these little beauties, and he was kind enough to allow me to borrow it to try it out and do some comparisons with my other filters (MFJ-784B, Datong FL-3 and SGC-ADSP), this I am currently doing, and I hope that by the time the next edition of this publication is released I will have a very comprehensive review included here showing just what its full capabilities are. Needless to say I am currently saving up my bottletops and loose change, and I hope to have one of these of my own in a few years time! ☺

Left: *The Timewave filter, one for the person who wants the very best that money can buy!*

Cascaded Audio Filters:

As readers may have gathered by now, I am very fond of my audio filters. During my recent tests with the Timewave filter I decided to connect it in series with all of my other filters (MFJ, Datong and SGC) so that I could easily switch between them to make comparisons, however, more by accident than design, I decided to see what would happen if they were all connected in series. Well I have to say that I expcted some improvement, but probably a whole lot of overload and other problems too, so imagine my surprise at just what an incredible improvement it made to even relatively weak signals – hardly surprising I guess when you consider that a now very clean signal was passing into another very powerful filter, which would boost the audio quite considerably. I wouldn't suggest that everyone runs out and forks out a large amount of dosh on several very expensive DSP filters, but if you can afford a couple, or already have an older model and are planning to upgrade to something like the Timewave, then you keep your old model for a little while and try them out in cascade, you may be pleasantly surprised by the results that you get.

The Timewave will be going back to its owner shortly, but I shall in future make use of both the MFJ filter and the SGC module together, and even switch in the analogue Datong filter just for good luck!

The setting up and placing of Loudspeakers:

Okay, we've now purchased a speaker of some description all we do is plug it in and away we go - right? Well not necessarily, maybe we should first think about where the best place to site is might be, or even think about whether two or even three speakers are better than just one? Well I did, and as a result I ended up with four different speakers in my shack, all situated around my listening position in a circle. What is the benefit of doing this if any? Well, when I move around the sound stays the same, since I'm hearing it more or less in a 360 degree circle I no longer find myself 'straining' to get an ear pointed towards the solitary speaker, very useful when listening and performing other tasks at the same time (I like to log straight to my PC during listening sessions, and this requires turning my head about 150 degrees towards the PC screen). It might all be 'in my head', but I'd swear that this "surround sound" helps me to hear everything better.

Wiring up extra speakers isn't too difficult, and in my case it involved wiring two 4 ohm speakers in series (4 + 4 = 8 ohms), then wiring the two other speakers the same way (4 + 4 = 8 ohms), and finally connecting both sets of speakers in parallel (2 x 8 ohm in parallel = 4 ohms), this then gives a total of just 4 ohms, the same as the original single speaker, and matches the receiver output just as well.

I hope that now gives a better idea of what I mean by "improving the bit at the end", as you can see, we have come a long way from one small and 'tinny' built in speaker located on the underside of our radio and pointing at the desktop. There are still other ways of improving things even more though, and I've continued with a description of some of these below:

Headphones:

Many die-hard DXers will tell you that a good pair of headphones is an essential piece of equipment for any radio shack, and I certainly wouldn't argue with that, I always like to wear my 'cans' during a serious listening session. What you really want to know though is "what kind of headphones are best?" and "What sort should I buy?" My comments in the previous paragraph about the frequency response of the speaker being important apply equally well to headphones - find a pair with a good frequency response! Some Amateur Radio manufacturers (Yaesu, Kenwood etc.) do manufacture headphones which are specially tailored for SSB, and these can perform very well. One other factor to take into consideration though is that of comfort, as wearing a very heavy pair of cans, which make your head ache and cause sweat droplets to roll down the back of your neck, are not at all pleasant, especially on a long hot summers night! I've often found lightweight phones that give very good results, but it's well worth trying out a number of sets and seeing how they feel as well as how they sound before you make that final choice.

Many professional broadcasters use very expensive "professional" headphones, such as the ones made by Sennheiser etc. This is not a cheap option, but if you plan to wear them a lot you will find that they are very comfortable to wear, and will also last for quite a long time. My own favourite pair of phones cost me just £12 ($20), and I've found these as good as anything else that I've ever used. In recent months I also purchased a pair of "wireless" headphones, and these can transmit the signal over a range of up to 100 metres and operate at around 864 MHz FM. These types of phones can be very useful, since there aren't any trailing leads to tie you to the shack, and I can now wander off to get a cup of coffee during my early morning sessions without having to 'unplug' myself from the receiver. Another benefit here is that you won't forget you are wearing them, and walk off without unplugging yourself first - I've done this several times during the early

hours when my brain wasn't at its sharpest, and it's very embarrassing to find that you've either ripped the cable out of it's plug, or even worse, pulled your radio or audio filter of the bench!

Most of the currently available "commercially" made headphones are of the low impedance (4 to 32 ohm) type, but some listeners prefer the old high impedance (2000 ohm etc.) military types instead. The thought here is that these are less prone to picking up hum or other undesirable low frequencies than the low impedance types. Some of these are still available, but they're not always the most comfortable to wear for long periods and they might not match your equipment. Again, I would suggest that you try out as many different types as possible and find a pair that suits you and your requirements, rather than just look nice - a good pair of headphones is a good investment!

Audio filters:

Above: *MFJ-784B & Datong FL-3*

I won't apologise for having repeated myself several times already about these devices, but they do make a real difference, and any beacon enthusiast will find his reception greatly improved by the addition of one. The downside of buying one of these is that after having just shelled out a fortune on a new receiver, having to then spend another several hundred pounds/dollars/euros on an audio filter my be off-putting - especially to the XYL (or OM), who would rather see the money spent on something more useful. Whilst it's true that a brand new DSP, or analogue audio filter can be quite expensive, there are several much cheaper ways of getting your hands on one of these. Below are a few suggestions:

1. Buy and build a kit. Several manufacturers produce very good audio filter kits (C.M. Howes in the UK for example), and if you are reasonably proficient with a soldering iron you may well find this not only cheap, but a lot of fun as well. For those who are fond of construction there are a lot of fairly simple to build projects available in various books and via the Internet - check out many of the QRP related sites, I'm sure you will soon find something there.

2. Check out the second hand market, and online auctions. You will often find second hand audio filters advertised in the For Sale/Wanted columns of radio magazines, or at auction sites like eBay. In many cases these are for sale because the owner has upgraded, or as often happens, because the owner found the unit too complex to use, or didn't use it very often. 2nd hand units often appear in very good condition, and with comments like "hardly used", so I at least assume this to be the case. I mentioned online auctions such as eBay, this is probably the best known Internet auction site, and I've been surprised at the number of Datong FL3s and MFJ-784Bs that have been for sale just in the last few months alone. As with all auctions prices vary greatly, but I've noted that FL3s generally seem to sell for between £40-£50 (about 60-80 dollars/euros) - not an unreasonable price for one of these units! I've seen MFJ-784Bs sell for around £140-150, though these don't seem to appear anything like as often. I'm speaking here of eBay UK, it's very likely that many other units will be available at the much larger eBay.com, last time I checked this out there were over 300 pages of radio goods for sale at eBay.com, and around 30 at eBay.co.uk!

If this is a route you are interested you can check out the eBay pages at the following URLs:

USA/World: http://www.ebay.com **UK:** http://www.ebay.co.uk

Please note there are also many other 'regional' eBay sites (Germany, France, Ireland etc. etc.), but I haven't visited these and can't really say just how much equipment is available there. If you've never visited eBay before just click on the "BROWSE" button, and then go the "Consumer Electronics/Radio Equipment" link, and do a search there. If you have never used eBay before be sure to study and read all of their information about how to use the service before making any bids or purchases. As with all second hand sales there is an element of "**Buyer Beware**", and anyone planning to buy second hand should endeavour to make sure that the seller is genuine, and the product is what it claims to be.

Assuming that you have now obtained your audio filter, the next step is to learn how to drive it. With some units it's a simple as just switching the power on, with others the user needs to learn how to "drive" the unit to get the full benefit. It took me a little while to master my filters, but it's definitely worth the effort, and users shouldn't give up, even if it does seem confusing at first. As with all electronic devices, if it's proving too difficult to make sense of the manual, try enlisting the help of a eleven year old child, I think manufacturers

must have their manuals written by youngsters in this age group, since they seem to be the only ones able to master the instructions for video-recorders, remote controls, and satellite TV set up screens! ☺

Graphic Equalisers:

After we've filtered our audio and got a decent speaker (or speakers), and headphones sorted out, we still haven't reached the limit of the improvements that we can make to our audio. If you have ever visited a radio station, or seen a close up shot of a radio station's mixing desk on TV, you will have noticed that as well as having a lot of sliders for opening the various microphones, tape machines, CD Players, turntables etc. there are also a large number of small knobs as well and these are used to 'equalise' the incoming signals and improve the quality of the sound. In some cases these will offer high, or low cuts (to reduce hiss or rumble), and some will boost a weak signal (useful on phone patches etc.). It's not coincidence that the best radio stations often have the best quality sound, they often have the best equipment as well, and use it to the greatest possible effect.

Now I'm not suggesting that everyone rushes out and buys themselves a radio station mixing desk (it'll probably set you back a few grand anyway if you do), but you can copy a few of their techniques by using far simpler equipment, and this is certainly well worth while doing. I use an old Technics equaliser (these were units that fitted between a record turntable or cassette deck, and the amplifier input), and whilst they don't have any built in amplifier of their own, they do allow the user to 'boost' and 'cut' incoming signals in 9 different frequency bands by a level of about plus or minus 12 decibels. In normal hi-fi use the lower bands (63 Hz, 250 Hz, 400 Hz) would be used to boost or cut the bass response of the music, e.g. for Ozzy they'd all be set to the maximum 12 (and for Spinal Tap 13), and for Classical music these would probably be set lower and the higher responses (4 kHz, 8 kHz 18 kHz etc.) set higher if required. The user would adjust the various sliders for the best response suitable for their particular acoustics (see 'Acoustics' paragraph for more details).

For beacon use, boosting the 400 Hz/1 kHz range, and cutting all the others would be desirable, and this really does make a big difference to our already filtered audio, believe me! I was so impressed with the improvements this brought that I decided to adopt the same techniques with my scanner, and I now switch the scanner output through the same audio filter/equaliser/amplifier/speaker set up, all that is required is a few adjustments to the equaliser settings and audio filter.

If you want to be really flash, one trick that you can try with one of the stereo 'unamplified' types of equalisers is to make use of both the channels. Since the signal coming from your radio is mono, only one channel of the unit is required. You can try feeding the signal into the left channel, and then taking the output of the left channel and feeding it into the right channel, the output can then be taken to the amplifier. What are the advantages of doing this? Well, with just a single channel used you'll probably be able to cut or boost the wanted/unwanted signals by up to plus or minus 12db, if the second channel is set with all the sliders at zero it just sits there not really doing very much at all, but in extreme cases you can always bring it into play as well, and this puts a potential cut and boost of up to 24db at your fingertips. Whether you would ever need this is not really the point; it's just that it's there ready if you should ever require it. Why waste a perfectly good channel by leaving it unconnected and unloved!

Left: *This is a shot of my Technics SH-8045 Equaliser, purchased at the local second hand shop for the princely sum of just ten Pounds Sterling:*

I've also found some of the old car 'equaliser/booster' units to be a very cheap and effective method of boosting the wanted audio too, and the added advantage of these units is that they often come equipped with a 20 or 40 watts audio amplifier as well. Just add 12 volts and suitable speakers, and then try not to blow out the speaker cones. If you do use one of these DON'T try connecting the output of one channel to the input of the other; they don't like it up em!

Lots of scope there for experimentation anyway. I know some enthusiasts who have very good hi-fi systems with built in equalisers and very quiet amplifiers (low background noise), they run their audio from the audio filter to the auxiliary input, and, with the addition of a decent pair of headphones, great results can be achieved (remember what I said about the frequency response of the speakers? try taking the output from the hi-fi's line output socket to a DSP speaker, or as I do, to my PC's soundcard for digital recording etc. (see section on using your PC to enhance your beacon dxing for more details).

Acoustics:

I find that many radio enthusiasts never take any notice of, or give any thought to the acoustics in their radio shacks, a big mistake in my opinion. Going back to radio stations again, many studios will be seen to have the various "egg box" type tiles on the walls and ceilings, and these are put there for a good reason. A flat wall and angular corners will reflect sound, and this can contribute to the overall ‘colour’ of the sound, the broken up surfaces of the tiles will either absorb or break up the sound, and reduce reflections. This all contributes to the overall quality of the sound in the radio room. I’m sure we've all heard radio hams (or in some cases radio stations), which sound as though they're in a large empty hall with their head in a tin box whenever they're speaking.

Many shacks seem to have naturally good acoustics, usually for no other reason than they're cluttered with junk that is very good at absorbing sound. If you're not happy with the sound quality in your shack though you might well like to think about purchasing a few acoustic tiles, or even saving up those old egg boxes before the XYL can throw them out! ☺

One point that should be mentioned though is that whilst we might have worked hard to get our CW booming in, equalised, amplified, and eventually roaring out across the room at good levels, maybe some of it is also passing through the walls too - have you ever stood in an adjacent room when CW is blasting out? Yes, it does penetrate walls very well, not a popular move if you happen to be listening without headphones at 4 in the morning! If this is a problem the use of acoustic tiles will also help to prevent the audio from penetrating the walls, and many radio stations will also use insulation under the floorboards, or above the ceiling tiles too. This may be a bit extreme for the average radio shack, but if you are copping flack from the XYL about the weird noises coming from your shack, a trip to the local DIY store might well provide the answer!

We’re almost done, but first one more idea .....

I think I've just about covered most topics related to improving your received audio (please let me know if I've missed anything that you would like to know about, and I'll try to include it in future editions), just one last item is worth a mention though, but as I haven't yet tried this out for myself I can't give a personal opinion of how effective it is. I have read various articles on this subject however, and seen several reviews so I do plan to try it out and put it to the test one of these fine days (if I can ever find the spare time that is!):

Stereo CW:

Mention Stereo CW to people and they think you're joking, I'm not, and yes, it does work very well. The basic theory behind this is that when you feed your mono CW signal into a suitable stereo decoder/audio filter circuit, you produce an output that gives a stereo image with low frequencies on the left, and high frequencies on the right, signals around 800 Hz appear in the centre. If the listener uses a pair of headphones a signal will appear which can "trick" the brain into noticing the slight separation of wanted signal and unwanted noise, this can be beneficial when trying to pull a very weak signal out of the background mush. I can’t yet confirm this but I think this could be a very useful feature for any beacon enthusiast to make use of. To date I haven't seen many commercially produced receivers making use of this feature, one exception though is the Fairhaven RD-500VX+. I haven't yet had the opportunity to try out one of these expensive UK built receivers, but it could be a very useful ‘plus’ feature if you are thinking of lashing out on one.

If any reader does own one of these receivers I would be very interested to hear from you, and about how you’ve found the Stereo CW decoder for use with beacon reception. Please send any comments, positive or negative to: hunter@beaconworld.org.uk

SECTION SIX: USING YOUR PC FOR BEACON RECEPTION AND RECORDING.

In recent months I’ve received a number of requests from readers to add some information about the use of computers for beacon dxing, particularly about how some of the readily available items of software can be utilised. If you’re reading this document you are probably about 99% certain of being a computer owner, since it is only available in .pdf format from my website. If you are in the 1% who are reading this from a copy printed off for you by a friend, you might like to read this section anyway, since it might well encourage you to go ahead and invest in a PC for your shack.

Not every radio enthusiast has a computer in the radio shack, this may be because the home PC is shared by other members of the family, or because it causes interference to your reception if it is placed too close to the radios, this can certainly be a real problem if certain precautions aren't taken. Many of the newer PCs are very high spec, and probably far too good for many of the available pieces of radio software anyway, so why not invest in an 'old' PC, say an old Pentium of around 200 MHz, there are plenty of these available at fairly reasonable prices nowadays. Recently I managed to pick up an old Toshiba Laptop of around this specification, and it seems to run nearly all of my decoding and logging programmes without any problems. I can't say I've noticed much additional interference when running it near to the radios either I'm pleased to say. Some enthusiasts have reported that some of the more popular radio software won't run very well on many of the newer machines, or the programme isn't supported by the newer Windows operating systems such as Windows XP or 2000 – again this can be a good reason for getting an older machine purely for use in the shack. Local computer fairs, Radio Rallies (Hamventions) can be a good source of these machines, and for UK readers, a look through the weekly 'Micro Mart' magazine (sold on most news-stands) will offer many sources of 'cheap' computer stockists who can supply them.

As I mentioned previously, one of the problems with having a shack-based computer can be interference, and wherever possible care should be taken to keep the PC and its associated cables separated from the radios. If you are using the PC to decode data modes or control your radio then it must of course be interfaced to the radio. Many radio amateurs like to use 'line isolation transformers' (old modems are a good source of these) to provide good isolation, and prevent interference from being coupled directly into the radio. Monitors can be a bad source of interference, and if this is a big problem for you, a laptop or a new TFT monitor may prove to be the best solution. I use mains filtering on all of my equipment, and I always fit ferrite chokes and isolation transformers wherever necessary. I have now got my set up sufficiently quiet, and can now log straight to the PC during my listening sessions. This is a great asset, and saves me a lot of time and effort in having to retype them up from paper sheets afterwards. It has also allowed me to make use of programmes such as RadioRaft for the decoding of DGPS signals, and beacon aids such as 'Beacon Clock' and 'Geoclock' to aid my HF Beacon monitoring. Best of all I can now check frequencies straight from my European NDB Handbook CD. More about this later in the article.

Well let us assume that we now have our PC, it's set up and interfaced (interfacing means taking the audio output from either the radios loudspeaker/tape output/line output connection, and feeding it into the computer's line input on the soundcard, or via an Hamcomm type interface into the computer's serial port), now we can look at some of software packages which can be downloaded or purchased for our use.

Decoding Software:

Programmes do exist which will decode Morse code and other data modes, and I briefly touched on the shortcomings of Morse decoders earlier in this publication. They do have their uses though, and many beacon enthusiast will make use of impressive programmes such as 'Spectran', or 'Argo' and 'Jason' for decoding both fast and very slow CW. These aren't CW decoding programmes as such, but they are used for audio analysis, and will display the received code in such a way that it can be read from the screen (see screen shot Figure 1 below):

This shot shows my local beacon 'MCH' running horizontally across the bottom of the screen, if this is looked at more closely (Figure 2), you can clearly read the letters MCH.

Figure 2. *The MCH characters can be clearly seen.*

This can be very useful when the signal is barely audible, or if there are several beacons close together, this is especially true when a signal is close to a loud carrier tone. Many listeners make great use of this.

Figure 1. *The Spectran interface.*

The Spectran software was created by I2PHD and IK2CZL, it can be obtained for free from various sites on the Internet, and also comes free with the CD versions of the ENDBH and NANDBH. I won't list any URLs

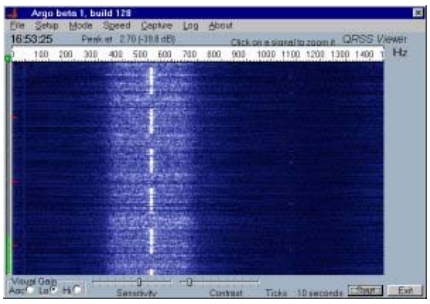
here, but just type the name ‘Spectran’ into a search engine such as www.google.com and you are sure to find the latest version available for download. Spectran also has a very interesting feature, in that it allows the user to make screen captures of the received signal, very useful for later analysis of your catches.

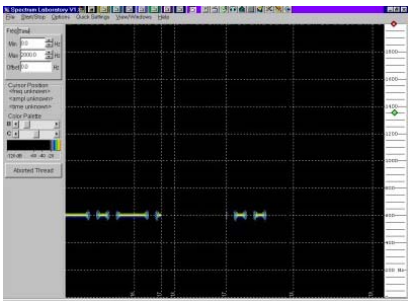
For extremely low power use, more exotic modes such as “very slow CW” can be used to great effect; this allows the transmitting station to send a callsign at a very slow speed (1 wpm or less). This means that instead of a short dit or dah being lost under the background noise or masked by short bursts of static, the dah will last for one or several seconds, and will appear on the screen as a dash when decoded. This method is very effective, and some amazing records have been set using this mode and incredibly low power levels. It is very popular with many radio amateurs, and as a result there are many very useful pieces of software (freeware) available on the Internet. To date I have just played around mostly with Argo and Spectrum Lab, but there are many other types available too, though I can’t say which are the best, or if Argo and Spectrum Lab offer any better features than the rest of them. I must admit that I don’t make much use of these types of software - I like to hear my catches - and mention them just to show what is available.

Two excellent sources where you will find many useful software programmes to download are:

Oliver Welp’s Software Site: http://www.muenster.de/~welp/sb.htm
Hamware Software: http://www.elte.at/OAFT/c3.htm

Below are screen dumps of Argo and Spectrum Lab at work:





Digital Recording

For me, one of the more useful features of having a computer in the shack is the ability to make audio recordings on it. In past years I would record rare beacons onto a cassette tape or reel to reel tape recorder and save them that way, but have you ever tried to find one of these things again once you’ve made the recording? It’s no fun listening to 45 minutes of static in the hope of finding that few seconds of precious audio that’s for sure. Thanks to the wonders of modern technology I can now easily record the signal as a short .wav or mpeg file, and store it in an easily accessible folder, or on a CD Rom disk. In my Beaconworld website you will now find a number of recordings made in this manner, and if time and webspace ever permit I will upload many more of the vast number I’ve recorded in the past three years. Not only is digital recording very easy, but it also allows the listener to edit and ‘clean up’ many of the catches, and in ways that would have been unthinkable for most enthusiasts just a decade or so ago.

From speaking to other Dxers, it appears that two of the most popular programmes used for audio recording are Cool Edit and Goldwave, both offering many really useful features which aren’t available on the standard ‘recorder’, which comes as a part of most Windows operating systems. I’ve been using Cool Edit Pro for some time now, and below is a screen shot of my interface showing the morse characters of a signal I was recording. Note the fading on the signal.

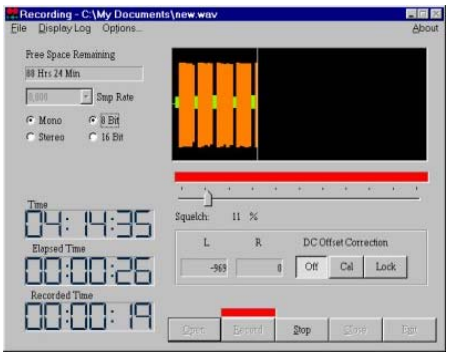
In this shot you can see the control buttons running across the top of the screen, these allow the user to edit, cut, trim, amplify, or clean up the recordings. At the bottom left hand side are the Play, Record, Pause, Loop etc. buttons, which allow the user to start and stop the recordings. In the main window you can see the trace of the signal itself, complete with fading.

I feed the audio from the output of my audio filters and equalisers straight into the PC’s soundcard line input. Not only is this useful for DX purposes, but it also allows me to record radio programmes from my hi-fi system too, and this means

that I no longer have to endure recording a one hour programme onto a 45 minute cassette tape, with a quick turnover, and a slight gap in the final product.

Cool Edit can be set to show the trace in ‘real time’ as recordings are made, and this is very useful, especially when recording HF beacons, which are subject to deep fading. This particular programme allows the files to be saved in various formats, but mpegs seem to be about the most popular at the moment, since they allow large amounts of data to be stored more easily.

Scanrec:



I came across this very useful piece of freeware, and thought it would be great for use with my scanner, especially when looking for VOR beacons. I’ve found it to be a very handy little programme, and I would certainly recommend downloading and installing it, you will definitely find lots of uses for it. One thing I particularly like about it is the interface, and the fact that you can ‘squelch’ a channel to mute the background noise, very useful when sitting on an empty channel waiting for a signal to fade in. You can download the latest version from the Internet (version 1.4), along with an update (1.8) from: http://www.davee.com/scanrec/

Computer Logging:

By far the most useful function I have found with the PC is the ability to log all the beacons that I hear as I hear them, and also to quickly add any new catches to my ‘Master Database’. There are specialist-logging programmes available, but I mainly use a simple programme called “Textpad” for my initial loggings, and then paste the new catches into an Excel database afterwards. The reason I started doing it this way was that I discovered that I could make myself a simple template, which I could copy at the start of a session, and then just add any dates and times as a beacon was heard. This method wouldn’t be any use on a general search around the band, but for my nightly check of the Transatlantic beacons, it does provide a very simple way of avoiding having to search out the frequencies and then see who is on them. This works very well for this task, and is essential for my daily checks of the HF beacons (around 300 are listed, and working my way down the list is the simplest way of checking these several times per day).

Below is an example of my daily Transatlantic ‘hit’ list, I always check these channels to see which way the propagation is flowing, the more southerly beacons such as the ones in the Azores and Cape Verde are a good indicator of good north/south openings. Why not make up your own personal template showing your own favourite daily targets?

Daily T/A Template: (just copy and then fill in the times, or add any additional beacons you might hear)

Date: (enter here) N - New or first time logging

kHz:	Call:	Location:	ITU:	Country:	UTC:	Offset:	km:
216.0	CLB	Carolina Beach	USA	USA	0345	-1020+	6141
220.0	BX	Blanc Sablon QC	CAN	Canada		400+	3634
224.0	QM	Moncton NB	CAN	Canada		400+	4384
245.0	CB	Cambridge Bay NU	CAN	Canada		400+	5035
247.0	YDP	Nain NL	CAN	Canada		400+	3693
250.0	YMH	Mary's H'bour	CAN	Canada		400+	3520
256.0	YCY	Clyde River NU	CAN	Canada		400+	3682
263.0	QY	Sydney NS	CAN	Canada		400+	4112
274.0	SAL	Sal	CPV	Cape Verde		0	4479
275.0	VG	Vaga	NOR	Norway		-400+	779
276.0	YHR	Chevery QC	CAN	Canada		400+	3834
280.0	QX	Gander NL	CAN	Canada		400+	3599
281.0	CA	Cartwright NL	CAN	Canada		400+	3518
305.0	YQ	Churchill MB	CAN	Canada		400+	5248
305.0	LT	Alert	CAN	Canada		400+	3686

```
323.0 UWP   Argentia NL       CAN   Canada              400+       3647
332.0 YFM   La Grande 4 QC    CAN   Canada              400+       4501
338.0 5Y    Trenton NS        CAN   Canada              400+       4302
339.0 YFT   Makkovik NL       CAN   Canada              400+       3591
340.0 YY    Mont Joli QC      CAN   Canada              400+       4476
346.0 1D    Charlotteown      CAN   Canada              400+       4300
347.0 YG    Charl'town PE     CAN   Canada              400+       4300
350.0 DF    Deer Lake NL      CAN   Canada              1020+      3765
356.0 AY    St Anthony NL     CAN   Canada              400+       3543
358.0 NL    St Johns NL       CAN   Canada              400+       3547
358.0 YKG   Kangiqsujuak QC   CAN   Canada              400+       3852
360.0 PN    Port Menier QC    CAN   Canada              400+       4163
360.0 SL    Svinafell         ISL   Iceland            -1020+      1405
360.0 HT    Horta             AZR   Azores             -1020+      2622
360.0 ASN   Ascension         ASC   Ascension          -1020+      6923
362.0 YZS   Coral Harbour     CAN   Canada              400+       4457
362.0 JAN   Jan Mayen         JMY   Jan Mayen           400+       1949
363.0 1F    Bathurst NB       CAN   Canada              400+       4396
364.0 2B    Springdale NL     CAN   Canada             -400        3668
366.0 M     Moncton/Mike NB   CAN   Canada              400+       4431
366.0 YMW   Maniwaki QC       CAN   Canada              400+       5121
370.0 GR    Grindstone QC     CAN   Canada              400+       4150
372.0 OZN   P.Christ'n Sund   GRL   Greenland           400+       2544
373.0 YXK   Rimouski QC       CAN   Canada              400+       4497
378.0 HO    Hopedale NL       CAN   Canada              400+       3635
385.0 NA    Natashquan QC     CAN   Canada              400+       3984
390.0 JT    Stephenville NL   CAN   Canada              400+       3882
391.0 DDP   Dorado            PTR   Puerto Rico        -1020+      6680
392.0 KF    Keflavik          ISL   Iceland             1020+      1640
392.0 ML    Charlevoix QC     CAN   Canada              400+       4662
396.0 JC    Rigolet NL        CAN   Canada      0400    400+       3584
401.0 YPO   Peawanuck ON      CAN   Canada              400+       5094
404.0 YSL   St Leonard NB     CAN   Canada              400+       4536
414.0 BC    Baie Comeau QC    CAN   Canada              400+       4439
```

As you can see that is quite a sizeable list, though the fact that I have been able to programme all the above frequencies into memory channels in my AOR7030+ is an added advantage. I can now quickly step through the channels to see if they're propagating, and with the long slow fading associated with Transatlantic reception, the ability to do this can save a lot of time and help to catch a beacon during a very short opening. The HF Beacons Daily Template is very similar, though without so much detail. It's far too large to show the entire template here, but below is a small extract just to give you the general idea (if anyone would like a copy of the full template just contact me and ask for a copy!):

```
NEW DAILY TEMPLATE:

(frequencies shown are the 'audio heard', not zero beat)

kHz:        Callsign:   LOC:  UTC:  Sig:

1805.0      VO1NA       GN38
1817.0      ZS1J        KF15
1854.0      OK0EV       JN79
3550.0      OK1IF       JO80
3579.0      DK0WCY      JO44
3594.5      OK0EU       JN79
3600.0      OK0EN       JO70
5195.0      DRA5        JO44
5269.0      VO1MRC
5290.0      G0MJW
7038.5      OK0EU       JN79
7871.67     LN2A        JO29
```

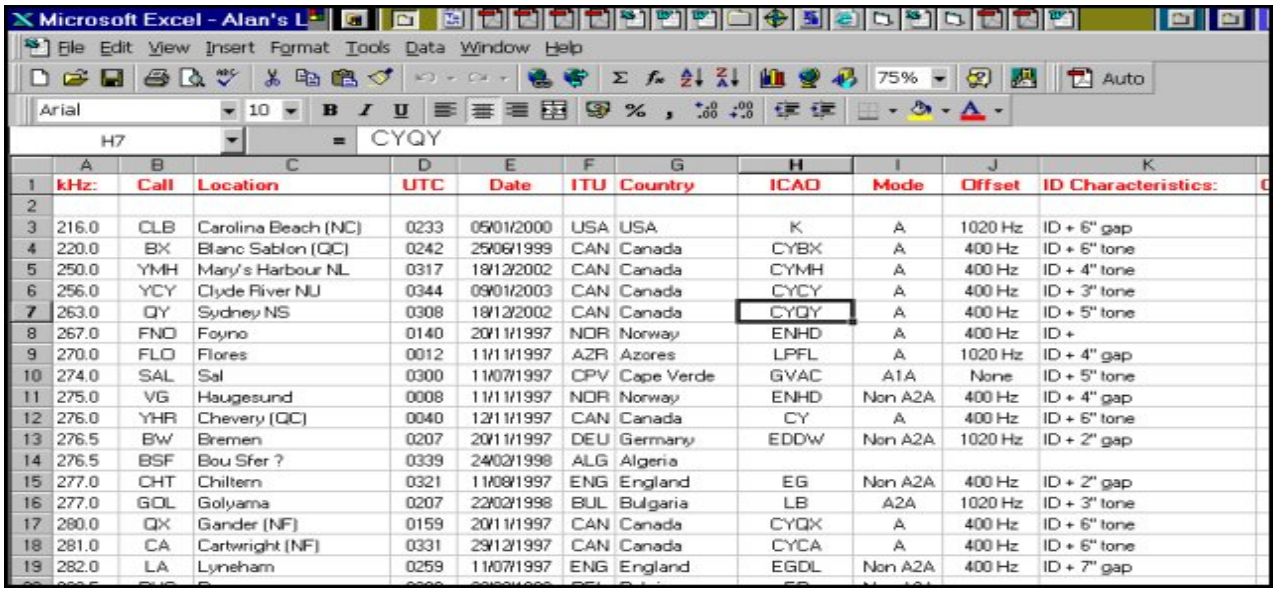
```
10109.1      HP1RCP/B     FJ09
10134.0      OK0EF        JO70
10139.2      HP1RCP/B     FJ09
10140.0      PY3PSI       GF49
10144.0      DK0WCY       JO44
10226.0      KS6Z         DM13
14046.0      LU0ARC
14100.0      4U1UN        FN20
14100.0      VE8AT        EQ79

--------snip-------------

28301.0      PI7ETE       JO22
28302.5      UA4NM        LO48
28303.2      WF9EE
28321.0      DL5KZ        JO30
28326.2      ER1Beacon
28702.5      DA5MMB       JN47
```

The Excel 'Master' Database:

When I first bought a PC and started to use it for radio purposes in 1997, I found that having the ability to keep an accurate 'master', or 'all time' log, which could be easily sorted by date, call, country etc. was a really marvellous facility to have. In all the years prior to that my logs were kept in various notebooks, or on sheets of paper, and I never really fancied the idea of having to go through them all to count the number of beacons I'd heard, or how many from each country etc. With Excel this task was very simple to do, and rather than waste several good years of Dxing time retro-logging 20 years worth of old logs, in August 1997 I decided to start again from scratch and class all beacons logged as 'new'. My entire list of catches can now be downloaded from the Beaconworld website, and I can sort or count them whenever I feel like it now. You might wonder why I would want to do this, and this answer is not from any sort of vanity, but rather because the NDB List now offer a fantastic array of Achievement Awards. If you're looking to claim an award certificate for logging 80+ French NDBs, a quick 'sort' using Excel, followed by a copy and paste of the data into a claim form is a proverbial 'piece of cake' to do now.

Below are some examples of my "All Time" Log (you can see the full version at www.beaconworld.org.uk), and, also shown are some examples of the many superb award certificates produced for the NDB List members by our Awards Co-ordinator Andy Robins of Michigan (**Note#** these are free to list members and sent out in .pdf format – no postage costs or charges, great value for such an excellent and unique award!):

Alan's All Time Log:



	A	B	C	D	E	F	G	H	I	J	K
1	kHz:	Call	Location	UTC	Date	ITU	Country	ICAO	Mode	Offset	ID Characteristics:
2											
3	216.0	CLB	Carolina Beach (NC)	0233	05/01/2000	USA	USA	K	A	1020 Hz	ID + 6" gap
4	220.0	BX	Blanc Sablon (QC)	0242	25/06/1999	CAN	Canada	CYBX	A	400 Hz	ID + 6" tone
5	250.0	YMH	Mary's Harbour NL	0317	18/12/2002	CAN	Canada	CYMH	A	400 Hz	ID + 4" tone
6	256.0	YCY	Clyde River NU	0344	09/01/2003	CAN	Canada	CYCY	A	400 Hz	ID + 3" tone
7	263.0	QY	Sydney NS	0308	18/12/2002	CAN	Canada	CYQY	A	400 Hz	ID + 5" tone
8	267.0	FNO	Foyno	0140	20/11/1997	NOR	Norway	ENHD	A	400 Hz	ID +
9	270.0	FLO	Flores	0012	11/11/1997	AZR	Azores	LPFL	A	1020 Hz	ID + 4" gap
10	274.0	SAL	Sal	0300	11/07/1997	CPV	Cape Verde	GVAC	A1A	None	ID + 5" tone
11	275.0	VG	Haugesund	0008	11/11/1997	NOR	Norway	ENHD	Non A2A	400 Hz	ID + 4" gap
12	276.0	YHR	Chevery (QC)	0040	12/11/1997	CAN	Canada	CY	A	400 Hz	ID + 6" tone
13	276.5	BW	Bremen	0207	20/11/1997	DEU	Germany	EDDW	Non A2A	1020 Hz	ID + 2" gap
14	276.5	BSF	Bou Sfer ?	0339	24/02/1998	ALG	Algeria				
15	277.0	CHT	Chiltern	0321	11/08/1997	ENG	England	EG	Non A2A	400 Hz	ID + 2" gap
16	277.0	GOL	Golyama	0207	22/02/1998	BUL	Bulgaria	LB	A2A	1020 Hz	ID + 3" tone
17	280.0	QX	Gander (NF)	0159	20/11/1997	CAN	Canada	CYQX	A	400 Hz	ID + 6" tone
18	281.0	CA	Cartwright (NF)	0331	29/12/1997	CAN	Canada	CYCA	A	400 Hz	ID + 6" tone
19	282.0	LA	Lyneham	0259	11/07/1997	ENG	England	EGDL	Non A2A	400 Hz	ID + 7" gap

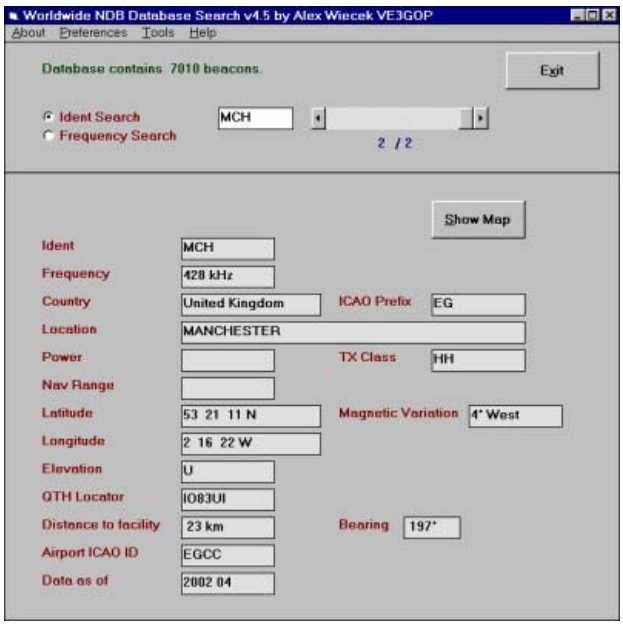
Created using Excel 2000, logs can be easily sorted using this type of programme.

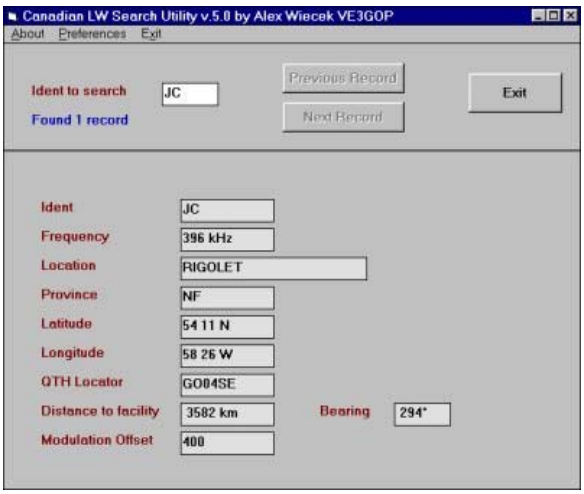
An example of some NDB List Award certificates (just one of the many benefits of list membership!)

These are just a few of the many impressive awards available (full size can be printed and framed)

More excellent aids to NDB Logging:

These days there are some really excellent pieces of software coming out of Canada, all are very useful aids for NDBers, and all are completely free! The first two shown here are produced (and continue to be developed and updated) by an Ontario Navaid Technician, Radio Amateur, and keen NDB enthusiast **Alex Wiecek VE3GOP. T**hese are the **WWSU** (WorldWide Search Utility), and the **CLWSU** (Canadian Long Wave Search Utility). The WWSU is a searchable database of most of the world's NDBs, and CLWSU, a searchable database of Canadian NDBs. Both are very useful, and Alex continues to develop these and bring out new versions at regular intervals, for more information check out Alex's website, you can download the very latest versions there.



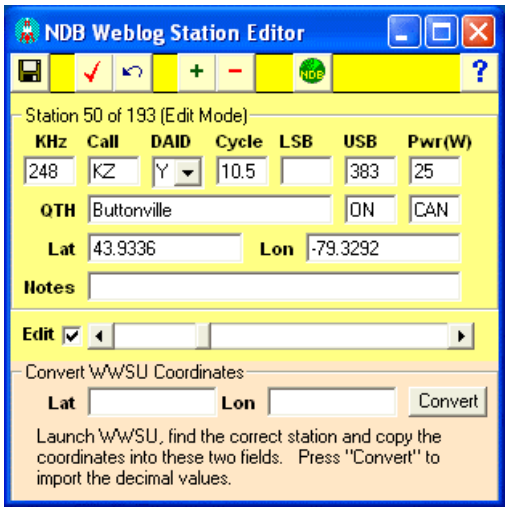


Above: *WWSU:*

Left: *CLWSU*

As can be seen from the above screenshots, both interfaces give considerable detail about the beacon being searched, and you can even configure it to show the distance and bearing from your own QTH. One additional feature (not shown here) allows the user to plot a map of the beacon's location. I'm sure you'll agree that this is an excellent set of features, so what are you waiting for? Click on the link below and get downloading them right away!☺ http://members.rogers.com/wiecek6010

NDB Weblog:



New in mid 2003, another very useful piece of software, also from a Canadian NDB enthusiast, **Martin Francis** arrived. Martin has developed an excellent programme called "NDB Weblog".

Martin noted that many NDB radio enthusiasts publish their reception logs on the web, and this is often very useful data to have as it enables other listeners located nearby to get a good idea of what beacons are around and are likely to be receivable in the neighbourhood. However, because every DXer seems to have his or her own way of presenting the information he has attempted to provide a standard way of viewing this kind of data, and has now produced **the NDB Weblog**. The very latest version (v1.1.20 – updated June 2004) can be downloaded from Martin's website at: http://www.classaxe.com/dx/ Check out Martin's NDB Station Editor and AM Radio Station map whilst you're there.

Nice one Martin!

The world at your fingertips – a good PC based data source:

One of the most useful things about having a PC in the shack is that it can give you easy access to a lot of very useful data, often without the use of a lot of space and effort. In pre-PC days a NDB chasing session would normally involve having several books of beacon listings, an atlas, a lot of sheets of blank paper, and a logbook spread out across my desk. This worked fine, but having to search through everything to find the location and details of a callsign that I'd just heard could very quickly become quite a chore – especially if it happened at 3 o' clock in the morning when my eyelids were already struggling to stay open. This all changed when I switched to a PC based monitoring and logging system, and I thought that a brief description of the normal nightly listening method that I now use might be well worth covering here in case you are thinking of trying something along these lines.

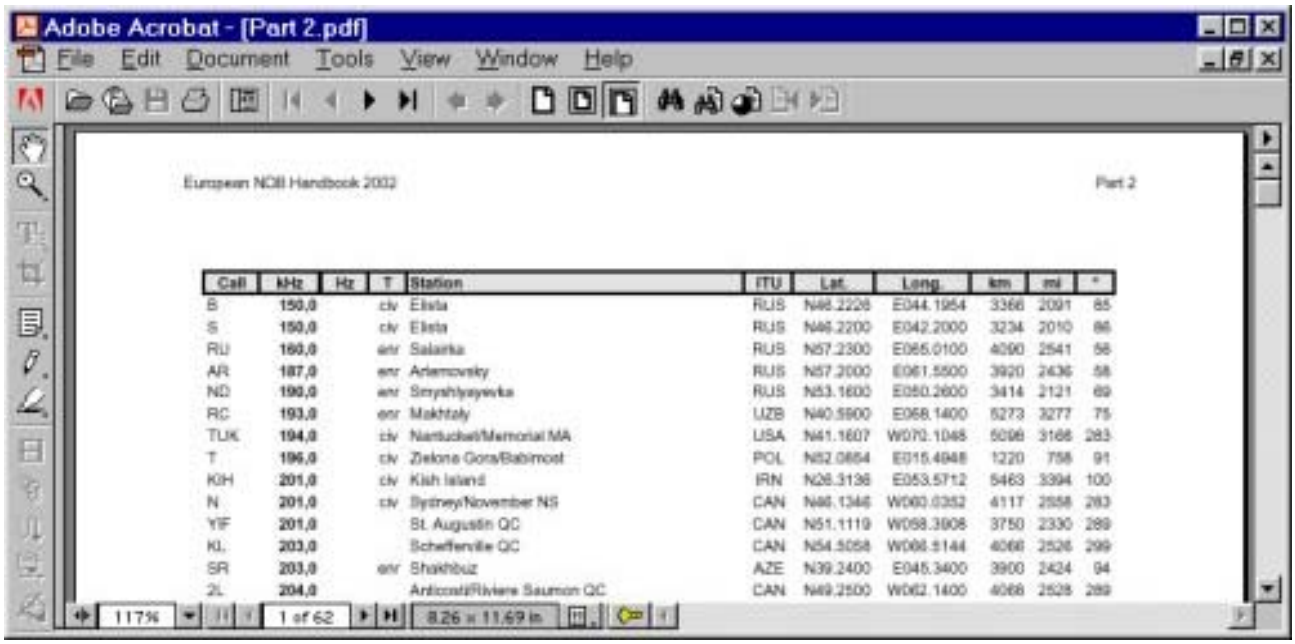
My system changed in early 2001, when the European NDB Handbook became available on CD-Rom in .pdf format. Prior to that I'd used the spiral bound printed copies of this publication, a copy of the Admiralty List of Radio Signals Volume 2, several Aerad Flight Supplements, and various Nautical Almanacs. As you can imagine, things did tend to get a bit crowded in the listening area and this didn't always make for a comfortable or speedy search for the information that I wanted. All that changed with the acquisition of the ENDBH CD, and now I had the choice of just running up the CD and accessing all of the different parts that it contained, such as listings in frequency, callsign or country order. And all just by clicking on a link in the html interface! After a little experimentation I adopted a slightly different method, instead making use of a 'Toolbar' on the 'Shortcut' toolbar offered with Microsoft Office. This allows the user to customise a toolbar, and add 'quick access' buttons, or links to various documents or programmes. Just the ticket for a beacon chaser. I now have a toolbar set up with links to all four sections of the ENDBH, NANDBH, CLWSU, WWSU, B-Keyer, DGPS Database, my all time log, various maps, and Geoclock – just about everything I need is easily accessible at the touch of a button. The real beauty of this system is that I can leave several windows open, and quickly work between them, very useful when adding a new logging to my all time log!

Below is a screenshot of what the toolbar looks like, it's easy to create one, just copy all of your files into a folder on your hard drive, right click on the toolbar, and select 'customise'. Adding files or folders is literally just a minute of a job. If you don't have an Office toolbar you can of course create shortcuts on your desktop, the downside of this is having to minimise your windows to access them. This toolbar will stay on top of all other open windows and remain accessible.

Being able to quickly access a file is one thing, the real benefit though is the ability to 'search' for a particular callsign or frequency, very easy with .pdf files or Excel documents, just click on 'edit', and then 'find', and the entry you are looking for will be located in a fraction of the time that it takes to do this manually with a printed

copy. As can be seen from the shot below, the 62 pages of Part 2 of the ENDBH can be searched in just seconds. How did I ever manage in the days before PCs I often ask myself?☺

Below: *an example of the .pdf version of Part Two of the ENDBH:*

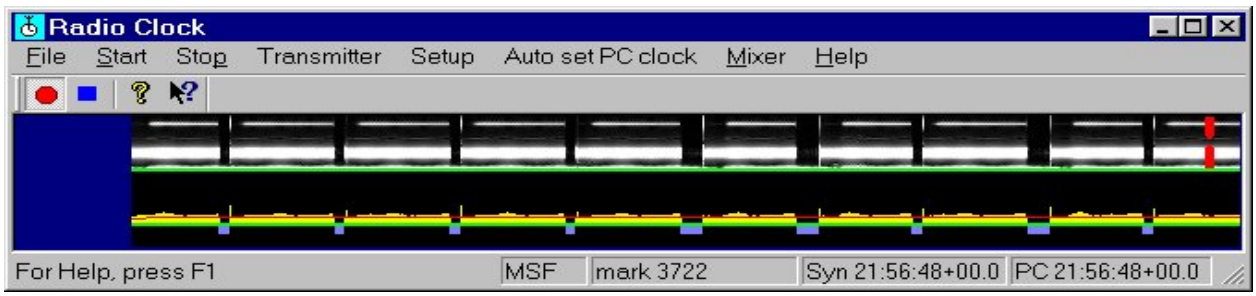


More useful software:

On this page you will find details of a few other useful bits of software. These aren't specifically designed for NDB Dxing, but they are very useful for reasons, which I hope will soon become obvious. First let us take a look at a very interesting little utility called "Radioclock":

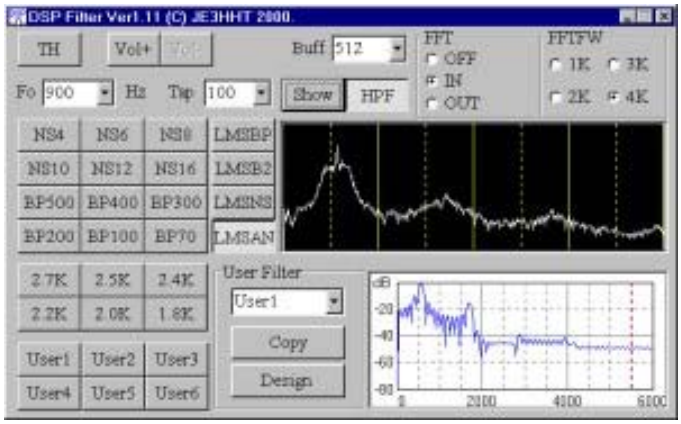
This programme has one function only, it will set your PC's clock using a time signal station such as MSF, WWV or DFC77. First you need to set your radio receiver the frequency of the Time Signal Station, in my case MSF on 60 kHz, next you start the programme up and leave it to do its thing. After several minutes your PC's clock will be fully synchronised with the Time Signal station's clock, and you will know that the time shown on your PC is now accurate.

What use is this for beacon chasing you might well ask? Well, if you are trying to log beacons in the International Beacon Project/NCDXF Beacon Chain, and are using one of the many pieces of software available for this task, an unsynchronised clock will not give you the correct information. In this case an accurate PC clock is a necessary item for an accurate result. Radioclock can be downloaded from the following site: http://sapp.telepac.pt/coaa/radioclock.htm



On the next page you will find a number of examples of the various beacon clock software types, which are available to monitors of the International Beacon Chains:

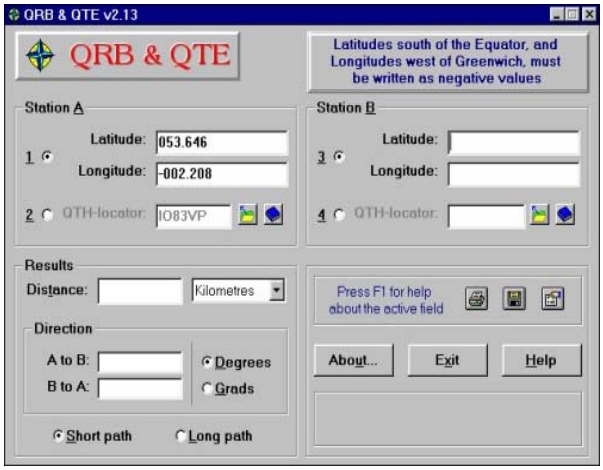
DSP Filter Version 1.1



Maybe you can't afford to buy an external 'hardware' DSP audio filter, well if that's the case don't worry, you can always try using a software DSP filter on your PC.

The workings of this programme are too complex to go into here, but if you check out the following site you should find full details, plus full download instruction:

http://www.qsl.net/mmhamsoft/dsp/



QRB & QTE:

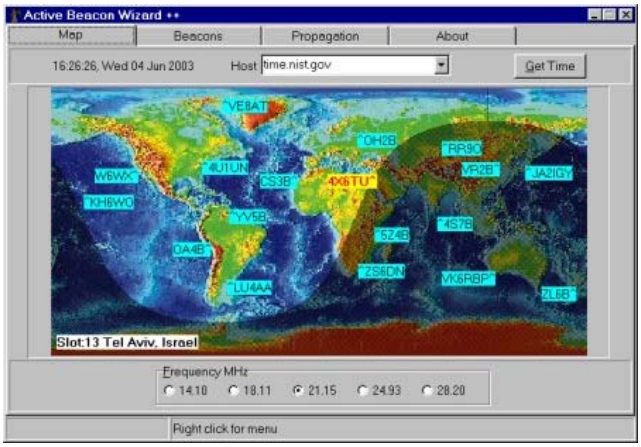
Once you've heard your beacon you might like to know just how far away it is, or maybe you're using a Loop and want to know which way to point it? The QRB & QTE programme will do both, and it will also give you the distances in Miles, Kilometres or Nautical Miles.

If HF beacons are your thing, you will notice that many give out their IARU Locator code in the ident message. Enter yours, as Station A, and the beacon heard as Station B and the distance will appear at the touch of a button!

http://www.qsl.net/lc3hat/qrbqte/download.html

IBP/NCDXF Software:

As I mentioned on the previous page, there are a number of programmes available, which will assist you with your monitoring of the chains, below are a number of them (at least the ones I could take screen dumps of) to show you what they look like, and what they do:



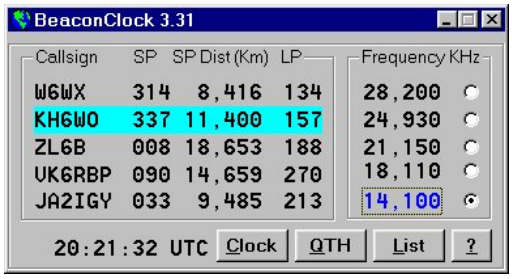
Active Beacon Wizard:

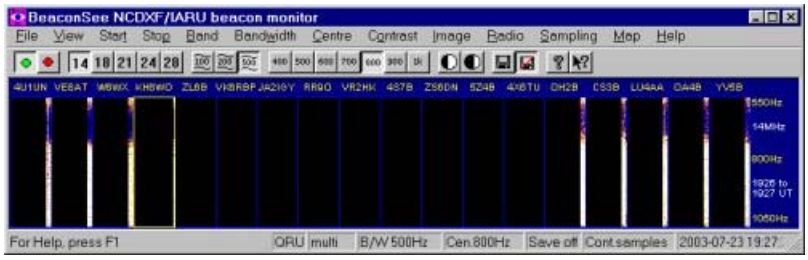
Produced by Tabor Soft, this programme is very comprehensive, and when properly set up will display the IBP/NCDXF Beacon, which is currently transmitting on the chosen band.

Other functions (not shown here) will include the automatic downloading of various current solar data from many internet sources, and this programme will even allow the user to set the correct time on their PC by using the 'Get Time' button. Full details of the Taborsoft programmes can be found at: http://www.taborsoft.com

Beaconclock 3.31

This is a very nice little programme, and one I use often, I like the fact that it can be set to 'stay on top' of your 'window', thus allowing me to log direct to the PC whilst it is still displaying the upcoming beacon. More information about this programme from: http://www.huntting.com





BeaconSee:

This is quite a complex programme, which automatically monitors the NCDXF beacon chains. Takes a little setting up, but is very comprehensive.

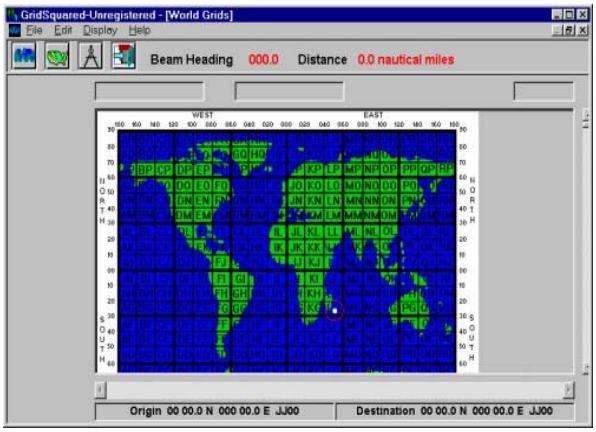
http://www.ip.pt/coaa

Grid Squared:

This is not a beacon clock, or logging type programme, but will compliment all of the above programmes. It will show the listener at a glance where in the world the beacons being heard are coming from. This version comes with two interfaces, North America and the whole world. Displayed is the world map.

Very useful if you haven't got room on the shack wall for a large paper version!

http://www.qrz.com/files/utility/grid1232.zip



PCR 1000 – a useful tool for VHF Beacon chasers:

One useful addition to my shack was an Icom PCR-1000 computer controlled receiver, this little 'black box' connects to a spare com port on your PC, and through a software interface allows you to monitor a range of frequencies from around 100 kHz to 1300 MHz! I originally got it for the purpose of monitoring the local airport, the 50, 70, 144, and 432 MHz ham bands, Band 2 FM Dxing, and an unlimited number of memory channels. Having one box that would do all of these things, and without having to fork out a small fortune in the process - seemed like a very good idea at the time. As it turned out it does do all of these things very well, but I also discovered that it's also very useful for monitoring the many propagation beacons on those Amateur Bands, which often put in an appearance during Sporadic E openings in the summer months, and during tropospheric enhancements. Even better, I can also look for the VHF 'VOR' beacons at the local airports, and also the occasional ILS Marker too. A whole new world of beacon possibilities was now available to me thanks to this little box of tricks!

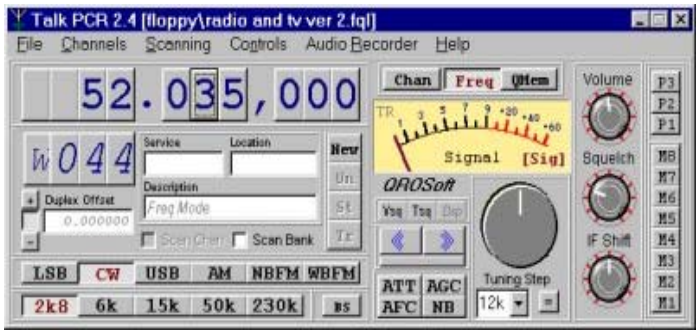
The downside to this unit is the fact that you need a PC to make it work (not a problem for shack usage, or when used portable with a laptop), and the bandwidth, which at around 3 kHz is just far too wide for any serious LF NDB chasing. Even using the DSP audio filter set to a lower bandwidth cannot overcome this disadvantage to my complete satisfaction unfortunately. In practise this isn't too much of a problem on the VHF bands, since beacons there are not usually that close together, as I didn't get it for this function anyway it hasn't really been a problem for me, but it is worth mentioning in case anyone is tempted to buy one.

In recent months a new computer controlled radio (PCI plug in card) has appeared, and this is called the WiNRADiO G303i. This only covers frequencies from 9 kHz to 30 MHz, and wouldn't be any use for VHF beacon chasing, but does offer some promising features, which could make it very attractive to LF NDB chasers. The particular specifications which caught my eye include a sensitivity figure over the whole range of around 3uv, and more importantly a fully variable IF bandwidth of 1 Hz to 15 kHz – the possibilities this facility offers is mouth watering to say the least! Whether there is a downside in having the receiver operating within a potential interference source at LF frequencies I couldn't say, I can only say that many well respected reviewers have given glowing reports about its performance, and I certainly wouldn't mind having one to play with. A newer version G313i will be available very soon, and promises even more features. If it has the same coverage range as the PCR-1000 it could well be a beacon enthusiasts dream I reckon!☺

Icom PCR-1000 software interface:

Icom now offer Bonito Radiocom software with some new models, and there is also an alternative software package called TalkPCR available for trial and purchase on the Internet. The interface shown (below left) is the 'general coverage receiver', this one of three available, the others are shown below just to give you some idea of what they look like.

Below: *TalkPCR interface:*



Below: *Icom PCR-1000 'Midi' Interface*

Another advantage offered by the PCR-1000 is an unlimited number of memory channels! In its basic form the unit offers 20 banks with 50 channels per bank. This in itself is very generous, after all, how many radios offer 1000 channels? In reality, the user can have many times this number, just by creating a new set of memory files and opening the desired one. For example, the user could in theory create a list of 1000 beacon channels, and just open this file, thus giving 20 banks of 50 beacon channels. If the user later desired to do some aircraft monitoring it would be a simple matter of just opening the aero memory file, and in just seconds the PCR-1000 could be a 1000 channel Aero scanner!

Certainly the PCR-1000 is a very versatile piece of equipment, and I've been very busy programming the memory banks with all of the UK VOR and ILS beacon frequencies, just in case of any Tropo or Sporadic E openings reaching up into the VHF aero range. I'm looking forward to do the day when I can take my PCR out portable with the laptop and check out some of the aero navaids at some of the local airfields.

SECTION SEVEN: YOU'VE HEARD IT, NOW HOW ABOUT GETTING IT VERIFIED?

Hearing a beacon from way outside of your own area can be very exciting, but once you've heard it you will probably want to try and get it confirmed with a verification (QSL) from the beacon operator. Unlike broadcast stations, Radio Amateurs, or some commercial utility stations, many beacons don't have their own QSL cards, though this doesn't necessarily mean that you won't receive a verification for your request, but it does often require a different approach when sending out reports. Many beacon dxers have very large QSL collections, and can attest to the fact that by approaching this subject in the correct way it can be well worth the effort, and very successful and rewarding.

What to Include in Your Report: As with any report certain details need to be included in your letter. Frequency heard, time of reception in UTC or their local time (both even), date, call letters heard etc. One problem with beacons though is that they just send their ID over and over again repeatedly, and don't contain any programme information of any sort. So how can you prove it was actually their beacon that you heard then? One useful idea is to include details about the 'characteristics' of the beacon ID (these do vary considerably), and information such as: "callsign repeated twice over a 6 second period, followed by a tone or gap of 6 seconds" may be enough to prove to the operator that it was indeed his beacon that you were listening to. Details about the offset used (as explained in the earlier sections) may also be worth including too. A general overview of conditions at the time of reception may also be of interest, since reception may often be enhanced towards a particular area on certain days for all manner of reasons (solar activity levels, geomagnetic storms etc. etc). A recent addition to the shack was a digital stopwatch; these are very cheap and ideal for ident timing.

Don't forget to include a detailed description of your receiving set up, and try and explain in some detail about just how your receiver works (e.g. the bandwidth of IF Filter used, or any accessories such as an Audio or Digital Filter). Just quoting a model number may not mean very much to the recipient, who may have little knowledge of non-commercial radio equipment. Some dxers make up a small information sheet about themselves and their equipment, sometimes with a small photograph of the receiver or aerial also shown, this is quite a good idea, since it will give the recipient a better idea of just what your receiving set up actually looks like. Since the beacon keepers don't (usually) solicit reception reports, and often don't have printed QSL cards of their own, it may be a good idea to include a PPC (pre-prepared card or letter) along with your report. This can include all the relevant information required, with a space left alongside for the beacon keeper to fill in and sign. You will also need to include either return postage or International Reply Coupons (IRCs), which may be purchased from your local post office or stamp shop. Personally, I always include a self-addressed sticky label, since this can save the verifier a lot of time struggling with writing unfamiliar addresses, and is often greatly appreciated. Finally, remember that the recipient may be far more interested in you and your location than in your technical details, and a little local information or tourist information sent along with a friendly letter may produce a much more positive response than a formal technical one!

Beacon Addresses: Finding these can often be the most difficult part of beacon QSLing. To date the only publication that I have come across which specifically lists NDB addresses is a publication by the Malmoe DX Club in Sweden called 'NDB Address List 2004', the new edition of which was published in early 2004. Another useful source was the excellent monthly 'European Utility Newsletter', which could either be purchased or downloaded for free from their website. Unfortunately, due other commitments the editor, Andreas Ibold, was unable to continue editing this, and as of November 2001 no replacement had been found and this publication has now ceased. The good news however is that an EUNL Reflector has been set up at Yahoogroups, and some of their old files are available from their member's area. Their list of beacon addresses from which QSLs had recently been received should still be available for some time yet. Full details about where to find the EUNL can be found in the datafile.

Another method used with some success when a specific address can't be found is to try sending it to the airport address (or central address in the case of many waypoint or en-route beacons) and marking it for the attention of the Navaids Department. The reply may well return from a different address, but it does frequently seem to get through. I've often found the local reference library to be a good source of 'official' and 'Industry' publications (Jane's, Euravia etc.) listing such information.

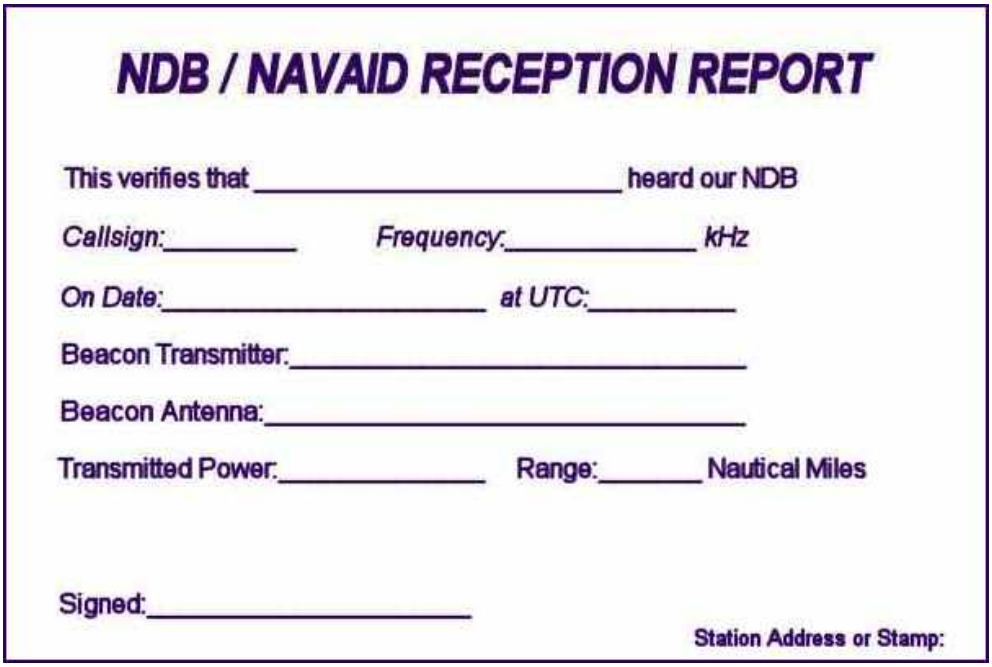
For HF Beacons, I produce a series of regularly updated address lists, and these cover the HF Beacons, 50 MHz Beacons, and also the 70 MHz Beacons too. All of these can be downloaded for free from the Beaconworld website, either at the main "Download" page, or in the separate "HF Beacons Section" of the site.

PPCs – "Pre-Prepared Cards": Also know as PFCs (Pre-Formatted Cards), or PFLs (Pre-Formatted Letters), these are 'blank' QSL cards/letters which are created by the listener, and are sent to Beacon operators who don't have ready made cards of their own. The idea is that the Beacon Keeper or Airport Manager fills in the blank spaces, and then signs or stamps the card to verify that your reception report is correct. In the case of HF Propagation Beacons, which are run by Radio Amateur's, this is usually unnecessary, since they will normally have ready made cards of their own. For the majority of NDBs though, the listener will either have to be content with receiving a personal letter from the operator, or will have to create some form of pre-prepared card of their own to send along with their reception report.

Types of cards and what to put on them: There are no hard and fast rules about this, in fact, the listener can be as creative as they like here, and as long as the operator can make sense of what it is, will often receive a very attractive looking confirmation once this is signed and returned. A number of examples of returned cards can be seen at the Beaconworld website, but since this handbook is largely aimed at newcomers to the hobby I thought that including a few 'examples' here might be a big help.

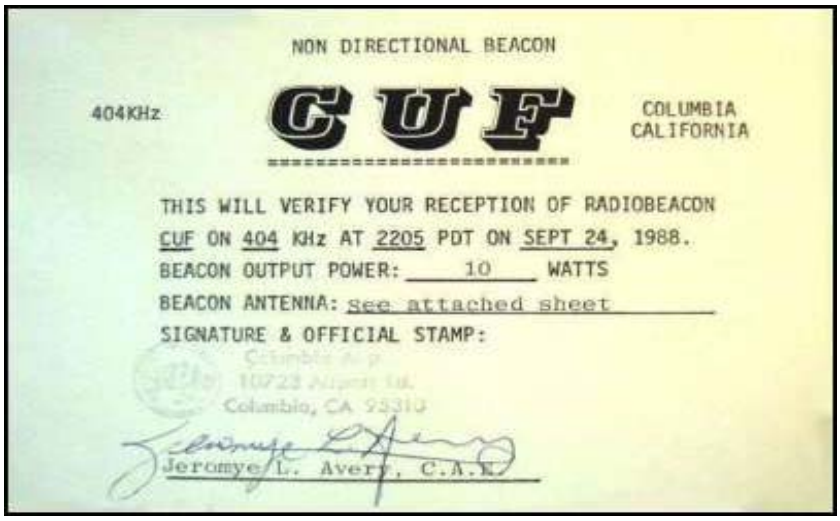
In earlier days cards would often be printed (at the local printers), or typed up onto a piece of plain card, or on the back of a postcard, thanks to the more widespread use of personal computers in recent years it's now an easy task to create a simple template using a fairly basic graphic programme (I use Paint Shop Pro 7), and fill in a number of details (Date, Frequency etc.) before posting it off. Needless to say this has many advantages, in that cards can be tailored, and it doesn't require the listener to have a large (and expensive) print run to create these beforehand.

Figure 1: *This is a typical example of a very basic PPC that can be easily put together using a PC or Typewriter, I created it in a few minutes using paint Shop Pro:*



A few examples of some PPCs/PFCs: PPCs, or PFCs may often be the only way of getting a verification from many NDBs, and whilst some of the larger organisation will have their own printed cards, many beacons, especially the smaller ones probably won't have any, and with the small number of reports received most likely wouldn't find it economical to do so anyway. Some beacon operators are also radio amateurs and are well aware of what QSL cards are, and may well have produced a few of their own, but in many cases your report will very likely be answered by someone who is not a 'technical' person (Station Manager etc.), and may not even be aware of what a QSL is, or even what the term "QSL" means. In this case a small data sheet explaining what our hobby is all about, and what a QSL/Verification is might help, and this can be sent along with your PPC/PFC. I've learned from personal experience that many non-technical types are often more interested in the person who has sent the report, so don't forget to tell them a little bit about yourself, and perhaps send a local postcard or picture as well, they may be very interested to know who is sending them the report as much as they are in how well you received their signal.

To show that PPCs/PFCs do work, below are a few examples of cards produced and received by a very experienced Canadian NDB enthusiast, Steve McDonald, VE7SL. I'm grateful to Steve for sharing these precious confirmations with us, and more of these can be seen on the Beaconworld website. You might also like to check out Steve's "Radio Notebook" website at: http://www.imagenisp.ca/jsm


NON DIRECTIONAL BEACON

404KHz

CUF

COLUMBIA
CALIFORNIA

THIS WILL VERIFY YOUR RECEPTION OF RADIOBEACON
CUF ON 404 KHz AT 2205 PDT ON SEPT 24, 1988.
BEACON OUTPUT POWER: 10 WATTS
BEACON ANTENNA: See attached sheet
SIGNATURE & OFFICIAL STAMP:

Jeromye L. Avery, C.A.E.

1. PFC received from beacon CUF by Steve, note the beacon's official stamp added to the card.


DDP

391 KHZ

SAN JUAN
PUERTO RICO

THIS WILL CONFIRM YOUR RECEPTION OF RADIOBEACON "DDP"
ON 391 KHZ ON OCTOBER 12, 1986 AT 0351 HOURS UTC.
BEACON TRANSMITTER: NAUTEL (3KW)
BEACON ANTENNA: 300 ft. Guyed tower with ground
REMARKS: radials.
TO: Steve McDonald
Thank you for your fine report. signature:
William L. Lindsey

2. A great catch here from Puerto Rico. Note that the operator has included the beacon power output and details of the antenna system.

Mind your language: One other thing worth mentioning is that of what language to send your reports in. In North America this shouldn't be much of a problem, since most operators will speak and read English (though some Canadian operators may prefer your reports to be written in French). For other parts of the world this may require a little more thought, and a report sent in English may not be understood. There are various sources of material available for helping the listener produce foreign language reports, and again, the excellent WUN website may be a good starting point here. There are publications written for broadcast listeners, which offer various phrases in a number of local languages, but these are not always suitable for beacon enthusiasts. Many top QSL Hunters will have already created templates of their own, and this is something that I hope to work on in the near future. There are a number of software packages which can translate your letters, but I've often found these to be a bit erratic in their conversion processes, and the results, whilst better than nothing, are often poor.

Some listeners try sending reports in a 'main' language such as English, German or Spanish and hope that they will be understood by someone at the station, and this does often work, if using this method try to keep your reports as simple as possible, and use more visual methods of communication (small .gif or .jpegs can help here) rather than long wordy passages.

Timing Idents: I mentioned at the start of this chapter that a digital stopwatch could be very useful for timing the idents you hear, and of course if you can make a reasonably accurate timing of the cycle of the beacon, or the length of the long tone or gap between idents this will be very helpful in proving your reception. I picked up a very inexpensive LORUS stopwatch at the local Argos catalogue store for just £5 (about $8/Euros 8), and below is a picture of what it looks like. For really accurate timing a programme such as Cool Edit, Goldwave or Spectran will show a visual image of the signal, you could also print this out and post it with your report.

Just to summarise what we've covered in this section:

1. Have a good source of QSL Addresses, and try to get the report to the right place, a copy of the NDB Address List 2004 should bet at the top of your shopping list.

2. Find out if the beacon produces its own QSLs or requires a PPC/PFC.

3. Include sufficient information in your report to prove your reception.

4. Create your own personalised PPC/PFCs or Pre-prepared Letter Forms.

5. Be sure to include return postage or IRCs, most beacons won't have a budget for this.

6. Include a friendly letter with some personal information about yourself and the hobby.

7. Try to find out what languages the operator will accept reports in wherever possible.

8. Send me details about your results and experiences so that I can include them in future editions, this will be a great help to other newcomers. If you would like to show off a sample your own PPC/PFC design I would be more than happy to include one in the next edition of this publication.

A final note:

As well as Pre Prepared Cards, some listeners like to send pre prepared letters, and again, you can be as creative as you like here. Just remember to include the important details such as your name, and when you receive it you should have a 100% confirmation that you did indeed hear their transmission. QSL collecting can be great fun, but as with most utility stations you have to do a little more work to get your hands on one. A little effort can be very rewarding though, and you can also have a lot of fun producing unique and individually customised cards of your own to send out. Good QSL Hunting!

SECTION EIGHT: UBOs - UNIDENTIFIED BEACONS AND ODDITIES:

Over the years a number of beacons have been frequently heard which don't appear in any of the beacon listings. Some of these can be explained away by the fact that they are situated on private airfields, and not part of any official VFR plans. Others though are more difficult to track down, and recently we've become aware of a phenomenon called 'Negative Modulation', or 'Reverse Modulation' as it may also be known. This is a strange situation where the CW ident becomes inverted and the dots and dashes become spaces of the same length, and the spaces become tones. This can produce some strange sounding IDs, and can often be characterised by uneven spacing, or a very long dash, which appears between the callsigns. Many of the ones that are frequently heard are located in Eastern Europe, though negative calls have also been heard from Western European countries from time to time. **Vaino Lehtoranta** of Finland, gave a good explanation of this phenomena and said that:

"The main reasons for the 'negative keying' or actually a reverse modulation of the carrier level (amplitude) are related to the high Q of an electrically short antenna. The carrier and the sidebands all see slightly different load impedance (matching). The effect becomes more pronounced when the water present in some form inside the antenna circuit itself is transformed into another form. The ATU (antenna tuner) can not compensate for it and result is a higher level of negative modulation. ICAO spec for such unwanted effect is +1/-1 dB".

A graph pad can be very useful in working these out, and by drawing them on the pad and filling in the gaps above the dashes, a rough idea of what the 'normal' ident might be can be quickly arrived at. From my own observations this phenomena seems to occur mostly with beacons using 1020 Hz offsets, and having a wider bandwidth than the 400 Hz or 'zero' Hz offsets. At low frequencies, and with a physically short aerial, a total bandwidth of 2020 Hz seems more prone to this effect than a beacons with an 800 Hz bandwidth. As can be appreciated, at low frequencies the difference in wavelength over even such a short span can be quite considerable.

Unravelling the Negative Idents:

Another method that can be used to great effect is to try out the following formula put together by experienced NDB dxer **Michael Oexner** (author of the excellent **'European NDB Handbook'**). Michael suggests using the following method for unveiling the correct 'positive' IDs of these stations:

Procedure to unveil the positive keying callsign:

1). Add a **"dah"** before the first **"dit"** of the negative callsign.

2). In the negative callsign, the short period of silence between two adjacent (i. e. inside a single Morse code character) **"dits"** or **"dahs"** or **"dit-dahs"** or **"dah-dits"** becomes a **"dit"** of the positive keying.

3). The **"dah"** of a negative keying becomes a character separator in the positive keying.

4). In the negative callsign, the long period of silence (character separator) between two Morse code characters becomes a **"dah"** of the positive keying.

5). The very long silence between two consecutive IDs of the NDB becomes a very long dash.

This might be a little bit hard to follow at first, but if you transform ILA like that, you'll soon find you can easily create the letters CF!

1). ***dah*** to be added in front.

2). Space between **"dit dit"** becomes ***dit***.

3). Silence (character separator) between I and L becomes ***dah***.

4). Space between **"dit dah"** of **"dit dah dit dit"** becomes ***dit***.

5). **"dah"** of **"dit dah dit dit"** becomes *character separator*.

6). Space between **"dah dit"** of **"dit dah dit dit"** becomes ***dit***.

7). Space between **"dit dit"** of **"dit dah dit dit"** becomes ***dit***.

8). Silence (character separator) between L and A becomes ***dah***.

9). Space between **"dit dah"** becomes ***dit***.

10). **"dah"** of **"dit dah"** becomes *character separator".

Combining all that stuff creates: **dah-dit-dah-dit dit-dit-dah-dit**, and voilà, that's CF! Some folks have reported *ILE* (instead of *ILA*) as an UNID on or around CF's frequency. This is just another way of interpreting the somewhat strange sounding negative keying callsign. One interpretation takes the long dash between the callsigns into account, thus creating "dit-dah"; the other omits the long dash, thus creating only "dit".

Other examples are mainly to be found around some other NDBs operating from Eastern Europe, especially the Polish NDBs seem to be specialised on negative keying. ☺

GDA - 322 becomes **EAF**
DAR - 409 becomes **FNA** or **FNE**
GRU - 364 becomes **ERL** etc.

You can try the above recipe on a couple of other strange UNIDs (all of the "long dash after ID variety"), have fun! So remember, if you do come across an unusual callsign don't immediately assume it's a new station, it may well be just a faulty keyer' which has 'gone negative'

SOME OF THE THEORIES ABOUT THE ORIGINS OF UNIDS…

Robert Connolly, the author of **"Non Directional Beacons of Europe"** (see Datafile Section) came up with a number of interesting thoughts about why there are so many unidentified NDBs around, and why they aren't listed in any of the 'official' publications such as the AERAD, DoD, or Military Flight Information publications (FLIPs). I also found an interesting article about 'Meaconing' (hat's not a mis-spelling either!). If you should have a theory (or theories!) of your own about why there are so many unidentified beacons on the band, why not share your thoughts with us and I will be happy to add them to the list:

ROBERT'S THEORIES:

1) Possible military beacons across Europe etc. with information classified. This was the case with FNR and GMN in Eire, and it is only recently that GMN has appeared in the RAF Flip Document.

2) Some may be temporary NDBs being used while a VOR etc. is on long term servicing or rebuilding. This occurs quite often and can only be tracked down through International Notams. Usually however the ID is the same or similar to that of the original nav aid.

3) Re - location of oil rigs to various fields. According to my Navtex reports about ten rigs are constantly being moved about the various fields.

4) NDBs which have been installed at small airfields for flying clubs etc. Some of these are used on an irregular basis and the airfield are so small they are not listed in Aerads etc.

5) Naval ships which carry helicopters. There must be some system of helicopters finding and identifying their own ship, especially during periods of radio silence and or darkness.

6) Meaconing - Not a mis-spelling - see the section about Meaconing!

Quite a few interesting thoughts there, and to confirm what Robert suggested in item 2, I recently found the following information in the 'stop press' supplement in the December 04 copy of Aerad:

> ***"MARSEILLE: UFN temp VOR/DME installed 'MRM' 113.45/Ch 81 (N4322.8 E00519.7) & temp NDB 'MJ' 406 (N4326.4 E00513.1) usable in the event of unavailability of VOR 'MRS'."***

In cases like this, checking the notams for the suspected area may well be the only way of getting positive confirmation of where the beacon is operating. Several times during the years 2000 to 2002 an 'unid' callsign was heard, and we were able to identify it by checking out many of the online 'notam' websites. See the Datafile Section for details of where this information can be obtained.

Another useful piece of information was found at the website of **Southern Avionics Company (SAC)** - (see Datafile), SAC are one of the world's largest suppliers and manufacturers of radiobeacons, and they give the following useful information in a FAQ page on their website: http://www.southernavionics.com

Question: Who buys SAC radiobeacon systems?
Answer: Anyone, anywhere who needs to pinpoint a location or provide an instrument approach.

- General Aviation Airport Owners.
- Civil Aviation Airport Owners
- Government Aviation Agencies
- Offshore Mineral Explorers
- Offshore Production Platform Owners
- Wilderness Area Mineral Explorers
- Transcontinental Pipeline Owners
- Fishing Fleet Owners
- Ship Owners for Onboard Heliport
- Heliport Owners
- Military Strategists
- Disaster Relief Organizations

As can be seen from the above list, NDBs are used in a very wide variety of applications other than just the usual airfield types, and in many of these instances a beacon is likely to only be activated temporarily, or may even operate from a number of different locations.

MEACONING:

Like anyone brought up in the UK during the 1950s or 60s, whenever I see the word 'meacon' I immediately think of 'Dan Dare', but in this case we're not talking about a little green alien who files around on a small disc, but rather an unusual way of using (or perhaps that should be mis-using) a radio beacon. I was quite surprised when I came across the following piece of information when searching through a website run by the FAS, a US Military scientific organisation. This has a fascinating section relating to jamming, and it was found at the following URL: http://fas.org/irp/doddir/army/fm24-33/fm2433.htm

I must admit that I'd never thought of beacons being deliberately misused like this before, but it could well explain away some of the more transient and mysterious beacons which appear and then just as quickly disappear again - certainly some food for thought there!

Basically, the article stated that Meaconing was a system of receiving radio beacon signals from NAVAIDs and rebroadcasting them again on the same frequency to cause confusion with navigation. An enemy could conduct meaconing operations against a country's military to prevent their aircraft or shipping from arriving at their intended targets or destinations.

It list some of the enemy meaconing causes which could be successful against an opponent --

- Aircraft could be lured into hot landing zones or enemy airspace.
- Ships could be diverted from their' intended routes.

- Bombers could be induced into expending ordnance on false targets.
- Ground stations could receive inaccurate bearings or position locations.

With a large number of Airshows taking place throughout Europe during the summer months there were always lots of good opportunities to study various types of aircraft antenna systems at close range. This could be very instructive, and as 'Electronic Warfare' is a popular tactic nowadays, and it was always possible to see what types of antennas were available for deployment. However, following the terrible events of 9/11 the military are far more sensitive than they used to be and this is understandable, if visiting an airshow or airbase, good common sense should be shown at all times. Attempting to take photographs of military antennas or equipment might not go down too well, and do remember that a group of UK and Dutch plane spotters are likely to be imprisoned in Greece for doing nothing more sinister than collecting aircraft numbers and taking photographs. If you are in a position to take photographs do try and get the permission of the crewmen first, and if you are in any doubt about the reaction of the owners DON'T do it!

MILITARY NDBS:

A number of UNID callsigns were heard by dxers in North America at various times, and there was much speculation as to their origins. Well known Canadian Dxer and Propagation expert **Jacques d'Avignon** came up with the following answer to this back in August 1997 in response to a question from a Dxer about the origins of the callsign "**UAA**":

"The beacon identified as UAA is a National Defence beacon that has no permanent location. There are identifiers assigned to national Defence that have no permanent site. The ID's are: UAA, UFF, UGG, UJJ, UKK, UNN, USS, UTT, UWW and UZZ. No frequencies are assigned to these and they can be heard anywhere in the band. They are classified as tactical/transportable beacons".

It's not unthinkable that this sort of practise is fairly common amongst military operators, and many of the other 'unids' heard throughout Europe and North America are also owned and operated by the military. Many of these might only be active during a military exercise, and therefore only operational on very rare occasions. Do keep a look out for any unusual callsign patterns appearing on specific times and dates.

OIL PLATFORMS:

Quite a few of the beacons that we've managed to identify or DF have proved to be located on North Sea Oil Platforms. For some reason many of these don't appear on any of the usual aeronautical charts, and I can only assume this is to deter other pilots from using them as part of their flight plan. Doing this could potentially be very tricky if on arrival in the area it was found that the beacon wasn't active. As I explained in an earlier chapter, many of these beacons are only activated on request, or by prior arrangement.

It will also be noted that a lot of oil platforms seem to operate within the Medium Wave Broadcast band, and again the frequency of operation might offer a clue as to whether what you're hearing might be from an Oil Platform. A document found at the UK CAA website showed that certain frequencies were allocated for mobile rigs operating within a specific area of UK waters, and amongst the frequencies listed in this document, many of the rigs operating in these sea areas must use **579.5, 597.5, 897**, and **949 kHz** .

CALL LETTERS:

Following another discussion about 'single' and 'two letter' beacons on the NDB List e-mail Reflector, **Roger Caird** of Dublin Ireland posted the following suggestions regarding why some beacons have more or fewer letters, these make a lot of sense, and can prove very helpful when applied to one or two letter 'unid' beacons:

"Most of these Russian "one letter" and "two letter" beacons seem to be landing aids for airports, in the case of 365.0 - AD, it is a Locator beacon for Runway 02 at Sochi Airport. In the olden days there were usually three MF NDB's associated with the approach to certain runways, at most airports.

They were:

An Outer Locator, a Middle Locator and an Inner Locator. The Outer Locator would be a general landing aid to assist the pilot to line the aircraft up with the runway. This would be a "two-letter beacon" The Middle and Inner Locators would be progressively closer to the runway threshold, and would, I suppose, be very low-powered beacons. As these had to be identified as the aircraft flew

over them, their ident had to be fairly short, i.e. "one letter". Most MF/LF approach aids have now dispensed with one or both of these, Middle and Inner Locators) and they have been replaced with VHF narrow vertical-beam beacons on 75MHz. As far as I can remember, these VHF beacons illuminate a warning light in the cockpit, to let the pilot know how close he is to the touchdown point. Continuing with the same surmise, the "three letter" beacons usually seem to be "en-route navaids" and would be more powerful NDB's, the longer ident would not cause any problem as the pilot would only have to confirm the coding of the beacon from some considerable distance".

"This theory also holds good for Ireland, at any rate, all the approach procedure beacons are "2-letter": OB, OC, OE, OK, OL, OP. These are all Outer Locators, hence, I presume, the "O" in the ident. I am only aware of one "single-letter" NDB in Ireland, "S" on 316.0 (withdrawn from use years ago), and I'm fairly confident this was an Inner Locator. The U.K. also conforms to this standard (almost). However, I can also think of several instances where this theory doesn't work: North America, 389.0-CP Caparica, Lisbon, with a protected range of 250nm".

This produced a very interesting thread on this subject, and it became apparent that different countries do use different call letter systems. This prompted me to take another look at some of the callsigns previously shown in the UNID List. One thing did quickly become noticeable, nearly all of the beacons which only have a single letter call are situated in a very small number of countries - mainly in Eastern Europe and Scandinavia, but a number of Spanish beacons also appear to use this system too. After studying the callsign list in the **ENDBH**, the following countries were shown to use single letter calls:

Albania	ALB	Kyrgystan	KGZ
Armenia	ARM	Latvia	LTV
Azerbaijan	AZE	Libya	LBY
Belarus	BLR	Moldova	MDA
Bulgaria	BUL	Poland	POL
Canada	CAN	Romania	ROU
Czech Republic	CZE	Russia	RUS
Egypt	EGY	San Pierre & Miquelon	SPM
Estonia	EST	Slovakia	SVK
Finland	FIN	Spain	ESP
Georgia	GEO	Sweden	SWE
Hungary	HNG	Turkmenistan	TKM
Kaliningrad	KAL	Ukraine	UKR

That's still quite a long list, but it does perhaps narrow things down a bit. I've also noticed that in the UK at least, many of the military beacons e.g. the ones located at active RAF bases, seem to use two letter calls. I don't know if this is an active policy, or just the remains of some older system, but I will be taking a much closer look at the calls of unid beacons in future to see if they offer any clues as to who the operator might be. If anyone does have any more information about the way callsigns are allocated I'd be very interested to hear from them. Thanks to Roger for giving us a good insight into what might be a valuable clue!

ALGERIAN MILITARY:

Over the past few years DF bearings on a number of commonly heard NDBs would indicate that North Africa is the likely source. We suspect that one of the biggest culprits for unidentified and unlisted NDBs are the Algerian military, who seem to have most of theirs on the classified list. Since it's very difficult for NDB dxers to get QSLs from them it's very difficult to say whether or not we're correct, but in terms of DF bearings and ident patterns they continue to be our number one suspect.

With the current ongoing political situation in this country it seems unlikely that things will change and become more open in the near future unfortunately. If anyone is planning a holiday in any of the countries close to Algeria (Tunisia, Morocco etc.) and can take a rough bearing on any of these that would be a big help. Even if it were not possible to take DF bearings, just letting us know if they can be heard well during daylight hours would be a big help to us.

THE MILITARY IN GENERAL:

During the past year we have been fortunate enough to identify some of the previously unidentified beacons, and it turned out that a number of these were situated on military training bases, particularly those

containing helicopters. During training courses it's possible that these are switched on purely for training or navigation exercises, and this may well account for their erratic appearances. Again if anyone has more information about these, or has even served in any of the forces using them in this manner I'd be interested to hear about how they were used.

NORTH AFRICAN OILFIELDS:

Some recent research and a number of DF bearings have made me think that quite a few of the irregular 'unids' may also be coming from Algeria or other North African countries. I suspect that a number of them are of military origin, but also suspect that a greater number may be from oilfields rather than from air fields!

There are many large oil and gas fields in Eastern Algeria, and also a great many in Libya as well. Some aeronautical charts show a number of the Libyan oil fields, and also reveal that many of them are of the 'two letter' beacon variety. Assuming that many of the Algerian oilfields, a number of which appear to be located in largely uninhabited 'desert' areas, are operated in the same way, it's not unreasonable to think that many of these beacons will be of the 'two letter' variety as well.

Again, a number of DF bearings, particularly on 'two letter' beacons seem to indicate that the Libyan and Algerian oilfields are the source of a good many of our 'unids'. Although a lot of the current 'official' publications only show a very limited number of these beacons, I suspect that there are a great many more, which aren't listed. I have a very old US military aeronautical chart of North Africa dating back to the 1980s, and this does show a vast number of two letter beacons at various Libyan oil wells. Later and more modern charts don't show many of these, and whilst a number of them will no doubt have closed, I suspect that there are a great many still operating, and no doubt some of these find their way onto various UNID Lists from time to time.

QUIZITIVE IDENTS:

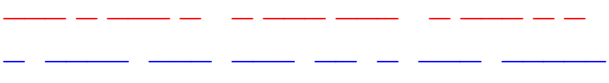
This is a new theory and a very interesting one. NDB List member **Brian Keyte** noticed that certain beacons were producing a very strange ident, and one, which shouldn't have been there. Several of these were noted, strangely enough, all on the RAF's beacons 'BZ', 'LA' and 'CWL'. A good example was that from the beacon at RAF Brize Norton - BZ on 386 kHz. The normal upper and lower sidebands are often heard with a very 'raspy' sound to them, and Brian had noticed that an 'unid' beacon with the callsign 'AIT' was often heard exactly on 386.0 kHz, and this had a very similar characteristic to the 'BZ' idents some 400 Hz above and below.

Brian did some research into this and managed to work out how the 'quizitive' idents were related to the dots, dashes and gaps in the positive idents. He says*: **"It's quite simple really, any CHANGE in the positive - from silence to tone or from tone to silence - generates a 'warble' on the carrier lasting for about one dot's length. That's all there is to** it".*

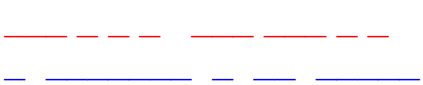
Brian even wrote a short BASIC program that used that rule. Running it using the three RAF NDBs that have the 'Quizitive' condition - LA -RAF Lyneham, BZ – RAF Brize Norton and CWL – RAF Cranwell, generates exactly what the 'quizitive' idents actually sound like for each. This is what he got when he ran the program on these three idents:

LA - 282 kHz

CWL - 423 kHz



BZ - 386 kHz



This produces all sorts of possibilities for the identification of some of our long-standing unids, and whether this is a general phenomenon, or just something peculiar to the RAF remains to be seen!

Brian also wrote a small programme, which also converts 'negative' idents into 'positive' ones, I'm sure both of these will prove very useful in our quest to track down all of the UBOs! called 'B_KEYER", this comes free in the 'added software', which is included on the ENDBH and NANDBH CDs. Below is a screen shot of the B_KEYER programme:

Thanks to Brian for working out the answer to this one, and creating the B-KEYER software for the benefit of Beacondom!

OTHER USEFUL UNID HUNTING TOOLS:

Unidentified beacon hunting can be a fascinating challenge, and this is where a good set of 'hunting tools' can be a great asset. By 'hunting tools' I mean a good DF Loop, lots of aeronautical charts, knowledge of where to find current Notam information, and a working knowledge of propagation. Understanding propagation can give the unid chaser a good idea of which area the signal might be coming from, for example, when the K Index is high signals from the south are often enhanced, do you only hear the beacon when the K Index is high, and are other 'known' signals from that same area propagating well at that time too?

An understanding of 'Greyline' propagation can also be a big help here too, for instance, does the beacon only appear for a very short period, and at a regular time every day give or take a few minutes? If it does it may be propagating along the 'terminator' (not big Arnie, the line separating daylight from darkness), and this is where a 'hardware' tool such as a 'DX Edge' (produced by Xantek inc.) came in very useful, or a software programme such as 'GEOCLOCK' comes into its own. These items can show a user when the morning or evening terminator will cross their QTH, and you can check to see what other countries are also along that path at the same time.

There are other various propagation software packages available, but as I haven't yet tried these out I can't really give any information how their effectiveness. There are also many interesting books available on the subject of propagation, but I have to say that the more I read the less I realise that I know about this very interesting, but extremely complex subject!

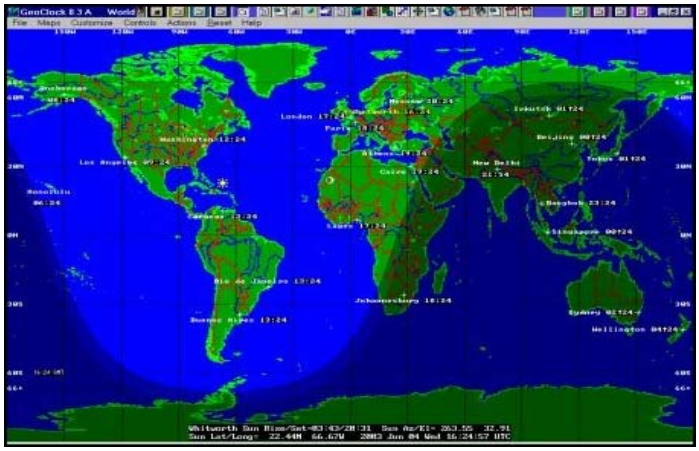
The following sections give some information about some of these, and where to obtain them:

THE DX EDGE: I bought my DX Edge in 1982 direct from the manufacturers, Xantec Inc. New York USA. At that time it cost around $18 US, and has been in regular usage ever since. It's not as sophisticated as some newer software versions, but is simple to use and doesn't require a PC. Basically, it's a plastic 'slide rule' type device, roughly 12" x 4.5" with 12 monthly transparent slides showing parts of the world in daylight or darkness for a given month. This was a very useful low-tech prediction method; sadly, as of late 2001 the manufacture of this device has been discontinued, so unless you're very lucky using a software product like the Geoclock programme may be the only option available.

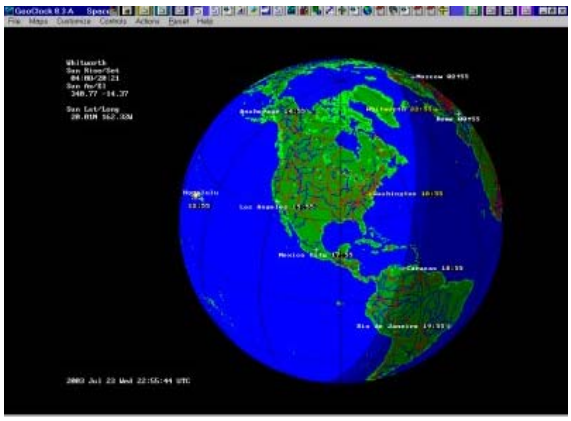
GEOCLOCK: This is a software based method of doing this, and is a lot more sophisticated, you can see the daily variations, and also re-check old dates by re-setting the timings. Widely used by many hams and Dxers, full details can be found at the Geoclock website: http://www.geoclock.com No doubt there are other similar programmes available on the internet, but I haven't needed anything other than these two so far!

One big advantage of Geoclock is the number of software add ons and plug ins that are available for this product, these come in the form of extra maps or layouts etc. though as the programme is shareware, the full capabilities of it may not be fully realised unless you register your copy.

Below are several screen shots of the Geoclock Interfaces:



Below: *the view from outer Space:*



Below & Left: *The approaching Greyline.*

Views of the world (above), and North America (left)

PROPAGATION BOOKS & WEBSITES: Attempting to list all of the books available on this subject would be very difficult, instead I will just point you towards several sources where books can be obtained, and in some cases purchased online:

ARRL (American Radio Relay League) Publications:	http://www.arrl.org
RSGB (Radio Society of Great Britain) Bookshop:	http://www.rsgb.org
PW Publishing Book Store:	http://www.pwpublishing.ltd.uk
Grove Enterprises:	http://www.grove-ent.com
Universal Radio:	http://www.universal-radio.com

Some very good websites for further Propagation Information:

Spaceweather.com:	http://www.spaceweather.com
HF Radio.org:	http://prop.hfradio.org
DX.QSL.net:	http://dx.qsl.net/propagation/
KN4LF – MF Propagation Theory:	http://66.175.38.157/kn4lf8.htm

SECTION NINE: ABBREVIATIONS IN USE ON THESE PAGES:

As is often the case with any aspect of utility Dxing you are likely to encounter a lot of jargon or abbreviations, which may not initially mean anything to you. To help you quickly identify some of the terms, which you are likely to come across whilst beacon Dxing, I have included a list of some of the more common ones below. For more information about the modes and beacon types to be found in the maritime and aeronautical aspects of the hobby you should refer back to section two of this publication. A more comprehensive abbreviation list can be found in Part Three of this publication.

ADF	Automatic Direction Finding
AM	Amplitude Modulation
BFO	Beat Frequency Oscillator
CAL	Calibration Station
CON	Consol Beacon
DAID	Dash After ID
DBID	Dash Before ID
CW	Continuous Wave (Morse Code)
DF	Direction Finding
DGPS	Differential Global Positioning System
(e)	If this letter is heard after an ident, it often means there is a problem with the transmitter. This extra (e) will alert the beacon operators to the problem.
GP	Glide Path
H24	Beacon Operational 24 Hours a day
HU	Hours Unknown
HV	Hours Variable
IDENT	Identification signal /Callsign
IF	Intermediate Frequency
ILS	Instrument Landing System
IM	Inner Marker
LF	Low Frequency (30 to 300 kHz)
LH	Lighthouse
LIM	Locator Inner Marker
LLZ	ILS Localiser
LMM	Locator Middle Marker
LOC	Locator Beacon (NDB having instrument approach procedure published)
LOM	Locator Outer Marker
LOOP	Type of ‘directional’ Aerial used by many beacon dxers.
LSB	Lower Side Band
Lt.	Light (House)
Lv.	Light Vessel (or Light Ship)
MF	Medium Frequency (300 to 3000 kHz)
MKR	Marker
MM	Middle Marker
MSK	Minimum Shift Keying
NDB	Non Directional Radiobeacon
NULL	The point at which the received signal is at its weakest when tuned with a directional aerial such as a Loop.
OM	Outer Marker
QSB	Fading, or disturbance to propagation
QRM	Normally used when referring to ‘man made’ interference
QRN	Normally used when referring to static or ‘natural’ interference
RC	Non-directional Radiobeacon
RD	Directional Radiobeacon
RX	Receiver
SSB	Single Sideband
USB	Upper Side Band
VOR	VHF Omni-directional Range
ZERO BEAT	This is the point at which the heterodyne, or tone becomes almost inaudible when tuning an AM carrier with the receiver switched to the SSB or CW positions (and also allows you to hear any weaker stations which may also be operating on the same channel!). It can usually be found at the mid point of the carrier eg. between the upper and lower sidebands.

SECTION TEN: BEACON BANDPLANS

In this section we will take a look at the Beacon Bandplans, but first I think that some explanation of what a Bandplan is might be in order.

The body that regulates radio frequencies throughout the world, the ITU (International Telecommunications Union) allocates certain ranges of frequencies to certain users, usually on a PRIMARY or SECONDARY basis. What this means in practice is that a band of frequencies may be used by more than of service, but one of these services may be classed as the Primary service, and all other users must use the band on a non-interference basis, i.e. they must not cause interference to that service, and may not have any protection if their services suffer interference from a Primary user's service.

These Bandplans can be quite complex, and since the world is divided up into three administrative regions –

Region One: = Europe, Africa, Russia and the Middle East.
Region Two: = The Americas (North & South), and eastern Pacific.
Region Three: = Australasia, Asia and the western Pacific.

This is a somewhat simplified list of the areas covered, but should at least give a rough idea of the areas involved. Because there are three regions bandplans may vary in the different regions according to local usage, and a good example of this is with Longwave broadcasting, which is not used in the Americas, where these frequencies are used by Marine and Aeronautical Radionavigation services. I don't intend to go too deeply into this subject, and anyone interested in knowing more about them can find plenty of useful references on the Internet, and in various publications, such as the well known Klingenfuss "Guide to Utility Stations", which is published annually, and very popular amongst utility enthusiasts. I have included several lists in this section, one covers the "official" ITU allocations, and the other show the additional users listed in more detail from various government sources, and a more user friendly "What is where" plan of my own, which is designed to help users quickly find out where the main beacon action is.

First though, a brief description of what the terms Low, Medium and High mean when used in reference to the different parts of the spectrum.

In Region One, the broadcast band operating between 153 and 279 kHz (most broadcasters operate on 9 kHz channel spacing) is commonly known as "Long Wave" (due to the long wavelengths), but this is often confused with the term LF, or "Low Frequency", which is used to describe the range of frequencies from 30 to 300 kHz. The term "Medium Wave" is commonly used for Medium Wave broadcast stations - 531 to 1611 kHz in Europe, with 9 kHz channels, and 530 to 1700 kHz in North America with 10 kHz channel spacings, but the term MF, or "Medium Frequency" is used to describe the range of frequencies from 300 kHz to 3000 kHz (3 MHz), so many beacons could actually be properly classed as MF rather than LF beacons. The term Short Wave is usually applied to the range of frequencies stretching from 3 MHz to 30 MHz, and this is also the frequency range normally classed as HF or "High Frequency".
As well as the more commonly known user services such as the Broadcasters, radiobeacons, Maritime Stations and DGPS service, there are also a number of other lesser known services operating signals with the LF and MF spectrum, and some of these can be very difficult to identify. I came across an interesting file at the US "FCC" website (Federal Communications Commission), and this also lists a number of other services, such as Cable Locating and Power Line Carrier services, as well. The UK Government's "Table of Radio Frequency Allocations" also refers to additional services, with being too specific, and in some cases this might also produce a few strange signals which are not easily identified.

As can be seen from the "Official" Bandplan, the categories are a little vague, but in general, the services shown in Capital letters are the primary users, and the services in lower case secondary services. Some regions do show very similar patterns in some ranges, whilst others vary greatly. This can offer some opportunities for the beacon dxer, who is looking for more distant signals, and in the case of North American listeners a whole range free from very high powered broadcast QRM, which makes hearing beacons in the lower parts of the LF band so difficult (but not impossible) for European listeners. For the North American listener, hearing a European broadcaster can in fact be a good propagation indicator, and show possible openings towards the east by their presence and signal strengths.

But first, let us take a look at the "Official" ITU bandplans for the range 160 to 535 kHz:

REGION 1: (kHz)		REGION 2: (kHz)		REGION 3: (kHz)	
255.0 - 283.5	BROADCASTING // AERONAUTICAL RADIONAVIGATION	160.0 - 190.0	FIXED	160.0 - 190.0	FIXED // Aeronautical Radionavigation
283.5 - 315.0	MARITIME RADIONAVIGATION // AERONAUTICAL	190.0 - 200.0	AERONAUTICAL RADIONAVIGATION	190.0 - 200.0	AERONAUTICAL RADIONAVIGATION
315.0 - 325.0	AERONAUTICAL RADIONAVIGATION // Maritime	200.0 - 275.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile	200.0 - 285.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile
325.0 - 405.0	AERONAUTICAL RADIONAVIGATION	275.0 - 285.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile // Maritime	285.0 - 315.0	MARITIME RADIONAVIGATION (Radiobeacons) // AERONAUTICAL
405.0 - 415.0	RADIONAVIGATION	285.0 - 315.0	MARITIME RADIONAVIGATION (Radiobeacons) // AERONAUTICAL RADIONAVIGATION	315.0 - 325.0	AERONAUTICAL RADIONAVIGATION // MARITIME RADIONAVIGATION (Radiobeacons)
415.0 - 435.0	AERONAUTICAL RADIONAVIGATION // MARITIME MOBILE	315.0 - 325.0	MARITIME RADIONAVIGATION (Radiobeacons) // Aeronautical Radionavigation	325.0 - 405.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile
435.0 - 495.0	MARITIME MOBILE // Aeronautical Radionavigation	325.0 - 335.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile // Maritime Radionavigation (Radiobeacons)	405.0 - 415.0	RADIONAVIGATION // Aeronautical Mobile
495.0 - 505.0	MOBILE (Distress & Calling)	335.0 - 405.0	AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile	415.0 - 495.0	MARITIME MOBILE // Aeronautical Radionavigation
505.0 - 526.5	MARITIME MOBILE // AERONAUTICAL RADIONAVIGATION	405.0 - 415.0	RADIONAVIGATION // Aeronautical Mobile	495.0 - 505.0	MOBILE (Distress & Calling)
		415.0 - 495.0	MARITIME MOBILE // Aeronautical Radionavigation	505.0 - 526.5	MARITIME MOBILE // AERONAUTICAL RADIONAVIGATION // Aeronautical Mobile // Land Mobile
		495.0 - 505.0	MOBILE (Distress & Calling)		
		505.0 - 510.0	MARITIME MOBILE		
		510.0 - 525.0	MOBILE // AERONAUTICAL RADIONAVIGATION		
		525.0 - 535.0	BROADCASTING // AERONAUTICAL RADIONAVIGATION		

As I mentioned previously, there are some services which aren't mentioned in the bandplan, and the UK list mentions that Induction Communication Systems can operate in the bands 185 kHz to 315 kHz, and these can be such things as low powered "licence free" automatic Garage Door Openers, or other such devices.
The BBC broadcast transmitter at Droitwich operating on 198 kHz also carries a "Teleswitching" signal, which is used to activate "White Meter" low cost power systems in various households, these signals can be detected by the listener with certain of the software programmes. The FCC bandplan is a little more informative on this issue, and lists many of the other services operating in this part of the spectrum, and these include such things as Cable Locating Equipment, and Power Line Carriers. These may be more

commonplace in North America than Europe, but I couldn't say for certain, and I just point this out to highlight the types of services who may be sharing the bands with the NDB signals.

I found a very useful website carrying a distillation of the US Frequency Plan at the website of John Neuhaus WA2JXE, and amongst the services listed on one of his pages was an allocation on 457 kHz, which is used by Avalanche Transceivers, and aircraft flying over water. I have never heard anything on these channels, but then again we don't get too many avalanches in this part of the world!☺

You might like to check out John's site, and the following page in partricular for more information, at the url shown here: http://www.jneuhaus.com/fccindex/spectrum.html#table_of_contents

International Regulations show that within the frequency spectrum there are certain small blocks of frequencies, which are allotted to specific tasks, and again we find a little more useful information here:

"The frequency 410 kHz is designated for radio direction-finding in the maritime radionavigation service. The other radionavigation services to which the band 405 - 415 kHz is allocated shall not cause harmful interference to radio direction-finding in the band 406.5 - 413.5 kHz".

"In the maritime mobile service, the frequency 490 kHz is, from the date of full implementation of the GMDSS (see Resolution 331 (Mob-87)), to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles N38/S31 and 60/S52, and Resolution 339 (WRC-95). In using the band 415 - 495 kHz for the aeronautical radionavigation service, administrations are requested to ensure that no harmful interference is caused to the frequency 490 kHz".

THE ITU PLAN:

The ITU's bandplan covering many of the areas in which we are interested is carried in the GE85-MM-R1 Document, and though a I haven't yet got my hands on a full copy of this publication, the ITU site does carry a Power Point presentation of many of the basic points. Within this document it gives details of the plan for the frequencies 415 to 435 kHz and 510 to 526.5 kHz, which are shared with the Maritime Service (or were until the recent demise of many of the Maritime Services in this part of the spectrum). This outlines the following details:

BEACONS: (Aeronautical & Maritime Radionavigation)

415.0 to 435.0 kHz	510.0 to 526.5 kHz	Total of 34 channels with 1 kHz channel spacings (0.5 kHz in exceptional cases) Modes A1A, A2A.

MARITIME MOBILE:

415.0 to 495.0 kHz	505.0 to 526.5 kHz	0.5 kHz channel spacings, Modes A1A, F1B.

MARITIME RADIONAVIGATION SERVICE:
(Plan GE85-EMA)

283.5 to 315.0 kHz	Modes A1A, F1B, G1D.

From personal experience I can tell you that there are many beacons operating outside the plan for this part of the spectrum, and I've even heard beacons within the old "Guard Band", which was supposed to offer a 5 kHz protection zone on either side of the 500 kHz Maritime Distress & Calling channel. Although there are very few Marine stations still operating their CW services in this part of the band nowadays, and most stations ceased keeping any sort of watch on the channel in the late 1990s, beacons are, and were often heard operating within this zone, and many of these appeared to be of the military variety, the types that just pop up for short periods and then quickly disappear once again. It may well be that these beacons were located in areas well away from any coastal activity and deemed to be unlikely to cause a problem, but more likely they come into the not too uncommon military attitude of doing pretty much whatever they want without worrying about infringing any regulations. It could well be argued that as military operators they don't come under the Aeronautical/Maritime Bandplans anyway, but as is usually the case, the military services aren't always very forthcoming about what bandplans they like to work too!

BASIC USER PLAN OF THE BEACON SPECTRUM:

In this section I have created a 'user' plan of the beacon spectrum, this intended to give the user a basic guide of where they will find the various signals, without having to first take a degree in Rocket Science to make sense out of the Official plans!☺

This first block shows the basic layout of European operations:

EUROPEAN BANDPLAN:								
135.7 -137.8	153.0 - 279.0	283.5 - 315.0	255.0 - 435.0	406.5 - 413.5	435.0 - 526.5	490.0	500.0	518.0
Amateur Service - some Amateur Beacons operate here	Broadcast Stations - Tele switching on 198 kHz	Marine Beacons // DGPS Beacons	Aero Beacons (NDBs)	Radio Dirction Finding Service 410 kHz	Aero Beacons - Military & Oil Platform NDBs operate here	Navtex Service	Old CW Marine Calling & Distress	Navtex Service

In North America things are slightly different:

NORTH AMERICAN BANDPLAN:								
160.0 - 190.0	194.0 - 530.0	285.0 - 325.0	406.5 - 413.5	490.0	500.0	518.0	525.0 - 535.0	530.0 - 1710.0
LOWFERS Low Frequency Experimental Band	Aero Beacons (NDBs)	Marine Beacons // DGPS Beacons	Radio Direction Finding Service 410 kHz	Navtex Service	Old CW Marine Calling & Distress	Navtex Service	Travellers Information Service (TIS)	MEDFERS (Low Power Experimental Beacons)

For the HF Propagation Beacons reasonably accurate Bandplans are more readily available to the enthusiast, and below are tables showing the more heavily used 28, 50 and 70 MHz bandplans. Though there are beacons on a number of other frequency bands, these are the most heavily used, so they're the ones I've mainly concentrated on here. The IBP (see Section Fourteen for more information about these) Beacon Chains are found on the 14, 18, 21, 24 and 28 MHz Bands and occupy approximately 200 Hz of bandwidth:

Up until the late 1990s, once of the major parts of the hobby was the monitoring of the Marine Beacons, and Marine Beacon Chains operating between 283.5 and 315 kHz. Since the demise of this service and the introduction of the DGPS system, many of the former Marine Beacons have closed and have now been replaced by DGPS Beacons. A few still remain, but these survivors are on borrowed time, and not expected to last for too much longer I'm sad to say. The Marine beacons did operate on a specific Bandplan from the 1st of April 1992, when the older Marine Chains were abandoned in favour of individual channel, in the next section you will find a complete Bandplan of the 1992 system, which by and large is now also the Bandplan used for the DGPS beacons. This is listed in the ITU's GE85-MM-R1 Document, but I haven't yet managed to get my hands on a copy of the full one (yet).

SECTION ELEVEN: THE MARINE BEACON BANDPLAN:

In 1992 the Marine Beacon Bandplan underwent a number of changes. In place of the old system with its 'chains' of stations operating in a set sequence, a new plan emerged which gave 64 exclusive channels covering frequencies from 283.5 to 315 kHz. As a result of these changes there were fewer beacons to be heard, and worst still, in 1999 and 2000 many of these remaining Marine Beacons were closed down and replaced with DGPS systems. There were many rumours of a major change in the DGPS Bandplan, and as of 19th of September 2001 the DGPS Bandplan underwent a major revision and it now looks as though many of the few remaining Marine Beacons could go altogether in the next year or two. The new bandplan uses pretty much the same channels as the marine beacon plan below, with the biggest change being in the distribution of DGPS beacons themselves, and a large number of frequency reallocations. Section Eleven, which deals with the DGPS system, has been expanded to deal with the new bandplan, and more information can be found there.

MARINE/DGPS CHANNEL PLAN:

Ch No:	Freq: kHz	Ch No:	Freq: kHz
00	283.50	41	304.00
01	284.00	42	304.50
02	284.50	43	305.00
03	285.00	44	305.50
04	285.50	45	306.00
05	286.00	46	306.50
06	286.50	47	307.00
07	287.00	48	307.50
08	287.50	49	308.00
09	288.00	50	308.50
10	288.50	51	309.00
11	289.00	52	309.50
12	289.50	53	310.00
13	290.00	54	310.50
14	290.50	55	311.00
15	291.00	56	311.50
16	291.50	57	312.00
17	292.00	58	312.50
18	292.50	59	313.00
19	293.00	60	313.50
20	293.50	61	314.00
21	294.00	62	314.50
22	294.50	63	315.00
23	295.00		
24	295.50		
25	296.00		
26	296.50		
27	297.00		
28	297.50		
29	298.00		
30	298.50		
31	299.00		
32	299.50		
33	300.00		
34	300.50		
35	301.00		
36	301.50		
37	302.00		
38	302.50		
39	303.00		
40	303.50		

Some marine beacons are still in operation, especially in countries like Spain and Italy. Recent changes suggest that the Spaniards are getting ready to close down their beacons soon in favour of DGPS, and we now have confirmation that the Italian Marine beacons will close down on the 1st of January 2003! :-(

NOTE#:

Although the channels listed above were allocated for the use of Marine Beacons, it was not uncommon to find a number of Aeronautical Beacons operating in that section of the band. Now that many of the Marine Beacons have gone and DGPS beacons dominate it's easy to forget that the Aero beacons are still there, and even a few Marine Beacons still survive in Spain and some of the East European countries. The next section details with DGPS Beacons, and you will find more information about how they operate and where they can be found there.

SECTION TWELVE: LIST OF RADIOBEACONS IN THE BRITISH ISLES:

WARNING: The information provided in this list is given purely for the use of radio enthusiasts, and it goes without saying that this list should not under any circumstances be used for navigation purposes. Only official publications such as '**AERAD**', or '**RAF EN ROUTE SUPPLEMENTS**' should be used for this purpose since these are more likely to be up to date and show any recent changes. As far as I'm aware all the information given below is reasonably accurate at this time (September 2002), but as is often the case with beacons, they do come and go, and frequency and callsign changes are an all too regular occurrence. Corrections and additional information to add to the list will be most welcome.

UNITED KINGDOM AEROBEACONS:

All beacons are Non A2A mode and 400 Hz offset unless otherwise indicated.

kHz:	CALL:	LOCATION:	COUNTRY:	HOURS:	CO-ORDINATES:	
277.0	CHT	Chiltern	England	H24	N5137.4	W00031.0
282.0	LA	Lyneham	England	H24	N5130.5	W00200.3
315.5	SS	Scatsta	Scotland	HV	N6027.7	W00112.8
316.0	BRR	Barra	Scotland	H24	N5701.6	W00727.0
316.0	EPM	Epsom	England	H24	N5423.6	W00738.6
320.0	CAE	Caernarfon	Wales	HV	N5306.0	W00420.3
320.5	SWN	Swansea	Wales	HV	N5136.1	W00403.9
321.0	STM	Scilly Isles	England	HV	N4954.8	W00617.4
322.0	LCY	London City	England	H24	N5130.2	E00004.1
323.0	SBL	Sherburn-in-Elmet	England	HV	N5347.4	W00112.4
323.0	WPL	Welshpool	Wales	HV	N5237.8	W00309.2
325.0	AC	Glasgow	Scotland	H24	N5548.9	W00432.5
325.0	BAE	Manchester (Barton)	England	H24	N5328.2	W00223.2
325.0	OF	Filton	England	HV	N5131.3	W00235.3
327.0	TNL	Tatenhill	England	HU	N5248.6	W00145.7
328.0	BLK	Blackbushe	England	H24	N5119.4	W00050.6
328.0	CL	Carlisle	England	HV	N5456.4	W00248.2
328.0	HAV	Haverfordwest	Wales	HV	N5149.9	W00458.0
328.5	EGT	Derry (Eglington)	N.Ireland	HV	N5502.7	W00709.3
329.0	JW	Jersey	Channel Isles	H24	N4912.4	W00213.3
330.0	SBY	Strubby	England	HU	N5218.0	E00011.0
331.0	GST	Gloucestershire	England	HV	N5153.5	W00210.0
331.0	GLW	Glasgow	Scotland	H24	N5552.2	W00426.0
332.0	OY	Belfast (Aldergrove)	N.Ireland	HV	N5441.6	W00605.1
332.0	SHM	Shoreham	England	HV	N5049.9	W00017.8
332.5	CAM	Cambridge	England	H24	N5212.6	E00011.1
333.0	PH	Penzance Heliport	England	HV	N5007.7	W00531.0
333.0	SMF	Sheffield Airport	England	H24	N5323.6	W00123.0
335.0	WCO	Westcott	England	H24	N5151.1	W00057.6
336.0	AQ	Aberdeen	Scotland	H24	N5708.3	W00224.2
337.0	EX	Exeter	England	HV	N5045.1	W00317.6

337.0	WTN	Warton	England	HV	N5345.1	W00251.1
338.0	GE	London Gatwick	England	H24	N5109.8	W00004.0
339.0	BIA	Bournemouth	England	HV	N5046.6	W00150.5
339.0	LNS	Longside (Peterhead)	Scotland	new - expected on air late 2002		
340.0	HAW	Hawarden	Wales	H24	N5310.7	W00258.7
340.0	LSH	Lashenden (Headcorn)	England	HV	N5109.3	E00038.9
341.0	EDN	Edinburgh	Scotland	H24	N5558.7	W00317.0
341.0	PMB	Pembrey	Wales	HU		
342.5	NWI	Norwich	England	HV	N5240.6	E00117.6
343.0	RDL	Redhill	England	HV	N5112.9	W00008.2
343.0	YVL	Yeovil (Westland)	England	HV	N5056.5	W00239.8
344.0	WCK	Wick	Scotland	HV	N5826.8	W00303.7
345.0	LUT	Luton	England	H24	N5153.6	W00015.0
347.5	TD	Teeside	England	HV	N5433.6	W00120.0
348.0	ATF	Aberdeen	Scotland	H24	N5704.7	W00206.3
348.0	FOS	Fairoaks	England	H24	N5120.8	W00033.7
349.5	COM	Compton Abbas	England	H24	N5058.0	W00209.1
349.5	LPL	Liverpool	England	H24	N5320.4	W00243.4
350.0	GLG	Glasgow	Scotland	H24	N5555.5	W00420.0
351.0	SBH	Sumburgh	Scotland	HV	N5953.0	W00117.6
352.0	NT (ex NEW)	Newcastle	England	H24	N5503.0	W00138.5
352.0	WOD	Woodley	England	H24	N5127.2	W00052.7
353.5	EME	East Midlands	England	H24	N5250.0	W00111.6
355.0	PIK	Prestwick	Scotland	H24	N5530.4	W00434.6
356.0	WBA (ex HG)	Wolverhampton	England	H24	N5231.0	W00215.6
356.5	SM	St Mawgan	England	HU	N5026.5	W00459.4
357.0	IOF	Flotta	Scotland	H24	N5849.8	W00308.6
357.5	EKN	Eniskillen (St Angelo)	N.Ireland	H24	N5423.6	W00738.6
358.0	SG	Sturgate	England	HU	N5322.85	W00041.02
359.0	RWY	Ronaldsway	Isle of Man	HV	N5405.1	W00436.4
361.0	GRB	Guernsey	Guernsey	HU	N4926.1	W00238.0
362.5	SND	Southend	England	HV	N5134.6	E00042.1
363.5	CT	Coventry	England	HV	N5224.7	W00124.3
364.5	DO	Dounreay (Thurso)	Scotland	H24	N5834.9	W00343.6
365.0	GY	London Gatwick	England	H24	N5107.8	W00018.9
365.0	KIM	Humberside	England	HV	N5334.4	W00021.1
366.5	CAR	Carnane	Isle of Man	HV	N5408.4	W00429.4
367.5	OX	Oxford	England	H24	N5149.9	W00119.3
368.0	UW	Edinburgh	Scotland	H24	N5554.3	W00330.1
368.5	WHI	Whitegate	England	H24	N5311.1	W00237.3
369.0	RCH	Rochester	England	HV	N5121.2	E00030.0
370.0	KS	Kinloss	Scotland	HU	N5739.0	W00335.1
370.5	AP	Aberporth	Scotland	H24	N5207.0	W00433.6
371.5	NH (NL soon?)	Norwich	England	HV	N5240.7	E00123.2
372.0	BV	Brough	England	HV	N5343.5	W00034.8
374.0	CBN	Cumbernauld	Scotland	H24	N5558.5	W00358.4
376.0	TL	Lerwick (Tingwall)	Scotland	H24	N6011.3	W00114.7
378.5	NN	Northampton	England	H24	N5217.8	W00047.8
380.0	BRI	Bristol	England	H24	N5122.8	W00243.0
380.0	CBL	Campbeltown	Scotland	H24	N5525.8	W00539.0
380.0	WFD	Woodford	England	H24	N5320.2	W00209.4
382.0	SLP	Sleap	England	H24	N5250.0	W00246.3
383.0	ALD	Alderney	Channel Isles	H24	N4942.6	W00211.9
383.0	SHD	Scotstownhead	Scotland	H24	N5733.6	W00148.9
383.5	LE	Leicester	England	H24	N5236.4	W00102.0
385.0	WL	Barrow (Walney Isl)	England	HV	N5407.6	W00315.8
386.0	BZ	Brize Norton	England	H24	N5144.9	W00136.0
388.5	CDF	Cardiff	Wales	H24	N5123.6	W00320.2
390.0	BFD	Broadford	Scotland	HU	N5715.1	W00549.3
390.5	WS	Weston	England	HU	N5120.3	W00256.2
391.5	BOU	Bourn	England	H24	N5212.6	W00002.6
391.5	EAS	Southampton	England	HV	N5057.3	W00121.3
393.0	EMW	East Midlands	England	H24	N5249.7	W00127.2

394.0	DND	Dundee	Scotland	H24	N5627.3	W00306.8
395.0	KW	Kirkwall	Scotland	HV	N5857.6	W00254.6
395.0	LAY	Islay	Scotland	HV	N5541.0	W00614.9
396.5	PY	Plymouth (City)	England	HV	N5025.4	W00406.7
397.0	LYX	Lydd	England	HV	N5058.2	E00057.3
399.0	NGY	New Galloway	Scotland	H24	N5510.6	W00410.0
401.0	FNL	Fenland	England	HV	N5244.5	W00001.6
401.0	BBA	Benbecula	Scotland	HU	On air June 2004	
402.0	GO	Fife	Scotland	H24	N5611.0	W00313.1
402.5	LBA	Leeds Bradford	England	H24	N5351.9	W00139.1
404.0	CNL	Connel	Scotland	H24	N5627.0	W00524.0
406.0	BHX	Birmingham	England	H24	N5227.3	W00145.1
416.0	WZ (withdrawn)	Newcastle	England	H24	N5500.4	W00148.4
417.0	ND	G.Yarmouth (N.Dene)	England	HV	N5238.1	E00143.7
419.0	LSO	Lee-on-Solent	England			
420.0	BPL	Blackpool	England	HV	N5346.4	W00302.0
420.0	HB	Belfast (City)	N.Ireland	HV	N5436.9	W00552.7
421.0	BUR	Burnham	England	HU	N5131.1	W00040.6
423.0	CWL	Cranwell	England	HV	N5301.8	W00029.1
424.0	HRW	London (Heathrow)	England	H24	N5128.7	W00027.5
426.0	IW	Bembridge	England	HV	N5040.8	W00106.2
426.0	PW	Prestwick	Scotland	H24	N5532.7	W00440.8
426.0	SH	Shobdon	England	H24	N5214.7	W00252.5
428.0	MCH	Manchester	England	H24	N5321.2	W00216.2
429.0	SSD	Stansted	England	H24	N5153.7	E00014.7
430.0	NOT	Nottingham	England	HV	N5255.3	W00104.7
431.0	SAY	Stornaway	Scotland	HV	N5812.9	W00619.5
433.5	HEN	Henton	England	H24	N5145.5	W00047.3
545.0	LIC	Lichfield	England	H24	N5244.8	W00143.1
850.0	CIT	Cranfield	England	HV	N5207.8	W00033.4

REPUBLIC OF IRELAND AEROBEACONS:
All Non A2A unless otherwise indicated.

kHz:	CALL:	LOCATION:	TYPE:	HOURS:	CO-ORDINATES:	
316.0	OE	Dublin (A2A)	LOM	H24	N5325.8	W00625.7
321.0	CRN	Galway (Carnmore)	NDB	H24	N5318.1	W00856.5
326.0	RSH	Dublin (Rush)	NDB	H24	N5330.7	W00606.6
330.0	NSM	Inishmaan	NB	HU	N5305.5	W00934.2
334.0	GMN	Gormanston	NDB	H24	N5338.9	W00613.5
334.0	KER	Kerry	NDB	H24	N5210.9	W00931.4
339.0	OL	Shannon	LOM	H24	N5244.9	W00849.4
343.0	OC	Cork	LOM	H24	N5154.3	W00831.7
352.0	ENS	Ennis	NDB	H24	N5254.3	W00855.6
361.0	CFN	Donegal (Carrickfin)	NDB	H24	N5502.6	W00820.4
362.0	OB (1020 Hz)	Cork	LOM	H24	N5145.3	W00826.4
364.0	KNK (1020 Hz)	Connaught	NDB	H24	N5353.8	W00856.2
368.0	WTD	Waterford	NDB	H24	N5211.3	W00704.9
378.0	KLY	Killiney	NDB	H24	N5316.2	W00606.3
381.0	CBR	Castlebar	NDB	HU	N5350.9	W00916.8
384.0	SLG	Sligo	NDB	H24	N5416.7	W00836.0
387.0	CML	Clonmel	NDB	H24	N5227.2	W00728.8
395.0	FOY	Foynes	NDB	H24	N5234.0	W00911.7
397.0	OP	Dublin (A2A)	LOM	H24	N5324.8	W00608.3
398.0	OK (1020 Hz)	Connaught	LOM	H24	N5355.4	W00842.0
402.0	FNR	Bundoran	(Irish military NDB)			
407.0	GAR	Dublin (Garristown)	NDB	H24	N5331.7	W00626.8

Since early 1999 no Marine NDBs are left in operation in the United Kingdom and Republic of Ireland. There are now just a small number of higher-powered DGPS beacons in service, and a list of these is included in the next section.

SECTION THIRTEEN: A GUIDE TO DIFFERENTIAL GPS (DGPS) DXING:

Differential **GPS** systems are used to help overcome the limitations in the accuracy of conventional **GPS** systems. By using a fixed reference point as a comparison, and comparing this with positions obtained from a conventional **GPS** receiver, a more precise and accurate reading can be obtained by the user. A hand held GPS receiver may be fine if you are on land, but if you're a mariner trying to navigate your way around a rocky Coast an error of 50 feet can be life threatening!

Of course that is a greatly simplified summary of what is a fairly complex system, for most beacon enthusiasts all you will be aware of is hearing a sound that resembles a RTTY/Navtex signal, and appears at various points on the band between 283.5 and 325 kHz. These signals can be found on the channels listed in the Marine Beacon Bandplan in Section Nine (some parts of the world outside Europe also use 315 to 325 kHz), and as more and more countries close down their Marine Beacon systems these will eventually be the only signals heard in that part of the band (with the exception of a number of aeronautical beacons still operating there) DGPS beacons are heard using **G1D** modulation with Minimum Shift Keying **(MSK).**

In the UK there are several companies providing a **DGPS** service, and many of these used to require special receiving equipment, since the signals were encrypted. During 1998 a number of them were unencrypted and it is now possible for enthusiasts with suitable decoding equipment to take usable (and dxable) idents off them. Until recently the only readily available decoding programme, which was available and cost effective enough for the Dxer to use was the 'Radio Raft' programme. This multi-mode decoding software included the facility for DGPS decoding, and even though it required the use of a Hamcomm type interface and a computer capable of running DOS programmes (a fairly basic older PC with Windows 95/98 was ideal for this task), it was better than nothing. I invested in a copy of this software, and during the past three years had quite a lot of fun with it. I have included more information about my experiences with this software below and details of where you can obtain it in the Datafile section. In late 2003 though a development took place which has made DGPS decoding a much simpler task, and will work with most versions of Windows, and with nothing more than a lead to the line input on the PC's sound card – this is the **"Skysweeper"** programme, and I will give a good rundown of just what this new programme can do in a later section.

With programmes like these available there is no reason for not giving this mode a try, these new types of beacons are here to stay, and we might just as well make the most of them.

DGPS - QRM OR A NEW FORM OF DX?

After several years of cursing the sound of the DGPS signals as irritating QRM, which was spoiling my chances of hearing the few remaining marine and aero beacons in this part of the band, I finally gave in and decided to try and see if this mode was worth decoding. I have long been interested in data modes, and have often used various software and hardware decoders to do this, but nothing I had was capable of decoding DGPS and so I hadn't taken too much notice of it. After seeing various logs posted on the WUN reflector, and then reading all of the interesting articles on this subject at Klaus Betke's excellent website, I thought that it was perhaps time to try out the RadioRaft 3.2 programme and see for myself what it was all about. Klaus did give some very good information about how to build a hardware decoder at his website, but due to other commitments Klaus is no longer able to maintain his site, and the data is no longer available for download. Until recently RadioRaft was the only cheap and easily obtainable programme available for radio enthusiasts, and before we look at the newer and more sophisticated Skysweeper software, let's take a look at the results obtained using RadioRaft during the past several years.

Where to obtain RadioRaft: Free 'trial' versions of the programme can be downloaded from various websites (see Datafile, and list of URLs later in this section), and these free versions will work with certain data modes but unfortunately DGPS is not one of them. RadioRaft is basically a DOS programme which requires a Hamcomm type interface, though with the downloading of a small additional .pif file from the RadioRaft website, this can be easily run from an icon on your Windows desktop (Windows 95/98). I purchased a registered copy from the Pervisell website (only the registered version will decode DGPS), and duly installed it as per instructions. It took a little while to get used to it, but after printing out the 30+ pages from the help file I had a reasonably good instruction manual to work with, and soon got familiarised with the controls. Keen to see what a DGPS signal looked like, I quickly tuned one of the strong 'locals' in, and then left the programme in its 'auto search' mode. After a few seconds up popped the following message in the format shown below:

```
------------------------------ Msg:9 ------------------------------
   Ref.Id:682  Z:46:43.8  Seq:2  Length:5  Health:0
   Data: 7DFD85 F6841C {Err}
------------------------------ Msg:9 ------------------------------
   Ref.Id:682  Z:46:48.0  Seq:4  Length:5  Health:0
   Data: 14FB9E 020702 FE2F00 {Err}
------------------------------ Msg:9 ------------------------------
```

At first glance this might look like gibberish, but for the dxer the important bit here is the Ref.Id number, which in the above example is '682'. A look at the chart below shows that this belongs to Point Lynas in Anglesey, North Wales, and the closest beacon to my home location. Working out the IDs from the available lists can be a bit challenging at first, mainly because some show several different numbers, and it's not always apparent which is the correct one. To overcome this, a good list and a little common sense are required, and matching the frequencies with the Ref.Id should come up with the right answer very quickly.

Having got the thing to work my next thought was "are these dxable, or am I only going to hear the same ones every time I tune in"? Well after eighteen months of use I think they are definitely dxable, and they seem to suffer the same nightly changes and variations in propagation as any other type of beacon. For example, on some nights I was hearing mainly Spanish and French idents, but on others very few of these were audible, and many of the Scandinavian DGPS idents were heard instead. I'm still very much a novice at this mode, but with the winter DX season getting into full swing and static levels dropping, I was very keen to see if reception of any of the Trans Atlantic DGPS beacons was possible. Early on the morning of the 5th of January 2002 the K Index was low, and conditions towards North America were excellent. With over 20 Canadian NDBs audible on the band, this I thought, seemed like the perfect time to put the theory to the test, and I'm pleased to say that I wasn't disappointed. Sure enough, the most easterly of the Canadian DGPS beacons at Cape Ray on 288.0 kHz was successfully decoded here in northwest England:

Date:	Saturday 5th of January 2002:	Time:	0453 utc	KHz:	288.0
Station:	Cape Ray, Newfoundland, Canada.	Ref ID:	340/942		

```
------------------------------ Msg:9 ------------------------------
   Ref.Id:340  Z:7:15.0  Seq:1  Length:5  Health:1
   Data: 1BFFC5 02100F {Err}
------------------------------ Msg:7 ------------------------------
   Ref.Id:340  Z:7:16.2  Seq:2  Length:9  Health:0
   Lat:17340  Long:54752  375 Km  290.0 kHz  R/beacon operation normal
   Tx.Id:942  200 Bauds MSK asynchronous  No added coding {Err}
------------------------------ Msg:9 ------------------------------
   Ref.Id:340  Z:7:18.0  Seq:3  Length:5  Health:3
   Data: 1A010B {Err}
------------------------------ Msg:9 ------------------------------
```

On first look the above data was a little puzzling, it shows the frequency as 290.0 kHz. On further checking it was noted that this beacon had been on 290 kHz until recently, and it appears that the operators hadn't yet got around to updating the information. I was very pleased to have received this, and hopefully with another winter approaching, and the solar cycle moving down towards solar minimum in the coming years, I will get to log quite a few more.

THE DOWNSIDE OF ATTEMPTING TO DECODE THESE SIGNALS:

So far with the aid of the nightly variations in propagation and the assistance of a good bi-directional Loop aerial, I've been able to log many of the DGPS reference IDs. One problem I have noticed though is that the high summer static levels can make this very frustrating, and sometimes you will need to sit on a channel for a long time before you get a decent decode. The other problem, and perhaps a more troubling one, is that unlike good old morse code, where the ears can be trained to hear very weak signals and can separate several beacons operating on the same channel, DGPS requires a reasonable level of signal to make the decoder even start to work. This may be less of a problem with some of the commercial 'hardware' systems, but this could well be a limiting factor when it comes to chasing DX using RadioRaft.

Only time will tell if this is so or not, and hopefully with experience I will have a much better understanding of the effectiveness of this mode for dxing. One other problem of course is the need for a PC and decoder interface, and this rules this mode out for non-PC users unless they have a dedicated hardware decoder available. On the plus side a fairly cheap 'old' PC such as a 486 can be used, and these can be picked up

for next to nothing these days, probably for less than the cost of a Hamcomm interface (unless you build your own that is!). The down side again is the need to be sure that you don't end up creating a new QRM source in your shack, and one that will be so bad it might prevent you from hearing any signals in the first place.

Other 'negative' points found with prolonged use of this programme is the lack of sensitivity (it does seem to require a high level of signal to get a lock), and the fact that I just couldn't get it to work when using a very narrow IF Filter (125 Hz) – this put me at a disadvantage when trying to decode very weak signals, something that wasn't a problem with conventional NDBs.

INTRODUCING SKYSWEEPER:

In late 2003 a very interesting development came to my attention – the well-known and very versatile "Skysweeper" decoding software produced by Skysweep Technologies, produced a new version of their programme which included a facility for decoding DGPS signals – a very welcome development!

This programme, whilst not the cheapest of options, has been arrived like the proverbial "answer to a maiden's prayers", and is now allowing many more DXers to sample this mode. "So what are the advantages of this programme over RadioRaft?" you might ask. Well apart from running in Windows and not requiring your PC to be DOS capable (good news for Windows 2000/NT/XP users), it's far more user friendly, and from my own observations, a lot more sensitive too - very important when trying to get a decode on a very weak and distant signal. Not only that, but it also decodes a whole variety of other modes too, and those of you with Amateur Licences can even use it to transmit SSTV, PSK31 and RTTY signals. As I said previously, it's not the cheapest of options (around £60 GBP, $100 US or 100 Euros for the 'Standard' version), but for the vast number of data modes it will decode (a full list is given below), it is a very good investment for any Radio Shack.

SKYSWEEPER CAPABILITIES:

Applications:
Bit Analyser
Chat
DLL
Signal properties
Recorder

Visualization:
3D FFT
EYE Diagram
IQ Constellation
Signal Statistics
SPECTROGRAM

Signal View:
SPECTROGRAM

Decoders:
ACARS
DGPS
CW
GMDSS
HELL
HFDL
HF FAX
MFSK16
MIL-ALE
QPSK
PACTOR
PSK
RTTY
SELCAL
SITOR
SKYB
SSTV
WEFAX

Filters:
Audio Expander
Equalizer
FIR filter
Frequency shift
HUM Remove
Median filter
Mixer
Noise reducer
Notch bank
Pitch

Generic Decoders:
GFSK
GMFSK
GMPSK
GMSK
GQPSK
GPAM
GPSK

Analyzer Types:
3D FFT
Auto Correlation
Bit Table
FFT / Power Spectrum
FSK Bit Analyzer
FSK Speed Analyzer
High Resolution FFT
IQ Constellation
PAM Bit Analyzer
Phase Analyzer
Signal Statistics
EYE Diagram
Histogram

Transmitters:
CW
HELL
MFSK16
QPSK
PSK
RTTY
SIGGEN
SKYB
SSTV

As can be seen from the above list, this is a very comprehensive programme, and if you are wondering whether it is worth the outlay just to decode DGPS beacons, well, I think the list of decoders gives you the answer to that. Since purchasing my copy I've had lots of fun decoding SELCAL and ACARS from the aircraft, and checking out the regular Navtex reports on 518 kHz using the SITOR function. I'm sure that one of these days I might even find enough spare time to try out a few of the other modes too, many of which I'd never heard of before!

In case you're still having doubts about whether it is worth buying, you can download a 'free' demo version (the DGPS mode will only work on short pre-recorded items in the demo mode, but will decode in 'real time' once registered!), and that should give you a better idea of whether this is something you might like to pay for. For the lottery winners out there, Skysweeper also produce a 'Pro' version, but as this is around six times the cost of the standard version I haven't yet had a chance to try it out, and can't say whether the extra features it offers are worth the extra cost. One final note; If you do decide to splash out and invest in a copy

of either versions, you will be able to receive any updates to the programme completely free of charge after registration, my copy recently offered an update from version 3.01to 3.05 and now offers a 'Hum Remover' function as well.

More information (and the free 'demo version' download) can be obtained from Skysweeper's own website, or from their UK agent Pervisell (I buy all my software from there), and their website details are given below:

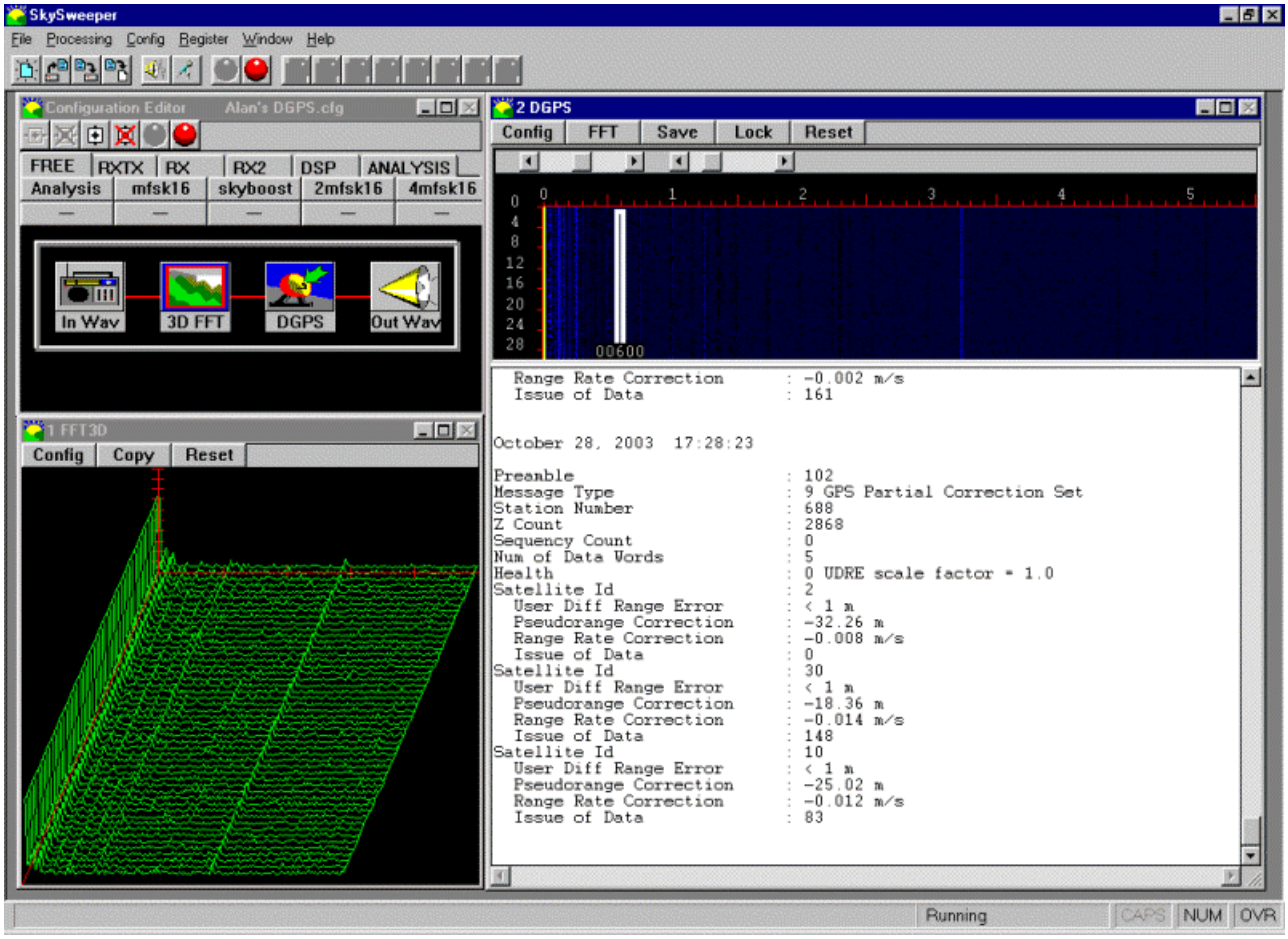
Skysweep: http://www.skysweep.com
Pervisell: http://www.pervisell.com

One final comment, before trying this software out be sure that your computer has sufficient resources to handle it, below is the minimum recommended operating requirement from the Skysweeper Help File:

-Pentium 400 MHz
-Sound Card
-30 MB of Hard Disk space
-64 MB RAM
-Windows 95;Windows 98; Windows NT, Windows 2000 or Windows XP operating systems

Skysweep Technologies are a High-Tech company based in Espoo, Finland.

Right, that's the commercial over with, now let's take a look at how the programme looks and operates:

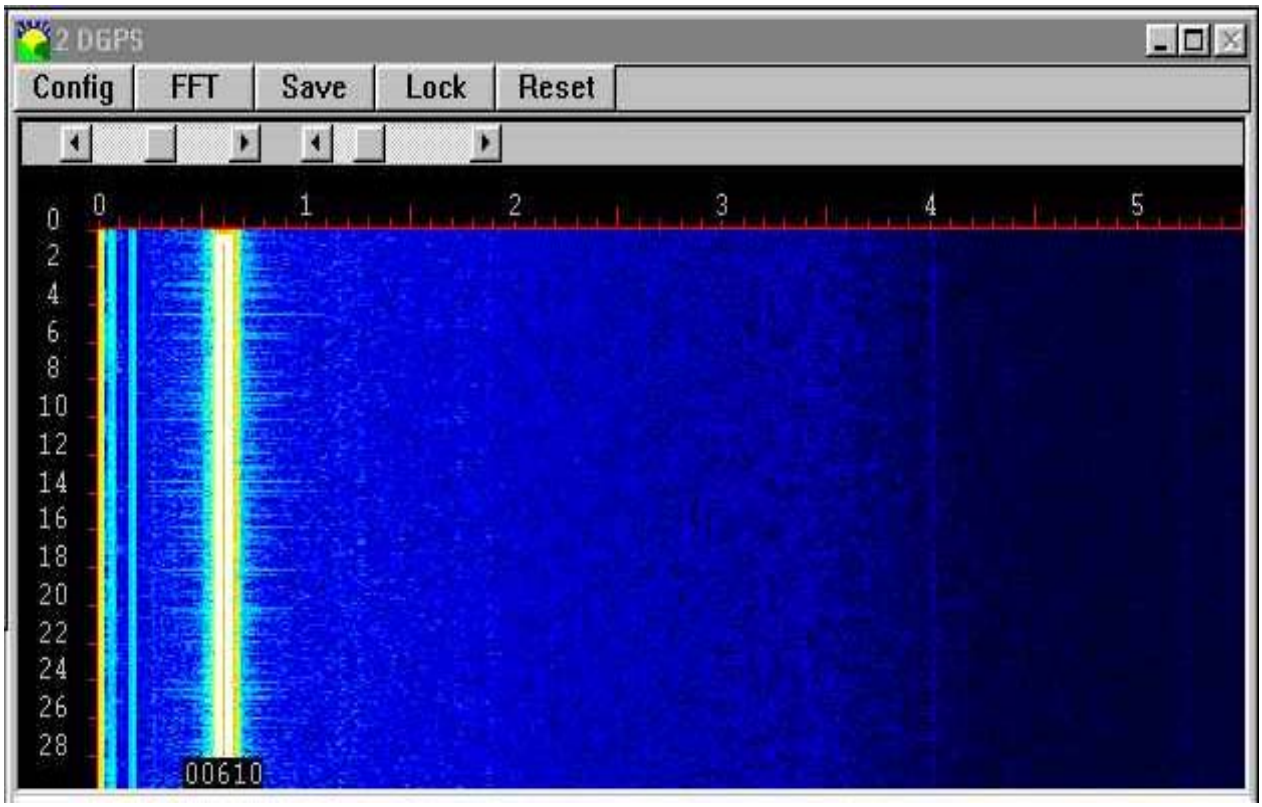


Above: This is a shot of the main Interface set in DGPS mode:

The image below shows how the programme looks when it is set to decode DGPS beacons. The window at the top right shows the 'config' panel, this is very important when first setting up the software, since it needs to be matched up with the pitch of the receiver's audio/BFO for best results. The default setting for this is

1000 Hz, but this can be easily altered by clicking on the 'config' button, and then re-setting the pitch as appropriate. In my case, I like the pitch of my CW at a slightly lower than normal 610 Hz (the common default for many radios is around 800 Hz), and below I have included an image showing the settings panel.

When you open your setup for the first time it will show 1000 Hz, a little experiment will soon have your signal traces lined up like the next image does:



If your trace shows the incoming signal markers to the left or right of the lines marked with your pitch (in my case 610 Hz), you will need to access the Config panel and make some slight adjustments (either higher or lower in frequency). I should also mention that the config panel is also used to set the baud rate to match the incoming beacon, in most cases this will be 100 bd, but there are still quite a lot of 200 bd beacons in some parts of the world, so if you're not having much luck in getting a decode try changing this setting. A lot will depend on which part of the world you are living in, but trial and error, or a good database (such as the ones to be found at the Beaconworld Download page, and listed later) will soon give you an idea of which setting is most likely to work.

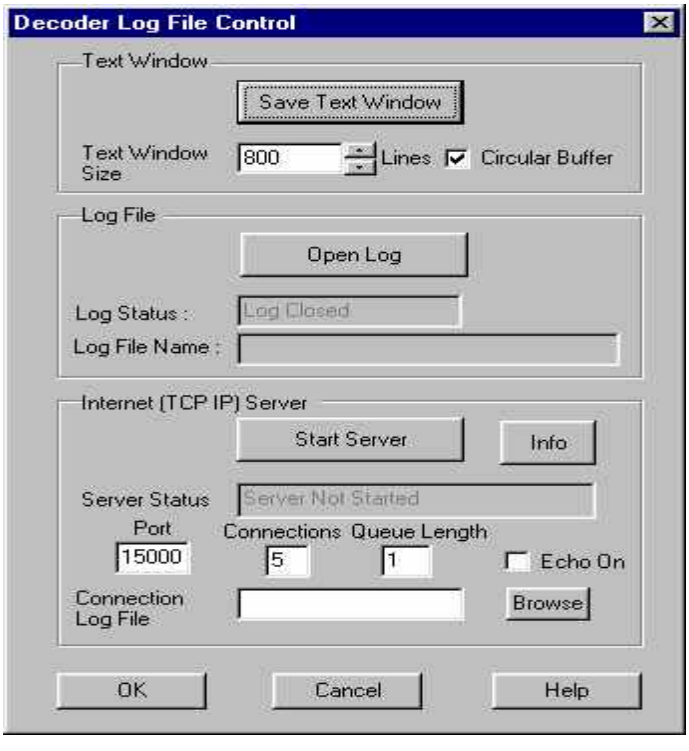
Once this is set you can 'save' your settings and give it a 'friendly' name, I just call mine "Alan's DGPS", and when I open the programme now I just click on "File" + "Open", then select the "Alan's DGPS.cfg" icon from the list, and everything is then set and ready to go. Another useful function worth mentioning is the "Save"

function box as well. This box is more or less self-explanatory, but it's worth setting this to make a copy of your results for later analysis, or for posting along with your logs. In the next paragraph we will take a look at the save text window, and take a closer look at the results we get from a decode.

Below: This is what you will see in the main window during a decoding session, or in the text file, which you have saved, and are viewing at the end of a session. There are several different message types, but the ones most commonly seen are of the message 9, or message 7 variety, and here you can see the results of a message 9 decode I made recently. The data we are most interested in here is the **'Station Number'**, this figure of **682** shows that the station being decoded is my most local beacon at Point Lynas in North Wales, and it transmits on 297.5 kHz 100bd.

```
January 15, 2004  21:37:30

Preamble                    : 102
Message Type                : 9 GPS Partial Correction Set
Station Number              : 682
Z Count                     : 3838
Sequency Count              : 0
Num of Data Words           : 5
Health                      : 0 UDRE scale factor = 1.0
Satellite Id                : 4
  User Diff Range Error     : < 1 m
  Pseudorange Correction    : -5.64 m
  Range Rate Correction     : 0.054 m/s
  Issue of Data             : 198
Satellite Id                : 1
  User Diff Range Error     : < 1 m
  Pseudorange Correction    : -6.54 m
  Range Rate Correction     : 0.054 m/s
  Issue of Data             : 10
Satellite Id                : 11
  User Diff Range Error     : < 1 m
  Pseudorange Correction    : -10.24 m
  Range Rate Correction     : 0.054 m/s
  Issue of Data             : 124

January 15, 2004  21:37:33

Preamble                    : 102
Message Type                : 9 GPS Partial Correction Set
Station Number              : 682
Z Count                     : 3845
Sequency Count              : 2
```

Right: This window allows you to save the text currently displayed in the screen, and also open a logging file, which will save all the incoming decoded text into a text (.txt) file on your hard drive.



There is also a facility for uploading the data to a server, but I haven't made any use of this facility, and can't really say too much about how it works.

My normal procedure is to click on the "Open Log" button at the start of my listening session, and leave this logging the data. Normally I would give this a file name of the current day's date – very useful when trying to find the file again some days or weeks later.

Most of the data given above is of little interest to the listener, but a good database of station numbers is, and on the next page I will list a few useful sources, where you can obtain some reasonably up to date lists to help you on your way.

DGPS MESSAGE TYPE SUMMARY:

It will quickly be noted that DGPS messages use certain “message type” numbers, below is a list of all known types, though in practice you will probably find that only a limited number are actually in use at this time.

There are sixteen message types in all:

TYPE:		DESCRIPTION:
TYPE 1 MESSAGE:	-	Now replaced by Type 9 messages.
TYPE 2 MESSAGE:	-	No longer required.
TYPE 3 MESSAGE:	-	Contains information on the identity and surveyed position of the active reference station in the DGPS station. Broadcast at H +15 & +45 mins.
TYPE 4 MESSAGE:	-	Not used.
TYPE 5 MESSAGE:	-	This message type will notify the user equipment suite that a satellite that is deemed unhealthy by its current navigation message is usable for DGPS navigation.
TYPE 6 MESSAGE:	-	Filler message, only used when no other message to broadcast.
TYPE 7 MESSAGE:	-	This message provides information of its broadcasting DGPS station and the other two or three adjacent DGPS stations. Broadcast at H + 7, then at 10 minute intervals.
TYPE 8 MESSAGE:	-	Not used.
TYPE 9 MESSAGE:	-	This message type has been selected for broadcasting pseudo range corrections instead of the Type 1 Message. Two methods of transmitting the Type 9 message are possible.
TYPE 10 MESSAGE:	-	Not used.
TYPE 11 MESSAGE:	-	Not used.
TYPE 12 MESSAGE:	-	Not used.
TYPE 13 MESSAGE:	-	Not used.
TYPE 14 MESSAGE:	-	Not used.
TYPE 15 MESSAGE:	-	Atmospheric Parameters (not yet used).
TYPE 16 MESSAGE:	-	Type 16 messages will be utilised as a supplement to the notice to mariners or shipping, regarding information on the status of the local DGPS service that is not provided in other message types. Additionally, the Type 16 Message may provide limited information on service outages in adjacent coverage areas or planned outages for scheduled maintenance at any broadcast site.

Type 9 and Type 3 messages will be the ones most frequently heard when decoding these signals. Some messages are only broadcast at specific times, so if you wish to receive them you may have to sit on a channel for some time and wait for one to come up.

A QUICK WORD ABOUT FILTERS:

One point worth a mention here is that of filtering, and by this I mane that of both the IF and Audio variety. This is very important if you are a Skysweeper user, and from my own observations I have found that too 'tight' a filter will struggle to decode many 200 baud signals. My receiver has several IF filters fitted, the narrowest of these being a 125 Hz INRAD type IF Filter. When decoding the 100 baud signals I find that this filter will usually work without any problems, and despite its high insertion loss, gives excellent separation from any nearby signals, or remaining Marine and Aero NDBs. When tuning to a 200 baud signal though no decodes could be obtained, and I had to then switch in the wider 300 Hz Collins filter. If your receiver contains some narrow IF filters it's worth trying a few experiments with local beacons of know baud rates and see which ones perform the best before you get going. If you have an audio filter of the analogue or DSP variety care should again be taken not to make the filters too narrow to allow your decoder to get a good lock. I find that a combination of both IF and audio DSP filters give excellent results, but care should be taken not to generate any 'false' signals, and I recently noticed that Skysweeper could be coaxed into doing just this if the wrong baud rate was chosen and the signal tuned slightly off frequency. Incoming signals are in Binary Code, and any mistuning that causes the signals to 'invert' will see all those 101010s turned into 010101s, along with the inverted station numbers, and some very strange coordinates. I recently managed to do this with a Norwegian beacon and instead of it reading 815 it read 518 – needless to say, any strange looking results should be treated with caution, and checked for any inadvertent inversions!

USER FRIENDLY DGPS DATABASES FOR DXERS:

To assist both aspiring, and experienced DGPS DXers, we have put a number of very useful and user friendly databases on the Beaconworld website, where these can be downloaded at any time. All these publications are completely free, and are updated as and whenever new information becomes available. These are not guaranteed to be 100% accurate, but should offer a reasonably good list to work from. I have placed a link to the page they are on, rather than the exact file, this is because the file name does change slightly whenever a new update appears, and rather than risk a broken link I would suggest just visiting the page and scrolling down to the DGPS section. The main "World" database is in the form of an Excel Database, but you will also find a frequency list in .pdf format, and an excellent database of North American DGPS beacons, which was compiled by **Andy Robins**.

http://www.beaconworld.org.uk/download.htm

FREQUENCIES & REFERENCE IDENTS:

There are a number of 'official' sites, where up to date information can be obtained, and for North American DGPS enthusiasts, two sources are well worth checking out: The first is the US Coastguard website, this is regularly updated, and not only carries a list of current DGPS Beacons, but also carries status reports and details of any new, or future planned stations.

The second one is run by the Canadian Coastguard, and also has a similar list showing which DGPS beacons they operate, and where they are located in the various Canadian provinces. To make life even easier these also include a number of maps. Other sites worth visiting are the Starlink DGPS site, this has a very useful map of current and planned US DGPS beacons and their locations, and the CSI Wireless site which has an excellent .pdf database of active DGPS beacons around the entire world. All of these can be found at the sites listed below, be sure to check them out for further information relating to this mode:

Website:	**URL:**
Canadian Coastguard DGPS:	http://www.ccg-gcc.gc.ca/dgps/main.htm
CSI Wireless (World DGPS Database):	http://www.csiwireless.ca/support/pdfs/radiolistings.pdf
IALA Website:	http://www.iala-aism.org/web/index.html
Klaus Betke's LF Website:	http://longwave.bei.t-online.de/
Radio Raft 3.2 Decoding Software	http://perso.wanadoo.fr/radioraft/
Starlink DGPS:	http://www.starlinkdgps.com/dgpsinfo.htm
Trinity House (England & Wales DGPS):	http://www.trinityhouse.co.uk/
US Coastguard DGPS Status:	http://www.navcen.uscg.gov/dgps/
WSV - German Waterways DGPS List:	http://www.wsv.de/fvt/funknavi/frequmst/fplan1.html

AND FINALLY:

Over the three years that I've been DGPS DXing I have become convinced that DGPS beacons really are a DXable mode, and not just another source of QRM. I would be very interested in hearing from any other readers who are using this mode, and hearing about your experiences. Watch out for future editions to hear what I think of its prospects for becoming a new DX mode to replace the rapidly vanishing Marine beacons.

Although it is now March 2004, and Skysweeper is set to blow away most of the opposition, I think it is well worth retaining the following RadioRaft update that appeared in the previous edition of this publication. After all, there may be many users out there who can't afford the more expensive Skysweeper, or are already using RadioRaft and are quite happy with it.

SEPTEMBER 2002 - RADIORAFT/DGPS UPDATE:

Whilst I was in the process of re-checking all of the links listed in this publication for edition 1.6, I had another look around the RadioRaft website and discovered that a new updated version 3.21 of the famous decoding programme was now available. Being a registered user these updates are free, and the little notice which read **"Version 3.21 - Improvements in DGPS and GMDSS modes" quickly** caught my eye, and made me decide to upgrade from version 3.20 just to see what these improvements might be.

I won't go into the ins and outs of how you upgrade here, this is comprehensively covered at the RadioRaft website, but I will show some examples of what the results obtained with this latest version looked like:

```
------------------------------ Msg:9 ------------------------------
   Ref.Id:682  Z:46:43.8  Seq:2  Length:5  Health:0
   Data: 7DFD85 F6841C {Err}
------------------------------ Msg:9 ------------------------------
```

In version 3.20 as can seen above, the more common 'message 9' items were displayed as shown, with each line separated by a hyphenated line. In version 3.21 the messages now appear like this:

```
MSG 9   Station 682   Z-Time 44:19.2  Sequence:1  Length:5  Health:0
Data: 05F88F EB401A FDBBE7 DF07FB DEE9DE
```

The difference may seem minimal, but the programme does seem to decode the actual time each message was received more efficiently, e.g. Z-Time 44:19.2 shows that this particular message was received at 44 minutes 19 seconds past the hour. Some other stations also showed a little more information such as frequency etc. at certain intervals, but again I will have to study this for a much longer period to find out if these patterns are peculiar to certain countries and administrations, or more generally found in transmissions.

Some other messages also carried the 'Message 3' and 'Message 1' decodes as well, and below are a few more examples:

```
MSG 3   Station 670   Z-Time 25:12.6  Sequence:7  Length:4  Health:0
Station coordinates (mtrs):  X= 3604060.89  Y= -522522.52  Z= 5218824.54
```

```
MSG 1   Station 460   Z-Time 42:24.0  Sequence:1  Length:14  Health:0
Data: 01FB8B F91A05 FC55F6 0C06FE E1F939 11FBCB F82616 FBBBFA
Data: BB18FD 00F804 19FE23 FA5A1E FE5AF9 25AAAA
```

Probably the most interesting message was this 'Message 7' sent by Station No. 693, a new station located near Stirling in Scotland, which opened in 2001:

```
MSG 7   Station 693   Z-Time 30:43.2  Sequence:4  Length:12  Health:0

  Position: 56ø04'38.1" North   04ø03'13.8" West
  Range: 370 Km  Frequency: 285.5 kHz  R/beacon operation normal
  Tx.Id: 443  100 Bauds  MSK asynchronous  No added coding

  Position: 57ø08'45.0" North   02ø02'36.2" West
  Range: 277 Km  Frequency: 297.0 kHz  R/beacon operation normal
  Tx.Id: 446  100 Bauds  MSK asynchronous  No added coding

  Position: 55ø16'50.2" North   08ø14'41.9" West
  Range: 370 Km  Frequency: 288.5 kHz  R/beacon operation normal
  Tx.Id: 435  100 Bauds  MSK asynchronous  No added coding

  Position: 53ø25'25.1" North   04ø17'04.3" West
  Range: 277 Km  Frequency: 297.5 kHz  R/beacon operation normal
  Tx.Id: 442  100 Bauds  MSK asynchronous  No added coding
```

The four TX Ids: shown in the list above are:

443	Stirling	Scotland
446	Girdle Ness	Scotland
435	Tory Island	Ireland
442	Point Lynas	Wales

At first look I thought this was a list of DGPS beacons operating in the northern part of the UK and Irish Republic, but there are other beacons in the Scottish Islands, which aren't included. I will need to monitor for a much longer period and see how often and how regularly "message 7s" appear.

Below are some more of the messages received with the new version, if you are already using an older version of RadioRaft you might well like to consider upgrading to the new version 3.21.

```
MSG 1   Station 460   Z-Time 52:46.8  Sequence:3  Length:17  Health:0
Data: 07F88B 15DD08 FAD917 CF09FB D315D2 0AFAB9 17E70F FA9E16
Data: 1C12FC 5E17EA 17FD97 16621A FE0A16 E41CFD B3162A 1DFDEE
Data: 18D4AA

MSG 3   Station 460   Z-Time 53:00.0  Sequence:6  Length:4  Health:0
Station coordinates (mtrs):  X= 4141610.79  Y= -128560.95  Z= 4832821.76

MSG 9   Station 425   Z-Time 30:25.2  Sequence:4  Length:5  Health:0
Data: 17FF5A 006332 FFEEFF EB29FF 6400D3

MSG 9   Station 670   Z-Time 22:36.0  Sequence:1  Length:5  Health:0
Data: 06FED0 023905 FCA502 0C0EF9 58002B

MSG 9   Station 665   Z-Time 37:18.0  Sequence:7  Length:5  Health:0
Data: 05FBDC F30C1E FE8AF1 2501FC 2CEF1A

MSG 9   Station 428   Z-Time 38:37.2  Sequence:7  Length:4  Health:0
Data: 11FD3C 022621 FD4A00 1AAAAA

MSG 9   Station 684   Z-Time 39:36.0  Sequence:5  Length:5  Health:0
Data: 16FC97 08BB1E FEA005 2511FA B70626

MSG 1   Station 813   Z-Time 43:46.8  Sequence:0  Length:14  Health:0
Data: 21FE90 E41A38 00470B 043E00 C4F925 060130 093939 005FFB
Data: 5A2AFD F9119A 25FEF1 FE0C36 FE4508 BBAAAA

MSG 9   Station 425   Z-Time 47:25.2  Sequence:2  Length:5  Health:0
Data: 18FEFE 010425 FE2F00 0C31FD CA0226
```

More on this subject in future editions, when I've had more time to explore Skysweeper's abilities!

SECTION FOURTEEN: FROM THE BOTTOM TO THE TOP - HF BEACON DXING:

We all like chasing the NDBs on LF and MF, and that's why we're here isn't it? But there is life outside this range and beacons do exist on the HF bands too, and these can be just as much fun chase after and get into your log. If you are fed up with just hearing the usual daytime 'locals' and want to try something different, you can take a break from digging around at the bottom end of the spectrum and try taking a look at what goes on up at the top instead. This needn't affect your more usual NDB chasing habits, and can be the perfect filler for the times of the day when the LF band isn't performing at its best. Unlike LF, which is generally at its peak during the solar minimum years, the higher HF bands such as 28 MHz are at their peak at Solar Maxima (now), and things will not remain this good for more than a couple of years!

WHAT TYPE OF BEACONS EXIST ON HF THEN?

Well the simple answer to this question is many different ones, some are Amateur in origin, some probably of a military nature (SLHFMs - Single Letter HF Markers), and of course the very wide range of airport and airfield navaids, which are used by the civil and military aviation authorities as part of the overall system which includes NDBs. Since the subject of CLE 20 is mainly Amateur Propagation Beacons, let's take a look at what these are, and where they can be found.

AMATEUR PROPAGATION BEACONS

There are a great many of these in operation, and they can be found on many of the bands, both at HF, and on the much higher VHF, UHF and even SHF frequencies - in fact, the highest one shown in my list is operating on 76032.895 MHz, or 76 GHz to be more exact! Now I'm not suggesting that many people will be wanting to listen up in this part of the spectrum - even if you did you'd probably have to build your own gear and put a beacon at the end of your back garden so that you had something to listen to - but I'm really just highlighting that beacons do exist in all kinds of weird and wonderful places.

More realistically, the amateur beacons that you might want to listen to are more likely to be found on bands from about 1.8 MHz (160 metres) up to 50, 70 or 144 MHz (6, 4 and 2 Metres). The basic reason for having these propagation beacons is to help radio hams work out what parts of the world (or countries) are currently propagating in your direction, and to give you some idea of what countries you might be able to hear or contact - no point in looking for stations in Australia if there isn't a propagation path between your QTH and that country is there?

Amateur beacons come in various formats, there are the internationally co-ordinated beacon chains (IBP) which time share a single frequency and operate to a fixed schedule, and a good example of these are the International Beacon Chains run by the IARU (International Amateur Radio Union) and NCDXF (Northern California DX Foundation), and the ITU experimental beacons LN2A and VL8IPS. Usually these will run a fairly high level of power (several kW in the case of the ITU beacons, and varying power levels of 100, 10, 1, 0.1 watts in the case of the IARU/NCDXF chains).

There are also a large number of 'private operator' beacons, most of which are generally run by a 'Ham', or Amateur club or organisation for the purposes of propagation research, or an interest in knowing where their signals can get to at various times of the day or night, and under widely differing band conditions. The power levels for these can vary greatly, but in general power levels will be less than 25 watts, with just 1 or 2 watts erp not being uncommon, some are genuine 'QRP' at power levels of just 100 or 200 milliwatts. As you can see, hearing beacons at these power levels can be quite a challenge!

Private operator beacons can be found all over the world, but the vast majority of these will be found at locations throughout North America, and the reason for this is that the licensing conditions in the USA and Canada which permit individuals to do this. The situation in many European countries is very different, and someone wanting to do this will probably have to apply for a special licence or callsign and go through a certain amount of red tape. In the UK for example, individual 'unattended' beaconing is only permitted on bands above 70 MHz (4 Metres). It's difficult to give an exact figure for the number of ham beacons which are currently operating, some run 24 x 7 for years, whereas others can be transitory in nature, and only operated on certain days or at certain times of the year. Some operators will switch their beacons off when operating on other bands to avoid QRM or breakthrough problems, whilst others will just switch them on when the fancy takes them. This may sound a little chaotic, but in reality it makes the chase that little bit more interesting since you never know what will turn up the next time you tune in.

Just as an example though, my personal HF beacon log shows that I've heard over 240 beacons in the last 3 years - not all at the same time thankfully, but it does show that there is no shortage of targets, and there are still many left that I haven't yet managed to hear, and new ones coming on air all of the time. What's more, if you like to collect QSL cards you will have a very good chance of getting one from a radio ham - they all know what a QSL card is for!

After you've worked your way through all of the HF beacons don't despair, there are plenty more VHF beacons on the 6 & 4 Metre Bands to go after. This can be more difficult due to the very different types of propagation that occur on these bands, but that again can make it all the more interesting for you. At this stage of the sunspot cycle it is not unusual for F2 propagation, the type that gives us the very long distances on the shortwave bands, to reach up above 50 MHz and bring in beacons from very far away during the winter months. In the summer months Sporadic E openings frequently abound, and hearing beacons from 1 or 2 thousand kilometres away won't be all that unusual. With other more exotic modes such as backscatter, meteor scatter, and auroral reflection to add to the fun you will probably find that there are a lot of countries and loggings in your personal logbook (and quite a few QSL cards) after doing this for just 12 months or so.

PROPAGATION

Unlike the LF bands, which propagate all year round and generally just become difficult to use in the summer months because of high static levels, the higher bands such as 28 MHz have specific propagation patterns. For example, the (roughly) 11 year sunspot cycle produces more sustained F2 openings (signals reflected from the F2 Layer, often with skip distances of 4000km+) on almost every day between the months of September and April at Solar Maximum, though this figure can be reduced to just one or two days (or even none) at Solar Minimum. In the summer months Sporadic E openings can be an almost daily feature at any stage of the solar cycle, and the closer (1000 to 2000 km) distant beacons which are generally not heard by F2 are often only heard via this propagation mode, and usually at very high signal strengths and for varying durations.

At the moment (early 2002) we are at Solar Maximum, and currently enjoying excellent reception of even very low powered (QRP) beacons of less than 1 watt erp at distances of around 4000 miles on 28 MHz. This constant change and variation can bring in a lot of new challenges, and this also adds to the fun of HF beacon chasing, as well as teaching you a lot about how HF propagation works.

As a rough guide to what you might hear, below is a description of a typical day's propagation:

At frequencies as high as 28 MHz the band is more of a 'daylight' band, and most signals will be heard during periods of local daylight, or during the several hour period just after darkness falls. Signals can occasionally heard later at night, but these openings are usually down to exceptional propagation modes such as Auroral or Sporadic E. Propagation varies greatly on these bands depending on which parts of the world are currently in daylight and darkness.

For European listeners, early mornings will see a path of daylight to the east, and this can produce 'short path' openings to Japan, Australia and other parts of the Far East. From late afternoon the path of daylight will be to the west and more North and South American stations will be heard. Sometimes in the early evenings (especially at this time of year), a path of daylight to the west can stretch from Europe, across North America, and right across the Pacific to Australia, signals travelling this route are known as 'long path' openings. For North America members, mornings should see 'short path' openings to Europe and the Middle East, and late evening openings to the Pacific, Australasia and Asia. Checking, or doing 'sweeps' at regular intervals throughout the day can produce lots of different paths to different locations, and this can produce many extra beacons. Lionel recently logged 90 different ones in just one day of monitoring!

WHERE TO FIND THE AMATEUR BEACONS

If you have read this far you are probably interested enough to want to hear a few of these beacons, so of course you'll want to know where to look for them won't you? Well below is a 'rough guide to HF/VHF/UHF Beacon Bandplans, tune around there and you should very soon have a few in your logbook

IARU/NCDXF Beacon Chains (International Beacon Project = IBP)

14.100 MHz (14.099 to 14.101 - reserved exclusively for beacons)
18.110 MHz (18.109 to 18.111 - reserved exclusively for beacons)
21.150 MHz (21.149 to 21.151 - reserved exclusively for beacons)

24.920 MHz (24.919 to 24.921 - reserved exclusively for beacons)
28.200 MHz (28.199 to 28.201 - reserved exclusively for beacons)

ITU Beacons

LN2A Sveio, Norway
VL8IPS Humpty Doo, Australia (now decommissioned)

5.4715 MHz	00-04 20-24 40-44 (minutes past the hour)
7.8715 MHz	04-08 24-28 44-48
10.4085 MHz	08-12 28-32 48-52
14.3965 MHz	12-16 32-36 52-56
20.9485 MHz	16-20 36-40 56-00

(all are nominal frequencies, idents are heard 1650 Hz above nominal)

28 MHz Beacon Bandplan

28.190 to 28.199 MHz Regional Time Shared International Beacon Project
28.199 to 28.201 MHz Worldwide Time Shared International Beacon Project
28.201 to 28.255 MHz Continuous Duty International Beacon Project
28.256 to 28.302 MHz (Beacons also operate within this mixed mode area)

50 MHz Beacon Bandplan

50.020 to 50.080 MHz (Exclusive)

70 MHz Beacon Bandplan

70.000 to 70.030 MHz (Exclusive)
70.030 MHz Personal Beacons (private low power unattended operating permitted within the United Kingdom)

144 MHz Beacon Bandplan

144.400 to 144.490 MHz (Exclusive)

432 MHz Beacon Bandplan

432.800 to 432.900 MHz (Exclusive)

Those are the 'official' bands shown in the International Bandplans, but there are beacons operating on many other bands such as 1.8, 3.5, 7, 10, 18 and 24 MHz as well.

BEACON IDENTS:

HF Beacons tend to identify themselves in a different way to aeronautical beacons, and in the case of Amateur beacons the operator's callsign must be included in the message. Some idents are very short - the NCDXF/IARU beacons chains just give their callsign followed by four tones of several seconds at varying power levels, 100 watts, 10 watts, 1 watt, and finally 100 milliwatts. Many of the privately operated beacons will include additional information along with their callsign, such as power output, locator square (* see footnote), name of their location, aerial type etc. Some examples of 'typical' ham beacons can be seem below:

VE4ARM sends "vvv de VE4ARM Amateur Radio Museum Austin, MB grid EN09 5W GP"

VE9MS sends "de VE9MS/B VE9MS/B FN65 K"

VP8ADE sends "VP8ADE ANTARC ----------20 second tone----------"

A look at the above idents shows that VE4ARM is a Canadian station (VE = Canada), 'MB' means that it is located in the province of Manitoba, and its Grid locator square is EN09. Power output is 5 watts, and the aerial type is a Ground Plane.

These idents will be repeated continuously in most cases, though some operators will have several messages, which are repeated in sequence, a good example is the ident formerly used by KJ7AZ, the solar powered beacon located in Wyoming:

"vvv vvv vvv de KJ7AZ solar power beacon on 28.284 at 18 wpm and 13 wpm spacing beacon"

"vvv vvv vvv de KJ7AZ co-ordinates 4147.25N 10714.56W Grid Square DN61JS altitude 6780 feet QTH Rawlins Wyoming beacon"

"vvv vvv vvv de KJ7AZ radio is a HTX100AT 5 watts. Antenna is an Altron at 29 feet. Beacon"

"vvv vvv vvv de KJ7AZ QSL Information is correct in callbooks. Active on APRS and on 28.450 W5EN mobile. End of beacon and restarting beacon"

As you can see, idents can vary greatly, but this all adds to the interest of monitoring them. The number of beacons available to be monitored will vary from day to day, and this is influenced by many factors such as time of day, time of year, and stage of the sunspot cycle. Summer months will bring in 'nearer' beacons via modes such as Sporadic E, and winter months the F2 layer will reflect signals over thousands of miles. On a typical winter's day over 60 beacon idents may be heard, and over the past four years I've logged well over 260 different ham beacons on the HF Bands!

*Note The Grid Locator system mentioned is called the 'IARU Locator System' or the Maidenhead system as it is still know in some quarters, and this is very useful in helping to work out where a beacon is coming from. Basically, the world is divided up into a series of squares each of 20° degrees longtitude (east/west) by 10° degrees latitude (north/south), these large squares are given a two-letter code consisting of pairs of letters between AA and RR. For example, My locator square is 'IO' or 'Italy Oscar', and most of the British Isles also lie within this square. The 'I' is the longtitude square, and the 'O' the latitude square, the point were these cross is in 'IO' square. This large square is again subdivided into 100 smaller squares consisting of 2° of longtitude by 1° minutes of latitude, and these are numbered from 00 to 99 starting from the south west corner. Each of these squares is again sub divided into another 100 smaller squares, and lettered from AA to XX, again starting from the southwest corner. MY QTH is situated in square 83, and block 'VP' of that square, on a suitable chart this can indicate the location of my QTH to within several hundred yards.

There are various software programmes available such as OH3NJC's Locator calculator, and this can be downloaded for free from the internet, and allows the user to insert their own grid square and the one given by the beacon to work out the distance and bearing. There are also useful 'shareware' programmes such as 'GridSquared', which are very useful for calculating Grid locations, again, typing this name into a search engine will shows lots of places where such programmes can be downloaded from.

REPORTING & QSLING:

Many listeners like to receive QSLs, and many beacon operators like to receive reception reports to find out how well their beacon is being heard and what the propagation conditions were like. But how do you go about sending reports to ham beacons?

If you are a licensed radio ham yourself you will already be familiar with what a QSL Bureau is, especially if you are a member of one of your national radio societies. You send a number of report cards or QSL cards to your outgoing QSL Bureau Manager and he will then sort these and send them to overseas radio societies along with the cards of other hams. At the receiving end these are again sorted and placed into envelopes addresses to the recipient, and when sufficient cards are received to fill this envelope it will be posted to him. This system works well and is certainly a lot cheaper than sending out individual cards direct to the beacon operator. It does have a drawback though, in some cases it can take months or even years to reach its destination, and by that time the report may be of little interest or use to the recipient. If the report is received and a card sent back through the bureau system it can again take a long time before the card gets back to the sender and this time lag does often make the whole exercise a lot less interesting.

Another problem may be that the beacon operator doesn't use the bureau, or doesn't ever receive the reports, and in that case a 'direct' report via the postal system might be the best bet. Reports can be received within a week or so, though this can prove quite expensive if a lot of reports are sent, and return

postage or a SASE has to be included. The drawback with this system is that the reporter will need either an international callbook, or access to the Internet to find out the beacon operator's address, and this can again be a time consuming and frustrating process. There is good news though, at least for people with access to the Internet. As I felt that there was a need for some sort of address list to help encourage dxers to send reports to beacon operators and one wasn't available I created one of my own. This is now updated regularly, and can be downloaded for free in .pdf format from my HF Beacons section of my website at http://www.beaconworld.org.uk/hfsite/download.html You will also find a list of 50 MHz and 70 MHz beacon addresses there too, along with links to a large number of very useful sites containing regularly updated lists of beacons, something that is essential for the dedicated HF Beacon chaser.

Thanks to the wonder of the Internet and e-mail, reports can now also be e-mailed to operators, and this is by far the fastest, cheapest and most efficient way of letting operators know that their signals are being heard. Many of the beacon operators now include an e-mail or website address in their idents, and these make it very easy for any listeners to respond to them. I have received replies within hours of sending reports using this method, and it can be a big help to the operator, especially if his/her beacon is suffering interference form another source whilst it is still happening. There is also a new service now, which allows 'electronic' QSL cards to be sent and received, and this looks like it could become more popular in the near future. You can find out more about this service and how it works from http://www.eqsl.cc

REPORTING CODES:

I'm sure beacon operators will be only to happy to receive reports from you, just be sure to add all the relevant information such as, date, time (utc), frequency, message heard, local conditions, your equipment, any interference to their signal, and propagation conditions at the time. Many hams and listeners like to use the RST Code (Readability, Signal, Tone) to send and receive reports, and other codes such as the popular SINPO, SIO and SINFO codes used by broadcast listeners aren't really suitable for this application. If you are planning to send a written report you might prefer to give a description of what the signal sounded like in plain language, but if you send QSL Cards, listener cards, or e-mail reports, you might prefer to stick with the standard RST codes.

It would be wrong of me to say that the RST codes should be used for reports to ham beacons (or any other CW station for that matter) without attempting to give an explanation of what the RST Code is, or how it works. I have included a table below showing the full RST Code, but before that a brief description of the code, how it is used, and why it is so useful, and why you might prefer to use this for your reception reports

RST - READIBILITY, SIGNAL & TONE:

If you are a CW operator the less words that you can send in a message the better. This is the reason that so much 'jargon' and so many codes are used instead of plain language, it's much easier to send the letters 'QRM' than the sentence "there is interference on your signal" - just count the dits and dahs in each and you'll see what I mean! The same goes for sending reports about signal quality - '599' says that a signal is 'perfectly readable', is an 'extremely strong signal', and has a 'pure DC note' far easier and more efficiently than the words can! The problem with such codes is knowing and remembering which is which, though if you print and cut out the table on the following page you'll at least have something you can easily refer to. For most signals the 'T' code will normally always be '9', but sometimes a beacon ident will sound a bit 'chirpy', (and you'll know exactly what that means when you hear one).

Chirp is caused by problems with the transmitter and any 'pulling' of the signal causing slight changes to the note which give it a strange chirping type sound), this can often be caused by instability in the power supply, or poor design in the transmitter, but that is far to complex a subject to go into in any depth here. For the dxer it's not always easy to work out which of the 'T' codes should be used to describe this (even hams have problems with it, personally I tend to favour 'T5 - Musically modulated note' to describe chirp, but I may be wrong). This is more of a problem for you if you're using a QSL card, which only has small 'RST' boxes to fill in, if you're writing your report in a letter just use plain language if in any doubt.

The 'R' and 'S' codes are more or less self explanatory, but it's pretty much a judgement call when it comes to assessing what the signals you are hearing should be, and if you asked several different people to describe what the RST code of particular signal was you'd probably get a lot of different answers and opinions. Please note that some radios have 'S meters' calibrated in S points, but this isn't always a good guide as many receiver manufacturers seems to have their own definition of what an 'S point' is, descriptions like "40 over 9" are okay if you are just doing signal comparisons with someone using a receiver calibrated the same way as yours is, but if you plan to use the RST Code you should base this on an 'audio report' e.g. does it sound perfectly readable and extremely strong - a signal can be R5 even if it's barely moving your 'S Meter'.

As I said previously, deciding what signal report to give is very much a judgement call, but it does get easier with experience, and that is why the RST Code shown below is such a big help.

One final point should be mentioned about the RST Code, and this is a valid one for many of the other codes and jargon used by amateurs too - 'language'! If the beacon operator, or recipient of your report doesn't speak the same language that you do a report of RST 599 will be perfectly understandable to him, whilst 'perfectly readable', 'extremely strong signal', 'pure DC note' etc. written in English may mean little or nothing to the non-english speaker. Morse code is much maligned these days, but is still far and away one of the best and most efficient low-tech data systems when it comes to making effective communication with other people, especially if those people don't speak the same language that you do.

I hope the above tutorial helps to make a little more sense of the RST code to readers, if you are still confused by it my apologies for not explaining things better! And at that point there ends this party political broadcast on behalf of the Morse code Enthusiasts Party, and here begins our look at the RST Code.

THE RST CODE

R1	Unreadable
R2	Barely Readable, occasional words distinguishable
R3	Readable with considerable difficulty
R4	Readable with practically no difficulty
R5	Perfectly readable

S1	Faint, signals barely perceptible
S2	Very weak signals
S3	Weak signals
S4	Fair signals
S5	Fairly good signals
S6	Good signals
S7	Moderately strong signals
S8	Strong signals
S9	Extremely strong signals

T1	Extremely rough hissing note
T2	Very rough AC note, no trace of musicality
T3	Rough, low-pitched AC note, slightly musical
T4	Rather rough AC note, moderately musical
T5	Musically modulated note
T6	Modulated note, slight trace of whistle
T7	Near DC note, smooth ripple
T8	Good DC note, just a trace of ripple
T9	Purest DC note

Finally, the morse idents used by beacon operators will use some punctuation or abbreviations as well as letters, and the most commonly heard ones will be for suffixes such as **'/B', '/BCN', '/Beacon'**, where an **'oblique' or 'stroke'** is inserted and this appears as **(dah-di-di-dah-dit)** . Break signs **(=)** are often used **(dah-di-di-di-dah'), AR - 'End of Message' (di-dah di-dah-dit)**, the **Comma (dah-dah-di-di-dah-dah)**, **Full Stop (di-dah-di-dah-di-dah), End of work (VA) (di-di-di-dah di-dah)**. A full list of Morse abbreviations can be found in the Morse Code section elsewhere in this publication.

SINGLE LETTER HF MARKERS:

It could be argued that these signals are not really beacons, but since they do operate in a similar way to beacons, and are a popular target for many dxers, a brief description of what these are and where they are seems like a good idea:

Not too much information appears about these signals, but they frequently crop up in the WUN Newsletter http://www.wunclub.com and I also found a website, which contains some information about these, and also lists some of the frequencies and channel designators: http://www.qsl.net/k7qo/ussr.html So what are they exactly? Well, according to popular belief, and various articles in the WUN Newsletter and on K7QO's website they are of Russian origin, and belong to the Russian military. These can be found on various frequencies between 2 and 25 MHz, and a well known cluster can often be found operating in the 7MHz amateur band around 7.039 MHz. These 'Single Letter Beacons', or 'Single Letter HF Markers' (SLHFMs) as they are now usually known, can provide a nice change for the beacon dxer who wants to look for something a little bit different.

DRIFT NET BEACONS:

These are very strange signals that have puzzled many HF beacon monitors for quite some time. Often you will be tuning across the 28 MHz beacon band when you will come across a long tone which is then followed by a two letter ident e.g. "----------AA". Sometimes these will repeat at intervals of several minutes, but their appearances can be very erratic and they're often found 'accidentally', rather than through searching for them. There doesn't seem to be a definite bandplan, but they have been heard on frequencies between 28032 and 28351 kHz.

HIFERS/MEDFERS/LOWFERS:

These beacons tend to be more of a North American phenomenon, but recently there have been several operating from Europe, and thanks to some of the more exotic very slow CW decoding programmes some of these extremely low powered signals have even been received here in Europe in the past year. Very strict restrictions, low power levels and aerial restrictions have been placed upon them, but if you'd like to look out for them they can be found on small bands of frequencies which are allocated to experimenters on an unlicensed basis. The best known of these is the **'LOWFER'** Band, which is to be found between 160 and 190 kHz, but there is also a **'MEDFER'** Band just above the Medium Wave broadcast band on frequencies between 1610 and 1710 kHz. Whether this band will survive the expansion of the AM band in North America remains to be seen. The final one, and one which I've only recently found out about is the **'HIFER'** Band, and this may well offer the best reception opportunity to dxers outside of North America. This band covers a part of the 13 MHz Band,

Lowfer Band:	160 to 190 kHz
Medfer Band:	1610 to 1710 kHz
Hifer Band:	13553 to 13567 kHz

A lot more information about these beacons can be found at "The Noise Floor", an excellent resource, which can be found at the following url: http://highnoonfilm.com/

VOR/VORTAC/DME/TACAN/MARKER & ILS SYSTEMS:

Many listeners will have an airport or small airfield not too far away from their QTH, and these can also offer a few additional navaids to look out for. If you own a scanner, or 2-metre transceiver with extended coverage which can receive the lower part of the VHF aircraft band from 108 to 118 MHz. Because of the different propagation at these higher frequencies you aren't going to hear anything like the number heard on the LF or HF bands, but you will hear some, and if you own a handheld scanner you can always take it with you on your travels and check out any airfields in the areas you are passing through. Some of these will only be heard at close range!

At certain times of the year there may be enhanced propagation caused by slow moving high pressure areas producing a 'lift' or Tropospheric enhancement, these can be very interesting, and bring in reception of some of the navaids normally well outside your usual range. As I write this we are just nearing the end of a period of enhancement, which has lasted for the best part of a week, and the barometer has rarely been below 1040mb during that time. This has produced one of the longest 'lifts' that I've heard in years, and throughout this period I've been hearing the ILS (Instrument Landing System) ident at Hawarden Airfield (EGNR) on the

Welsh border some 47 miles (75km) distant. That might not sound a lot but when you consider that an ILS signal would normally only be used by aircraft as they line up with the centre of the runway, and is usually only running in the region of 3 watts, it is certainly bordering on being classed as a real 'DX' catch! I will give a further explanation of what VOR/DME/ILS/VORTAC systems are in the next section.

THE DIFFERENT TYPES OF SYSTEMS CURRENTLY IN USE:

I briefly touched upon what an ILS system was in the previous section, and in this section I will expand on this a little, and look at which of these VHF Navaid systems might be of interest to beacon chasers:

VOR Beacons:

VORs, or to give them their full name, VHF Omni-directional Ranges, are types of radio beacons that transmit a signal containing precise azimuthal information, so that upon receiving the signal, an aircraft can tell with great precision exactly what the bearing with respect to magnetic north the aircraft lies from the station, or vice versa. Equipment in the aircraft can use this and the course alignment is considered to be excellent, with accuracy generally within plus or minus one degree.

According to many sources, a VOR beacon is much easier for a pilot to use than a NDB, and a dial in the cockpit can be set so that any deviations from the course will be indicated on it, or an audible warning produced. Since this article is about beacon dxing I don't intend to go too deeply into this subject (of which I am most definitely NOT an expert), but if you are interested in finding out more about these systems a search engine query or local library will no doubt turn up many detailed articles.

For our DX purposes the bit we are most interested in is the morse ident letters, and where we can find information that will tell us its location, and whilst the ident will be self explanatory to anyone interested in NDBs, the sources of such information may not be, and I will look at these in a later section. For anyone new to beacon chasing a VOR will generally use a three-letter ident sent in Morse code, and the letters will often have some bearing on its location. To give an example, my local 'major' airport at Manchester has a VOR with the ident of 'MCT', (the NDB ident is 'MCH') and the letters of course indicate that this is coming from Manchester International. An airline pilot flying to Manchester might well programme his flight path into his computer by using the various VOR systems, and this will recognise that a morse ident of MCT on 113.55 MHz is located at Manchester. In controlled airspace pilots will often follow the flight paths from one VOR beacon to the next, and if you listen to ATC channels you might often hear the pilot or Air Traffic Controller mention these.

Not all VORs are located at airports though, and some 'waypoint' beacons are stuck out in the middle of nowhere. My most local VOR is located at Pole Hill, and has the morse ident of 'POL' (112.100 MHz), and you will often hear pilots or ATC refer to this as "heading for the Pole", or "crossing the Pole" - in case you'd ever wondered about this it is most definitely Pole Hill in West Yorkshire, and not the North Pole they're referring to. Having walked to the top of this hill and spent a wet afternoon watching aircraft turning onto their new tracks directly overhead, I can definitely confirm that this one definitely comes into the 'remote' category!☺

VOR signals are generally thought of as line of sight, and unless you live at a good, high VHF friendly location, or like to operate portable from a local hilltop, you won't hear too many unless there is a big 'lift' in conditions. I would consider this to be a nice 'fill in' to complement NDB chasing rather than a hobby in its own right. Finally, VOR beacons operate on a channellised system, and for the benefit of anyone who might be interested, these are:

Channels: 1 (134.40 MHz to 16 (135.90 MHz) in 100 kHz steps.
Channels: 17 (108.00 MHz) to 126 (117.95 MHz) in 100 kHz steps.

Using this formula you can work out that my local VOR - 'MCT' on 113.55 MHz is on Channel 82.

TACAN - Tactical Air Navigation:

For reasons best known to the military the civil VOR/DME system was considered to be unsuitable for their use. A new navigational system called TACAN was developed by the military to fit in more readily with its military and naval requirements. The technical principles of operation of a TACAN system is considered to be quite different from those of VOR/DME facilities, but the end result as judged to be the same as far as pilot is concerned, the integrated facility is called a VORTAC.

According to the FAA (Federal Aviation Administration) Aeronautical Information Manual, a TACAN system is defined as:

b.) TACAN ground equipment consists of either a fixed or mobile transmitting unit. The airborne unit in conjunction with the ground unit reduces the transmitted signal to a visual presentation of both azimuth and distance information. TACAN is a pulse system and operates in the UHF band of frequencies. Its use requires TACAN airborne equipment and does not operate through conventional VOR equipment.

TACAN channels are listed as: Channel 18 (108.10 MHz) to Channel 119 (117.25 MHz)

ILS/DME - Instrument Landing Systems/Distance Measuring Equipment:

To a pilot ILS/DME/Markers etc. are all a part of complex instrument approach, and I'm not even going to attempt to expand on how this works, that task is way beyond my capabilities, perhaps just a very basic description would be that it's the thing aircraft use to line themselves up with the centre of the runway on approach (the Glide Path sets the angle of descent). Since it's just the morse idents we're interested in I'll just stick to what we should look out for, and we'll take a look the signals which may be picked up if you're near to an airport, or lucky enough to hear one during a 'lift'. Let's again take a look at some of the descriptions given in various articles on this subject:

A localiser transmitter operates on one of 40 ILS channels within the frequency range of 108.10 to 111.95 MHz, and is used to provide pilots with course guidance to the runway centreline. Idents are in Morse Code, and usually consist of a three-letter identifier preceded by the letter I (..) this is transmitted on the localiser frequency. As an example, the ILS at Hawarden that I heard recently has the callsign **I-HDN,** and a look at the charts for Manchester International Airport (EGCC) shows that the main runway 24/06 (this means that the runway is built at an angle of 06/240 degrees), has an ILS/DME at each end, and both are listed as operating on 109.50 MHz. Since the winds are predominantly from the west or south west Runway 24 is used the majority of the time, and when the winds are from the east Runway 06 is used. The charts show that for an approach to Runway 24 uses **I-NN**, and an approach to Runway 06 **I-MM**. These are situated near the centre of the main runway next to the **MCT** VOR, but unless you are very close to them or in a line with the ends of the runway you probably will have difficulty hearing them.

NOTE# If you are at or near the airport and have your scanner with you do take a listen for these, but if you are out wandering around near an airport, or airfield and you happen to have a scanner in your hand, please do bear in mind that with the current world situation any security staff may view you with great suspicion. Many countries have strict laws about scanner usage, and at no time should you attempt to gain access to private property without the owner's permission, and safety and security should always be your major consideration. If you are at a designated aviation viewing point or park at an airport no one is likely to bother very much, but if you are out searching for navaids please do take great care!

Information sources:

If you are interested in the navaids that operate at VHF some type of listing or information source will be a great help to you. Fortunately for us, there are plenty of 'professional' sources which, are produced for pilots, and these are often available from a number of aviation hobby sources, and can often be picked up at quite reasonable prices. Because a pilot must always have the latest and most up to date charts to ensure a safe landing and take off, and to comply with correct airport operation, charts and flight supplements can be issued on a monthly basis, and this means that there are always plenty of 2nd hand copies around which are less that a month out of date!

For my own use I like to get copies of the Aerad Flight Supplements, these are published by a UK company called "Thales Avionics Limited", and they cover the whole world in four separate volumes, all of which I am usually able to pick up for a few pounds at the aviation shop at Manchester International Airport (EGCC):

Europe & Middle East Supplement	Africa Supplement
Western Hemisphere Supplement	Asia, Australasia and Pacific Supplement

They also publish a wide range of high level, low level, and aerodrome charts and booklets, and these are a wonderful source of information for the beacon enthusiast, since they not only list the VHF navaids, but also Non Directional Beacons as well! Other very good sources are Jeppesen, who publish a wide range a similar publications, and also the United States Department of Defense, who have a mail order service which is second to none, and offer very reasonable prices even to overseas customers. My other favourite source is

the RAF AIDU, who publish their own books and charts, and unlike most of the others actually list many of the North Sea oil platform NDBs too. Buying new can be expensive, but unlike pilots we don't need to update these quite so often, so they can be quite a good investment and give the user plenty of usage.

One publication I like very much is "The Pilot's Free Flight Atlas of Europe", this doesn't list all of the navaids, but is basically an atlas which shows the location of many of the airfields and reporting points, VOR beacons etc. There is also a version covering North America, and this can be obtained from pilot suppliers such as Transair.

Aerodrome Booklets are very useful for finding out which navaids are used, and these usually show maps of the airfield, and actual locations of the navaids - very useful if you are planning to visit the airfield. Annual publications such as the 'UK VFR Flight Guide', and 'Pooley's Flight Guide' also contain maps of the airfields, and similar publications should be available in most other countries too. The ones listed above can be obtained from the sites shown later in this section. I usually buy my copies of charts and Aerad Supplements from the aviation shop at Manchester Airport, but if you have an airport near you it's always worth checking to see if they have a shop of their own. In the datafile in Part Two you will find a few websites which you can check out if you would like to find out more about what is available.

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IMPORTANT NOTICE IF YOU ARE PLANNING TO LOOK FOR NAVAIDS:

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Following the terrible events of September 11th 2001, when hijackers forced aircraft to crash into the World Trade Center and Pentagon, wandering around airfields looking for navaids could well get you in serious trouble if you are not careful. Many countries, as well as the USA are now very nervous of terrorist attacks, and if you were to try to get too close to an airport navaid without good reason you could find yourself drawing undue attention from the civil or military authorities. I usually confine my activities to what I can see from the authorised viewing areas at the local airports, but tracking down and photographing your local NDBs and Navaids can be a lot of fun if you go about it in the correct manner. In all cases, if you want to look at a navaid and find that it is on private or airport property **NEVER** under any circumstances set foot on this land without getting prior permission from the relevant authority!

If you do plan to try some any NDB or Navaid hunts I would strongly recommend that you read two excellent articles on this subject written by **Andy Robins KB8QGF**, and his brother **Russ Robins N8HOQ. T**hese publications are called **"An Informal Guide To NDB Hunting"**, and **"The Michigan NDB Tour"**, and show in words and pictures, how Andy and Russ went on a tour around their native Michigan to try and find and photograph many of the NDBs and navaids. These articles were written over the period 2001/2002 and give a lot of great and sensible advice about how you should go about this, especially in the changed period following 9/11.

Both of these excellent publications are available in .pdf format from the download page at my website, be sure to read these if you are planning a tour, and even if you aren't just read them anyway, they're a great read, and the pictures are wonderful!

Check out the following page to find both articles:

http://www.beaconworld.org.uk/download.htm

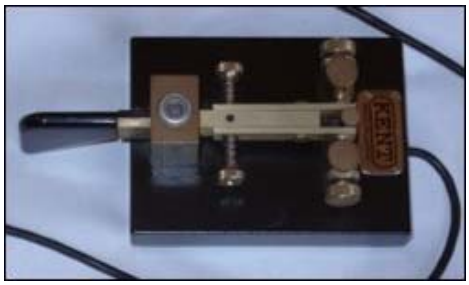
SECTION FIFTEEN: CRACKING THE CODE:

Before we begin to take a look at some of the many radiobeacons**,** which are located in the British Isles just one small problem remains to be solved - what if you aren't able to read the Morse Code?

Well, don't despair if your Morse reading abilities aren't too good (or are even non-existent) because you don't have to be an expert, or even especially proficient in reading **CW** to enjoy listening to radiobeacons. Fortunately for the beginner, most beacons just repeat the same letters over and over repeatedly - and very slowly at that - so even if you don't get it the first time, persistence and the use of a few little tricks will soon help you to get started. Many Radio Amateurs (or potential ones) listen in to these beacons when they're struggling to learn Morse code, and thanks to the constant repetition of the identification letters, will often very quickly become familiar with the sounds and rhythms necessary to recognise the various characters. No doubt this is also one of the reasons why so many beacon dxers also seem to be the holders of radio

amateur callsigns. With the help of the Morse code chart, which is given in the following section you, can very quickly get into the habit of identifying callsigns. But do always remember the old saying:

“If at first you don’t succeed, try, try again!”



Photographs courtesy Godfrey Bradshaw

The thought of learning Morse code can be a frightening prospect for many enthusiasts. However, as anyone who as ever succeeded in doing this will tell you, it often proves to be well worth the effort required in the end. In the case of the Utility DXer or Beacon Enthusiast, it can open up a whole new world of radio listening pleasure by giving you access to a great many more of the radio signals which are out there.

Of course there are many 'mechanical' means of reading morse code available nowadays, and these can be found in the form of dedicated decoding units such as the ERA Microreader, or Momentum Decoders, or even some of the very good computer programmes such as the old 'Hamcomm' software. Newer programmes such as 'RadioRaft' or 'CW Get' can also carry out this task very well too. At the top of the market, expensive devices such as the Hoka or Wavecom decoders can give excellent results, not just with CW, but also with many of the more ‘exotic’ transmission modes too. In recent times other ham related software such as the programme ‘Spectrogram’ - a small freeware programme designed originally for use in decoding the ‘very slow CW’ transmissions that are popular with ‘EME’ or VLF enthusiasts - and 'Argo' and 'Spectran' have also been found useful in providing a good method of decoding very weak NDB signals. Details of where to obtain this programme (and other similar ones) can also be found in Part Two of this publication.

You may well ask why anyone would want to go to the trouble and effort of learning the Morse code when such simpler ‘artificial’ methods of code reading are available? Well the answer to that is quite simple, "Have you ever tried to use a decoder on a frequency with two or more NDBs on it?” The poor thing can very quickly get perplexed, and unlike the human ears, which with experience can often 'filter out' a wanted signal from under a ‘mix’ of several stations, it soon finds itself struggling to cope. In my humble opinion, having both methods available is the best solution, and whilst these new aids can be undoubtedly be a great asset, I frequently find that in the case of weak NDB Dxing, lots of patience, a very sharp audio filter, experience, and a well trained pair of ears coupled with the old 'grey computer' can win out nearly every time!

The chart given at the end of this section isn't intended to turn you into a instant morse reading expert overnight, but it should at least give you the chance of making a start in identifying some of the many NDBs which are out there**.** If you've never given these slow Morse beacons a try before now is the time to begin, and this is how you can do it:

Take the chart in the next section, tune your receiver to one of the stronger ‘local’ signals, which can be found between 285 and 435 kHz, and then see if you can manage to identify it. The list of ‘**Radiobeacons in the British Isles’** which follows in **Section Ten** should show up at least one or two which are quite close to your location. This will be a good place to start, since a nice strong signal will be much easier to identify than a weak noisy one - there’ll be plenty of time for those later. If you happen to be located outside the UK you may need a local listing which shows where you can find your local beacons, some of the publications in The Datafile in Part Two should help you to do this.

Below you will find the letters of the alphabet. As well as each letter, you will also find the Morse equivalent, and also the **‘**phonetic pronunciation’. This last part is very important, as this is how the beacon you hear should sound to you when you hear it. Remember, try to get a feel for the ‘rhythm’ of a letter, rather than trying to think of it as a dot or a dash. After a very short time you will find that you can identify letters and callsigns (which are usually only two, or three letters). The important thing to listen for is the length of the space between each letter. If you follow the phonetic pronunciations given above you will soon get a feel for where one letter ends and another one begins.

THE MORSE CODE:

A	**. _**	**di-dah**
B	**_ . . .**	**da-di-di-dit**
C	**_ . _ .**	**dah-di-dah-dit**
D	**_ . .**	**dah-di-dit**
E	**.**	**dit**
F	**. . _ .**	**di-di-dah-dit**
G	**_ _ .**	**dah-dah-dit**
H	**. . . .**	**di-di-di-dit**
I	**. .**	**di-dit**
J	**. _ _ _**	**di-dah-dah-dah**
K	**_ . _**	**dah-di-dah**
L	**. _ . .**	**di-dah-di-dit**
M	**_ _**	**dah-dah**
N	**_ .**	**dah-dit**
O	**_ _ _**	**dah-dah-dah**
P	**. _ _ .**	**di-dah-dah-dit**
Q	**_ _ . _**	**dah-dah-di-dah**
R	**. _ .**	**di-dah-dit**
S	**. . .**	**di-di-dit**
T	**_**	**dah**
U	**. . _**	**di-di-dah**
V	**. . . _**	**di-di-di-dah**
W	**. _ _**	**di-dah-dah**
X	**_ . . _**	**dah-di-di-dah**
Y	**_ . _ _**	**dah-di-dah-dah**
Z	**_ _ . .**	**dah-dah-di-dit**
1	**. _ _ _ _**	**di-dah-dah-dah-dah**
2	**. . _ _ _**	**di-di-dah-dah-dah**
3	**. . . _ _**	**di-di-di-dah-dah**
4	**. . . . _**	**di-di-di-di-dah**
5	**. . . . .**	**di-di-di-di-dit**
6	**_ . . . .**	**dah-di-di-di-dit**
7	**_ _ . . .**	**dah-dah-di-di-dit**
8	**_ _ _ . .**	**dah-dah-dah-di-dit**
9	**_ _ _ _ .**	**dah-dah-dah-dah-dit**
0	**_ _ _ _ _**	**dah-dah-dah-dah-dah**

Note# A more detailed look at the various characters used in the Morse code can be found in Part Three.

SECTION SIXTEEN: SUMMER DXING:

Many listeners assume that NDB Dxing is purely a Winter pastime, and once the shorter nights arrive after the Spring Equinox, there is little possibility of hearing anything unusual. Well it's true that the shorter nights do leave less time and shorter paths for the signals to propagate through a path of darkness, and there is no doubt that static levels are considerably higher for much of the time, but if you are prepared to try listening at very unsocial hours, and put up with the odd burst of static in your headphones the rewards can be well worth the efforts required.

In the past I once considered that NDB Dxing had seasons, and that the Autumn/Fall/Winter months were the peak time for serious DX chasing, and certainly the very long periods of darkness during the months of November/December and January, and the low static levels due to the lower risk of nearby thunderstorms

was a great help, but after reading an article entitled “radio Propagation” by Michael Mideke I very quickly changed my opinion. In his article Michael touched on the possibility of Summertime Dxing, and stated that some of the most distant receptions had occurred during the months of July and August. Michael also said that summertime noise levels often restricted listening to the pre-dawn hours when static levels were at their lowest, and I thought this was something well worth looking into.

Armed with a suitable supply of matchsticks to keep my eyes open, and a careful study of Geoclock to see when local Sunrise was due to take place, I decided to see if any sort of DX was possible at this time of year. One of things that I quickly noticed was that unlike in the Winter months, when local dawn would often not take place until around 0800, and not always at a convenient time, in the Summer months this pre-dawn period could begin as early as 0300 local. This had several advantages over the same period in Winter, for one thing the number of local electrical appliances in use at that time is vastly reduced, with most of the neighbourhood safely tucked up in bed, and central heating systems, television sets, and other QRM making devices such as Lawnmowers, Power Drills and all manner of other items stowed away or switched off for the night. As Michael had said in his article, the static levels were also very low at that time of night, and the band seemed surprisingly quiet, much quieter than I’d ever imagined that it would at that time of year anyway!

I decided to check my favourite Canadian/Trans-Atlantic frequencies to see if anything was audible, and as it was now just an hour or so away from local Dawn I thought it would be good to monitor these frequencies over the period either side of the arrival of local daylight here. Much to my great surprise the almost nightly winter visitor, my favourite beacon “JC” at Rigolet in Newfoundland was coming in well on his usual frequency of 396 kHz, and during the next hour he appeared to get stronger and stronger. I was a bit surprised by this at first, since it wasn’t always anything like that strong even in the peak winter months. After a bit of thought I realised that the reason for this was that the daylight rapidly approaching from the east was now suppressing the QRM from beacons further east in mainland Europe and Scandinavia, leaving just the clear path towards the west in darkness and still propagating. I continued to monitor JC for almost 50 minutes after local dawn, and up until the time it eventually faded out. At that time the Sun was streaming in through my window, and it was very eerie to be listening to a beacon from several thousand miles away in these conditions. Since the signals are reflection from layers still in darkness and somewhere out over the North Atlantic, the arrival of daylight does not imply and instant cut-off point in local reception, and this period either side of dawn can be considered something of a “Golden Hour”.

On subsequent nights I again monitored during this period and I logged a number of “first timers” and had some of my best ever Transatlantic catches. From that date much of my beacon listening has taken place in the early hours, and I’ve regularly logged Canadian NDBs right through until September, when they seem to disappear for several months, and are rarely heard again until mid to late November. I’m not totally why this happens, but I’m not complaining, and being able to log Canadian NDBs in the UK for around 9 months of each year is okay by me.

Now that has covered the pre-dawn period and its behaviour to signals coming from the west, but what about signals from other directions? Well again the very useful Geoclock programme has proved its worth here, and after studying the patterns for the summer months it was very noticeable that the areas covered by the Greyline do change rapidly during this period, and different parts of Europe and North Africa would share a Greyline path with the United Kingdom at certain times of year. Another point quickly noticed was that for those of us at these northerly latitudes (53 North at my QTH), the northern sky never really gets completely dark in the middle of summer, and the areas just to the north of the UK are in almost 24 hour daylight at this time. I was curious as to whether this would allow Grey Line type reception, and to my sheer delight, the Geoclock predictions of a Greyline path to the Middle east bore fruit in a big way, when a Beacon In Bahrain (BI on 352 kHz) appeared for a period of about 20 minutes or so. It was interesting to hear it fade in and then peak for a couple of minutes before starting to fade out again and then quickly disappear, a true example of Greyline reception at its best! To prove this was no fluke I checked it again over several nights, and you could almost set your watch by its appearance, and even note the several minutes in change of its arrival time over a period of days, and as the nights gradually shortened. Curiously this was only received here during the month of July, and the pattern seems to repeat itself year after year, so it was definitely no fluke reception.

With Summer arriving here shortly I will again be checking out the night-time paths, and I would certainly recommend that anyone with the severe withdrawal symptoms from lack of beacon dxing should blow the dust of their receiving equipment and join the growing band of all year round NDB chasers. Summer Dxing requires a little more thought and planning than winter dxing, but it’s definitely well worth the extra effort!
(NOTE# As I write this in mid-June 2004 the Canadian beacons are audible around dawn on most days!)

SECTION SEVENTEEN: PORTABLE & MOBILE OPERATING AND EQUIPMENT:

I decided to include this extra section because I know that a number of beacon enthusiasts like to get outdoors occasionally, either to get away from local QRM sources, or just to try listening from a different location from time to time. In this section we will look at some of the equipment used for beacon Dxpeditions, and offer a few ideas about how the experts go about it.

Getting started:

Before setting out on a portable operating session, or Dxpedition, it is always a good idea to do a little forward planning first. This doesn't have to be anything too elaborate, but a little planning beforehand can save you a whole lot of trouble later on. By this I mean thinking about where you are going to operate from before you set out, checking out any maps of the area to ensure that there won't be any hazards or high voltage power lines, or any dangers to yourself and other members of the public. After choosing a suitable location, the next job is to plan out which equipment you will take, and how you will get it to your destination. If you are travelling on foot or "backpacking" your requirements will generally be a bit different to what they would be if you were going out mobile in your car. In the coming sections we will take a look at both methods, and the types of equipment you are likely to need.

Below: *One of my favourite local "hilltop" spots, great for VHF, but far too windy for longwires!*

Choosing equipment for walking dxpeditions:

As a non-car owner my portable expeditions will usually entail a hike up to the top of one of the many large hills that proliferate around here, and thankfully, these are usually well off the beaten track, and require travelling over rough ground or open Moorland to reach them. This means that not only do I have to limit the amount of equipment that I can take with me, but that I also have to ensure that any equipment that I do take won't get damaged in the event of a trip or fall, or that it doesn't get soaking wet if the weather suddenly changes and the skies open up on me. Heavy rain and thunderstorms can be a real danger when going out on foot and operating in the open, and you are likely to often find yourself well away from any forms of natural shelter. We have been known to have the odd drop of the wet stuff in this part of England, so I would never even attempt an outdoor visit without first making a thorough check of the local weather forecasts, and taking at least a few precautions "just in case!" Modern radio equipment can be very expensive, and your

household insurance policy might not cover any costs should you end up falling in a brook, or dropping your beloved receiver onto rocky terrain, so these are all points to consider before starting out.

Since I mentioned already mentioned Insurance, a little thought might be given as to whether that thousand dollar/pound/euro radio will be covered against such disasters, or even worse, in the event of theft should you get mugged or attacked. I don't want to sound like a prophet of doom here, and I've certainly never felt like I was in any danger on one of my trips to the great outdoors – generally I find the open Moorland far safer than the towns of cities, especially at night - but it is always a good idea to think about these things when planning a trip. I know that I would always get much better reception if I take my AOR7030+ receiver along, but often I prefer to take a portable of some type instead. In past years this was in the form of my trusty old Sony ICF-2001D, but nowadays it's usually a Sangean ATS-909 receiver, which is much smaller, and lighter to carry. It certainly won't perform anywhere near as well as the 7030, but at a fraction of the cost it's not only a lot less risky, but can even be run for several hours on its own internal batteries, and with its own internal ferrite aerial if necessary.

Batteries and Power Stations:

Batteries can be quite a problem for foot expeditions, a 4 or 6 Amp Hour Lead Acid battery can be quite weighty, especially when this also has to be added to the weight of the receiver and a portable aerial of some type. A useful power source, which is often favoured by many backpacking radio enthusiasts is the "portable power station", a small unit often containing a battery of 4 to 20 amp hours (the greater the capacity, the greater the weight), and with sockets to connect your radios and other equipment to (some offer 3, 6, 9 and 12 volts output). Another bonus with these re-chargable units is that they often include some form of light, and if night time operation is planned this can prove double useful. There are many dealers selling such units (your local car accessory shop may sell them too), but in the UK at least I've found a number of very good ones on sale at the website of one of the top amateur radio dealers – Waters & Stanton PLC. You can check these out at their website, but you might need to use the search facility to find them (I entered "batteries" and found it on the third page of listings) www.wsplc.com You can see a picture of a popular portable one above right, and this weighs in at just 3 kg, and delivers about 4 amp hours at 12 volts - enough for a reasonable several hour listening session.

Backpacks:

To conserve battery power you will also want to take along a pair of headphones (this will also prevent you from alarming any passing hikers with the strange noises), and you will also want a frequency listing of some type to help identify your catches as well. You may decide to carry all of the equipment in a rucksack of some description, but you may well decide that something a little more protective would be a good idea. A good friend of mine often goes out operating his ham station up on one of the hilltops, and he showed me a very neat ex-army radio rucksack that he'd picked up from an army surplus dealer. This was very impressive, the back of the pack could be opened in the form of a door, and the inside of the pack was large enough to hold one of the many camera type metallic cases, which are ideal for carrying radio equipment, these are already popular with mobile operators (see Mobile operating section for more information about this). On top of this it also contains a number of useful pockets, and these can also be packed with other items of equipment, especially smaller items, which are better off stored well away from the main receiver (it can be very gut-wrenching to return home and find that your beloved receiver now has a nice big scratch on the cabinet or frequency display!).

Other types of carriers can also be found, and myself, I usually take a rucksack for the odds and ends, but carry my radio in a camera bag, mainly because it can get very windy on the tops of those big hills, and the radio can be operated from inside the bag, with the zipper open at the top for access if required. These bags also usually have an additional section or two, which can take a book or magazine, and these are ideal for storing your copy of the ENDBH and Logbook inside. If you've ever tried to carry a magazine or A4 sized book around inside a rucksack you'll understand why I prefer to do this.

As I said earlier, I like to use a camera bag for my radios, as I've always taken the view that if they're good enough to protect valuable and delicate photographic equipment they'll probably be reasonably good at protecting delicate radio equipment as well. The UK radio dealer that I mentioned previously – Waters &

Stanton plc, www.wsplc.com even sell a range of special “Radio Bags” just for some of the more popular small transceivers, and no doubt these could be adapted to carry your short wave receiver quite easily. They do look like camera bags, so obviously someone else thinks that this type of bag is useful for portable operating (I don’t receive any commission from them for these plugs, I just mention them because they seem to stock most of these items, and they are the one I know about, I’m sure there are very many equally good suppliers out there also offering these goods!). If you don’t feel like making a trip around a few of the local camera shops and picking out a suitable case, then one of these radio bags might be just the thing for you. One final word on this subject, whatever type you finally settle on, do make sure that it feels comfortable, you may have to carry it a long way, and having something chafing your shoulder or digging in your back is no fun at all!

The “Backpack” Approach:

As I said in an earlier section, just lumping all of your precious radio equipment in an ordinary rucksack is not a good idea, as it may well get damaged, and the alternative method of using one of the many metallic camera cases, which are ideal for mobile operation, may not be very convenient when you have to carry them up a steep hill, or over rugged moorland terrain and just holding it by the handle. There is however a better option, and if you combine the two methods you can come up with a real winner of an idea, and one that will give you the best of both worlds. In this section you will see some great examples of how this can be done, and take a close look at how to go about setting up such a portable listening post.

The “Stef” Approach:

My friend **Stefan, G0BJW** has come up with a very good approach for his amateur portable operating set-up, and he kindly took a number of pictures of his pack for me. These show in great detail just how he has gone about doing this, and how the pack looks in use. You will see from some of the following shots just how good an idea this is, and if you’re serious about outdoor operating (for beacon hunting, or Amateur operating) it’s a method that’s well worth considering.

Left: *The Army Back Pack.*

The picture here on the left shows Stefan’s backpack, laid out on the ground, and fully packed with his radio case and radio equipment. The overall weight will depend on such factors as the size of your battery, or the weight of your radio (transceivers can be quite a lot heavier than receivers due to their large heat sinks), but the pack should be well balanced, and quite comfortable if the straps are adjusted correctly. Also, with the pack on your back and secured by the shoulder straps and webbing, your hands will be left free to support yourself, or to carry a map, walking stick, compass, GPS receiver or any other item that you might need to use on the way. If it’s good enough for the Army it should be good enough for us radio enthusiasts….

Right: *The pack opened up to show the radio case inside.*

On the right you will see a shot of the pack with its velcro straps opened to reveal the radio case (metallic camera case) mounted safely inside. Not only is this an ideal fit, but it is very quick and easy to set up, and also provides its own waterproof sheet to give some cover on the ground, should it be a little damp. If you want to be doubly sure that no rain will get inside, wrapping a plastic liner around the case will ensure a perfectly dry fit!

Left: *A close up of the "Radio Case"*

In the shot on the left you can see a close up shot of the "Radio Case", which carries the rig and power supply, we shall see the inside of this case shortly. Note the strength of the box, with solid fasteners to ensure that it doesn't come open at the wrong time, and reinforced corners to give added strength – this can be very useful in the event of a slip, and the pack crashing to the ground – the last thing you want is the box to buckle, and damage the inner contents! Note the terminals added to the top of the case, these are for connecting the aerial and ground wires (more about these later).

Right: *The open case.*

A couple of shots of the open case showing the radio, ATU and power supply. Note the temporary longwire aerial, tucked neatly away down the left-hand side of the case. I know from personal experience that the open lid is very useful on a windy day or windy hilltop, it can provide a welcome windbreak, and a useful place to store your ENDBH or NANBH during your session.

Below: *A close up shot of the inside of the case, you can see the contents here in much greater detail.*

And don't forget those other bits and pieces:

We've now chosen our receivers, batteries, bags etc. but there may be quite a few other things that are required as well, and here are a few of them to consider. The internal ferrite aerial in your portable receiver probably won't be too good, and you will require some sort of better, or specialist antenna to make the most of your remote location. This can be in the form of a small Long Wave Loop, or one of the many active whip type antennas, which are available from many of the commercial outlets. The loop might have the disadvantage of greater size, but bear in mind that an active antenna will require a power supply, so if you are operating off a separate Lead/Acid battery of some sort there will again be a weight factor to add to the overall load. Loop antennas can be "passive" (e.g. not powered), and with a bit of ingenuity a small and collapsible loop can be put together.

Below: *The full pack laid out with all the "extras" at the top.*

Above: *close up of the "extras".*

Alternatively, you might like to set up a long wire of some type, and with unlimited space at your disposal, this option offers the chance to erect some form of Beverage – the type of antenna that can be wonderful to play with, but far too big for use at the home plot. Anything that can easily be carried can be used!

Below: *The full pack, all ready to go.*

Above: *Stefan won't thank me for using this one!* ☺

As you can see from these pictures, the pack not only looks good, but offers very good support when strapped on, the Army design these things to be used in all kinds of rough terrain. You should be able to pick one up at your local army surplus store.

Radio Backpacking can be a lot of fun if you are properly prepared, and hopefully the examples shown above will give you a few pointers when it comes to planning your own outdoor, and portable Operations.

Those Portable Antennas:

If you have to take large amounts of wire along with you, then the overall weight this will contribute will be a factor you will need to take into account, and a small reel of very narrow gauge enamel copper wire might be the best option - this can be very thin, and have very little weight. There are disadvantages with this type of wire though, for example, trying to wind it up after you've finished on a very windy day can be no fun at all, but the use of something like and old fishing reel can make this task a lot easier. Another option which may be available, providing the area you are in area that supports it, is to make use of any 'natural' aerials, such as very long runs of barbed wire, or any suitable metal or barbed wire fencing which might be in the area.

Many farms will be surrounded by such fences, but be very sure to check that they're not carrying a small electrical charge before connecting them to your receiver (or touching them with your hand), they're not usually lethal to humans, but they might not do your beloved receiver a lot of good if directly connected. It's also important to ensure that the wire isn't grounded, broken, or shorted to the ground or other objects, and it goes without saying that high voltage power lines should be given a wide berth at all times. (more on the use of fences in the mobile operating section).

Electric fences come in a variety of guises, some will have mains power feeding a transformer, others may use a large capacity battery of some type, often buried in the ground. Fortunately for me, there aren't too many in this area, and the only ones I've come across so far are used to keep wandering sheep off the greens at the local Golf Course. Looking at the pictures below though, and the rusty looking wires used on some of these, it's not too difficult to see why they can easily become a QRM source with their 1 second 'ticking' noises, which can often be heard over much of the Long, Medium and Short Wave spectrum when they do develop problems. The images below should give you some idea of what these things look like anyway!



Above: *The power leads coming up out of the ground to link the wires together – note the inadequate use of insulation tape!*

Anything Else Required?:

We've now got our radio, our power supply, our aerials and our bags sorted out, surely there's nothing else required? Well yes there is I'm afraid, and unless you know the area you're operating in very well, I'd suggest that you take a map or compass (or GPS receiver) along with you to help ensure that you don't get lost. As much as I love monitoring the Search & Rescue services I would feel very embarrassed if they had to be called out to find me because I'd got lost in the hills somewhere. So far we've only looked at radio equipment, but it's also important to think about yourself, and just because it's a nice sunny day when you set out, it doesn't necessarily man that it won't feel much cooler when you are up into hills, or out at the coast. I always try to make sure I take along a suitable weatherproof garment in case of any sudden weather changes (in Lancashire we can often have all four seasons in one day, with the rain varying between tepid and freezing!). If it's a warm sunny day some Sun Block, or a hat might also be a good idea too, I once returned home on a not over warm day looking like a lobster because of the combination of Sun and Wind! You should also think about taking some sort of weatherproof sheet with you as well, because the ground may be damp, and you'll need somewhere to set down your radio equipment that's reasonably dry (and that's why the Army pack is so doubly useful!). I often head for the Ordnance Survey 'Trig' Points, which are to be found on the tops of most hills throughout the UK, these are not only useful for seeing exactly where you are on the Ordnance Survey maps, but they also make a very find stand for your radios to sit on, and are especially useful when trying to take any DF bearings on unknown signals.

Finally, don't forget to look after the inner man as well, because hiking up steep hills does burn up a lot of calories, and not only will running out of energy make the walk home difficult and tiring, but if the weather turns cool it can be positively harmful to your health – hypothermia is no fun at all, and if you are hungry you

do tend to feel the cold very easily. The body can go without food for long periods, but not without fluid, if you are out on a hot day, or hiking up steep hills, you can easily sweat a lot of fluid out of your system, so do be sure to take plenty of liquid with you, or make sure you know where to obtain any necessary refreshment when you need it. Even if it's nothing more than a few Mars Bars and a bottle of water hidden in your pack, at least make sure you have some sort of sustenance with you.

Oh yes I almost forgot, if you are heading for the hills or some remote location do be sure to inform someone close about where you might be going, and when you expect to be back again, this can save you and your family a lot of worry if anything unexpected should happen whilst you are out. I once sprained my ankle in an old Rabbit hole, and faced a very long and painful limp home afterwards, if I had broken anything I might have been in serious trouble.

In Summary:

After reading some of the above comments you might well wonder if a field trip is worth the effort involved, but yes, it really can be, and a very simple way of making your trip easier is to share it with some fellow listeners, not only will this spread the physical load, but it can make for a very entertaining team event in its own right. Of course if you are limited to operating in the daylight hours only you might find that the amount of beacons you can hear is also very limited (though if electrical QRM at your own QTH is a major problem you probably won't be too worried about this!), but if you are heading for a high spot and can only operate in the daylight periods, then it might be well worth taking a long a VHF receiver if possible, and looking out for some of the 50 and 70 MHz Propagation Beacons, or for any Airfield Navaids or VOR Beacons. These often abound at VHF frequencies, but aren't always easy to hear if your own QTH is in low-lying terrain, or you can't erect good VHF aerials. The additional height can make quite a major difference here, and from my favourite spot (shown at the start of this chapter) I am almost line of sight with airfields some 50 or 60 miles distant. To put things into perspective, I would need a tower some 400 feet high to achieve the same sort of VHF range from my own QTH, which is 400 feet lower down (the hill is called Brown Wardle Hill, and is approximately 1300ft (400 Metres) above sea level.

If none of the above appeals to you, or you aren't to keen on mobile operating, a better solution might be to forget about portable operation, and instead take up something like "NDB Touring", and by this I mean travelling around and seeking out the beacons themselves, to either see what they look like, or to take photographs of them. This can be done on foot, by bicycle or by car, and with the addition of a portable radio receiver - and if you own one, a GPS receiver (a compass is useful if you don't) - combined with a good map of the area, you can have a really interesting time. This obviously wouldn't be too easy to do after dark, and even if you managed to find the beacon, you wouldn't see very much anyway, therefore NDB Touring can make the perfect daytime activity, especially during the summer months, when there are very long hours of daylight available to you.

A word of warning though……

There are however certain precautions that you should take if undertaking NDB Tours, or visits to beacon sites, especially military operated ones, and these should not be taken lightly. In the current security climate, for instance, if a beacon is located on private land, and not easily accessible from public roads or footpaths, the landowner should be consulted for permission first, and you should **never, ever** enter into any restricted areas under any circumstances, and this is doubly true if the owners happen to be the local military folks – you may well find yourself arrested, or marched off at gunpoint!

I don't want to go into the ins and outs of NDB Touring here, because I've never personally done any (yet), and so I can't really speak from personal experience, instead I would strongly recommend that you read two really excellent articles on this subject, and both of these can be found at the Download page of the Beaconworld website: http://www.beaconworld.org.uk/download.htm These are called: **"An Informal Guide To NDB Hunting"**, and **"The Michigan NDB Tour"**. Both were written by Andy and Russ Robins, and offer a really superb insight into the ins and outs of NDB Touring. I would strongly recommend reading both articles before you think of planning any tours of your own, and following the very useful advice given there. I really appreciate Andy and Russ allowing me to make these available to listeners via my website, and you should also check out some of the other pictures they took, and recordings that they made during the trip along with a number of others, which a number of other fellow NDB Hunters were kind enough to share with me at the following page: http://www.beaconworld.org.uk/beaconpics.htm

One final word, if you do decide to try out any NDB Tours of your own, do let me know how you got on, and if you'd like to share any pictures taken with the rest of beacondom I would be only too happy to create a page for you to display them on!

Below: *This shot shows Stefan, G0BJW and Eric G0WHL at one of our hilltop Dxpeditions during the summer of 2003:*
(note the environmentally friendly use of the local rockface to support the aerial)

Have a good time with your portable operating – we usually do!☺

SECTION EIGHTEEN: MOBILE OPERATION AND EQUIPMENT:

Choosing equipment for mobile dxpeditions:

Whilst Dxpeditions made on foot can require a lot of physical effort, a mobile trip can be a lot of fun, and you can operate from a much wider choice of locations, and from over a much greater area. More equipment can be taken, shelter is readily available, and the vehicle itself can provide the source of power for much of your equipment. If you are fortunate enough to own a mobile home or caravan of some description the sky is the limit, and really intense expeditions over a period of days can even be mounted. If you are a real masochist you can even take the XYL or OM along with you just to ensure that you don't have too much fun!☺

In this section we will look at some of the equipment which can be taken on mobile jaunts, and see a few examples of some Big Game Beacon Hunters out in the wilds.

Hitting the road:

One of the big advantages of going 'mobile' for your portable operations is that you can take a lot more equipment with you, and you will always have a ready made shelter handy in case of sudden changes in the weather. It's not a lot of fun to be caught out in the great outdoors during a surprise thunderstorm, especially when there isn't much shelter to be had, and you're standing alongside an aerial, which might be the only metallic object in the vicinty, and a sure-fire attraction for any passing lightning flashes! As well as being in effect a 'mobile shack', a car or van can also allow extra useful equipment to be carried, such as large Loop antennas, earth rods, Audio Filters, ATUs, collapsible chairs (for sitting outdoors on warm days), and all manner of useful ancillary equipment, which would be too heavy to carry on a hiking expedition. The car's own battery supply could also be used, not only to power the equipment, but also to provide lighting during any late night listening sessions as well. Many modern vehicles can in themselves be sources of QRM thanks to the numerous QRM making items of electronic equipment, which they now seem to be festooned with, so in this case you might want to take a long a power supply made up of dry cell, or lead acid type batteries, again this is something which would be quite heavy to lug about on a hiking expedition.

Left: *Jean's R75 receiver in its carrying case:*

Some DXers will operate just with the receiver sitting on the passenger seat, whilst others will come up with more elaborate, and more efficient methods of operation, such as a carrying case specially adapted to hold (and protect) the receiver and power supply, and if used, audio filters. This seems like a very sensible idea, and not only will it allow the equipment to be set up before you depart on your journey, but allows the equipment to be readily moved away from the vehicle without the need to constantly plug or unplug the radios, and also offers a lot of valuable extra protection for your precious gear.

As you can see from the following images, kindly supplied by my good friend and fellow beacon enthusiast, **Jean Jaquemin** of northern France, this type of installation is ideal for the mobile Dxer, and not only is it a very efficient way to transport your radios, but it also looks very attractive too. In these security conscious days travelling around looking like something out of a James Bond movie may well attract unwelcome attention, but a little thought and modification can quickly produce something that doesn't look too suspicious, and will allow you to enjoy your trip undisturbed, and in peace and quiet.

Above: *Jean's excellent mobile beacon station, easily transportable and ready for use, note the ENDBH ready for action!*

What to take with you……

Answering this question is a bit like trying to explain how long a piece of string is. Apart from the obvious things like the receiver and power supply, what a mobile dxpedition can really offer is a much larger choice of locations - anywhere that can be reached can be made use of – and a much wider range of antenna can be utilised. The choice of vehicle will depend on what you have available, and if for example, you own a four wheel drive or "Off Road" vehicle, you might want to head for some remote terrain – as far away from man-made QRM as possible, or perhaps just to the coast, where if an uninhabited stretch of beach can be located, you can lay out all kinds of long wires and beverages, and take full advantage of those excellent Sea Paths, which seem to offer signals so much help. In fact, if you can reach it you can operate from just about anywhere, and this may be a single spot, which you will want to return to at every opportunity, or a whole range of different places, which you might want to try out to see to see if they offer any advantages to you.

Below are a number of pictures taken by my fellow NDB members and friends, **Andy Robins** (Michigan), **Roelof Bakker** (The Netherlands), and **Brian Keyte** (England), all have made a number of trips to the great outdoors, and come up with some novel and imaginative methods of Beacon Chasing:

Above: *Andy doing some night operating from a local National park from the NDB Truck, with a very impressive boxloop!*

Andy Robins took the "NDB Truck" to a local park for a listening session during one of our monthly NDB List "CLEs" (Co-ordinated Listening Events), the theme this time was outdoor operating, and a number of members took the opportunity to give their antennas some fresh air. Andy can be seen here operating with his Yaesu FRG-100 on the bonnet of the truck, the large Box Loop sits on the ground to the rear of his operating position.

Left: *Brian Keyte checking out a nice long barbed wire fence to see if it's suitable for use as an antenna!*

Right: *Brian decides that it's a good Place and brings on the Beverages!*

Someone who makes regular use of available fences on his travels is NDB List "CLE Co-ordinator**" Brian Keyte**, of Surrey, England. Brian often travels about the UK, and always tries to take advantage of any opportunities to try setting up a Beverage or two, or attach a feedline to a nearby length of barbed wire. This really must work well, I know because I've seen the logs he gets from them!☺

I touched on the subject of using wire fences as aerials in the previous chapter, but it really can be a great way of finding a nice long aerial without having to take it with you and erect it first. If you are planning to give this method a try do make a check of the fence first to see if there are any breaks, or any parts of the wire touching the ground, if there are you might need to make a few temporary repairs first, so it's always worth taking a few lengths and some tools long just in case, a multimeter can come in useful here too!

In the Netherlands, **Roelof Bakker** has also been trying some outdoor operations, usually with his trusty SPM-3 Selective Level meter. In the pictures below you will see Roelof's set up at two lovely locations, the first at the entrance to a field at Middelplatten, and the second one the beach at Walcheren – what a lovely location to do some Beacon Dxing!

Above: *Roelof's SPM-3 and audio filters ready for action.*

Above: *Roelof's mobile set up using the fence as an aerial.*

In the pictures above you can see the advantages of going mobile rather than portable on foot. Imagine trying to carry a SPM-3 and a table and chair on your back – going mobile allows you to take quite a sophisticated set up with you, and still do lots of operating in all that lovely fresh air!

Above & Right: *On the beach, what a fab location!*

If someone was to ask me where I would like to operate from if given a choice, then a location similar to the ones shown here would be my reply. Apart from being a lovely location, I would enjoy feeling that sea breeze in my face, and the prospect of seeing those weak beacon signals skidding across that lovely calm sea. Add to that a bucket and spade and a stick of rock and it would be my idea of paradise!

There are very many places that can be operated from, but the coast has to be one of the best, especially if it is outside the tourist season, or you can find a relatively quiet stretch. The above location would do me just fine, and if it was on the Atlantic coastline, and offering a sea path to North (and South) America that would be even better. I think by now you will either have got the impression that mobile and portable operating is great fun, and something to try out rapidly, or you'll have already departed!☺

As you can see, as far as suitable locations go, the sky is the limit if you are mobile and have a mobile set up like the ones shown above. You can even take the XYL and kids if you have to, but it will be a lot more fun without all the distractions that might involve. If you do take up the challenge and operate from somewhere unusual do let me know about it, I'd be very pleased to hear where you where able to operate from.

Meet the public:

Listening can often be a solitary hobby, and apart from the odd get together, or a trip to a local radio club or Radio Rally (hamvention), it will generally not be something that most members of the public will have much knowledge about. In most cases this won't be a problem, although I've often found it beneficial to let your neighbours know what it is that you do if you are already familiar with them, because I've often found that their only impression of us is of someone who is a little eccentric, and likes to festoon their home with various types of strange antennas and long bits of wire (or is that just me?). On occasions I've mentioned to them what my hobby is, and even invited them to visit the shack and see it for themselves, and I have to say that on all occasions they have gone away quite impressed after seeing and hearing some of the things that I pick up, such as aircraft and shipping, and even talking to someone in another country on my ham transmitter. In most cases I've found that they are far more tolerant of my hobby afterwards, and many often ask if I've heard anything unusual lately when I bump into them in the street, or have asked my advice about some reception problem.

The reason that I bring this point up is that when out in the field on a Dxpedition it's quite likely that some member of the public will stumble across you, and I know from personal experience that the result of such a first encounter can be a look a sheer bewilderment, or even mild fear about what you might be up to. To avoid such problems, and to give a boost to the image of our hobby, it's often a good idea to think about how you might describe, or present the hobby to an interested party, should they stop to ask what you are up to.

Over the past 23 years I've been involved in the operation of many Amateur Radio Special Event Stations, and these have required us to operate from a great many public places, often under the watchful eye of many visitors. Over that period we were asked numerous questions about the hobby, the equipment, the aerials, how we got started, how they can get started, what we can hear, what does it cost? etc. etc. etc., and after a little while we quickly learned that the best way to deal with this was by printing up some simple information sheets, containing the answers to many of these questions, details about where to find more information about the hobby, what radio magazines are available, and what other aspects there are to our hobby. Some visitors will stop by and ask questions, but many others will feel reluctant to speak, and will just take away a leaflet to read later (leaving a few of your old radio magazines or bulletins around with a note inviting visitors to take a copy can be a better use for them than dumping them in the rubbish bin!). All of these things can help to give the hobby a positive spin, and stop the visitors departing with just the impression that they've just seen a bunch of strange blokes (or women) listening to some strange noises on a fancy looking radio.

Now Amateur Radio may be slightly different to Beacon listening (a lot noisier anyway), but when encountering the public it can still be worth adopting a similar profile, and producing some sort of information sheet, not only explaining what the hobby is, and what radiobeacons are, but also showing some examples of any QSL cards received, or a little personal information about you, and how long you've been doing this as a hobby. If someone is going to go away forming an impression about you, or the hobby, better to help ensure it's a positive one. Likewise, any visitor showing a extra interest should be given a little bit of your time, and shown a few examples of what can be heard and what the equipment does. It can be a pain to be interrupted when you are in the middle of a DX session, but telling a visitor to go away (in slightly more Anglo-Saxon terms) will not endear him to our hobby, and he might well end up living next door to a fellow enthusiast one day, and be forevermore anti-radio! When in public we are all ambassadors for our hobby, so a little patience and understanding of the poor mortals that haven't yet been blessed with the knowledge of our wonderful hobby is always advisable.

Some years back I was taking part in a Radio Club DF Foxhunt, and was wondering around a populated area with a small VHF beam and taking bearings on the radio 'Fox'. One passer by asked me what I was up to, and jokingly I said that I was from the TV Licence Detection Service and was on the look out for licence dodgers (in the UK viewers are required to pay for an annual licence to fund BBC Radio and TV services). I hadn't expected the reaction I got, and it appeared that the passer by obviously hadn't bothered to renew his own licence. He very quickly went off around the area informing people that the "Licence Van" was operating in the area, and I decided that I'd better beat a hasty retreat before they realised that I wasn't. Needless to say I now attempt to restrain my natural urges to have a little fun with people, and I refrain from making any jokes about looking for licence dodgers, or being from GCHQ (UK intelligence gathering service) and being on the lookout for illegal transmissions and spies, or other outlandish stories, and instead just stick to the more mundane 'true' version of what I'm up to. It isn't half as much fun, but it's a lot less likely to get you into any trouble!☺

Miscou Dxpedition:

Small personal Dxpeditions are great, but some enthusiasts like to take this a step further and organise some major Dxpeditions, often to some very distant or remote location, far from any electrical QRM, and with ample space to erect very sophisticated antenna systems. For many listeners, especially those who live in built up urban areas with high noise levels, or who have insufficient space at home to erect large antenna systems, these trips offer a chance to get away from it all and listen in a completely different environment. For many years Medium Wave Dxers from the UK and mainland Europe made the annual pilgrimage up to Sheigra in the far north west of Scotland, and rented a small farmhouse for a week at a time. This allowed them to set up a number of beverage type antennas pointing in various directions, and to receive a great many 'first time' catches of stations not normally heard over here.

In recent years a group of Canadian and US Beacon and LF enthusiasts have made a similar pilgrimage to the remote island of Miscou in New Brunswick, in the north eastern part of Canada, and they were there again in October 2003 for their annual visit. As well as regular expeditioners Jacques d'Avignon, Monitoring Times "Below 500 kHz" editor Kevin Carey, and Ken Alexander were a number of other dxers, and again the group were attempting to receive signals from Europe and North Africa. This is a very well organised Dxpedition, and was covered in great detail in the January/February 2002 issues of UK radio publication "Short Wave Magazine". To read a full account of some of their past trips, and see exactly what took place there, I would strongly recommend a visit to the following websites, both of which carry very good accounts (and pictures) of the event:

http://www.dxing.info/dxpeditions/miscou2003.dx

http://www.aoruk.com/feature/feature.htm

And Finally:

I hope this new section has shed a little light on what joys and pitfalls may be found with portable or mobile operating, but don't let any of the negative comments I might have made put you off, dxpeditioning is, and can be great fun, and I would strongly recommend it. It's a bit like fishing, you take all the right tackle and the right bait, you find a great spot to do it, but still you might come home empty handed, and there is no guarantee of a good catch. As many anglers will tell you though, even if you don't catch anything there is little to beat sitting out in a beautiful location in the open air, and just making the trip can be a great success, the fish, or in our case, lovely DX catches, are often just the icing on the cake. Enjoy the cake and give it a go!

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PART TWO: THE BEACON DATAFILE

INTRODUCTION:

This part contains details of a number of useful information sources relating to the hobby of beacon monitoring. Its purpose is to help beacon enthusiasts to easily locate information which may be of assistance to them. Though this is by no means a 'definitive' list, and I am continually updating it and adding new material to it. Due to the constantly changing nature of things like the Internet, links do frequently change and become out of date quickly. Where possible I have attempted to check all material for accuracy, but my apologies if any of the links given below are now out of date, or the publications no longer available.

This datafile is divided into five separate sections covering the following material:

SECTION ONE: NON DIRECTIONAL BEACON RELATED WEB SITES:

Below you will find links to a number of beacon related websites, I'm sure there must be many more out there that I don't yet know about, so if your link isn't included here be sure to send me the details so I can add them to the next edition. I update the links page on my website a lot more frequently than I update this handbook, so if you find that any of the links below aren't working you might try visiting my links page and checking to see if the link there is working: http://www.beaconworld.org.uk/beaconlinks.htm

http://www.avionix.com/adf.html
ADF Aircraft Automatic Direction Finders:

http://www.segelflug.de/vereine/karlsruhe/cockpit/adf.html
ADF Systems:

http://www.qsl.net/iw3sgt/Lf/ndb_rd.html
Alessandro Kosoveu's Pictures of NDB 'RD'

http://members.rogers.com/wiecek6010
Alex Wiececk's Longwave Home Pages: - A great source for Canadian and NA NDB information!)

http://members.tripodnet.nl/Aren/id31.htm
Aren's Attic:

http://www.beaconworld.org.uk
Beaconworld:

http://www.inter.nl.net/hcc/Cor.vanSoelen
Cor Van Soelen's European Beacon List:

http://www.coturisca.com/navaids.htm
Coturisca DR Navaids Page:

http://www.csiwireless.ca/support/pdfs/radiolistings.pdf
CSI Wireless DGPS Database: - A Superb Database of World DGPS Beacons!

http://www.xetron.com/~daled/navaids
Dales's Beacon Page:

http://www.datasync.com/~rocker/longwave.html
Datasync:

http://www.picks.force9.co.uk/ngy.htm
Dave G3YXM's NDB Pictures:

http://www.elsa.co.id/prod05.htm
Elsa-Nautel Non Directional Beacons: (NDB Manufacturer)

http://www.faiallo.org/ndb.html
Enrico Oliva's NDB Page:

http://www.effective-solutions.co.uk/beacons.html
European Differential Beacons:

http://groups.yahoo.com/group/radiofari/
Farra nella Notte:

http://www.fernau.com/prodinfo/2060ndb.htm
Fernau Avionics Limited: (UK NDB Manufacturer)

http://www.xs4all.nl/~cisquet/NDB.htm
Frank van Gerwen's NDB Page:

http://www.b-howie.demon.co.uk/lfbcon.htm
GM4DIJ's NDB Page:

http://www.trifid-nebula.de/ndb/ndbhome.htm
Gregor's NDB Page:

http://web.tiscalinet.it/vlfradio/
IK1QFK's LF/VLF/ULF Website:

http://www.provcomm.net/pages/joe/introvlf.htm
Introduction to LF & VLF Monitoring:

http://www.asalink.net/market/g_2_9.htm#ndb
Italian Navaids:

http://jill.jazzkeyboard.com/radio/longwave.html
Jill Dybka's Longwave DX Radio Page:

http://www.geocities.com/kb5nhm
Jim - KB5NHM's Asian NDB Website:

http://home4.swipnet.se/~w-41522/ndb/ndbphoto.html
Johan Bodin's NDB Pictures:

http://longwave.bei.t-online.de/
Klaus Betke's LW/DGPS/Time Signals website: - (an excellent site for LF pics and DGPS info!)

http://www.geocities.com/Area51/Chamber/1943/ndbstuff.htm
Lars Lindh's NDB Stuff:

http://www.lwca.org
Longwave Club of America Home Page:

http://www.unetsul.com.br/py2pll/ndb_list.htm
Marcus Ramos' South American & South African NDB Database:

http://www.classaxe.com/dx
Martin Francis' NDB Weblog:

http://www.kondruss.com/mad/index.htm
Military Airfields Directory:

http://www.nautel.com
Nautel Limited: - (Manufacturer of Aero and Marine NDB Transmitters:)

http://www.airforcebase.net/usaf/navaids.html
Navaid Property Requirements (USAF):

http://fly.to/navaids
Nick's Navaid Page:

http://www.gatewaylinks.com/NDBLOG/home.htm
NDB Log 7.4: (NDB Logging Programme)

http://www.dxlc.com/northernbeacon/
Northern Beacon Project:

http://www.alaska.faa.gov/at/notices/decomno.htm
NTP NDB FAA Alaskan Region:

http://frodo.bruderhof.com/ka2qpg/
Pierre Thomson's Canadian Beacon Database:

http://www.navaid.demon.co.uk/pubs.htm
Recent Publications by the Radionavigation Group:

http://www.kilkeel7.freeserve.co.uk
Robert Connolly's Home Page:

http://members.aol.com/RKDX/longwave-home.html
Robert Kramer's Longwave Homepage:

http://www.datasync.com/~rocker/longwave.html
Rock's Longwave Beacon Log:

http://www.pesaro.com/sice/
S.I.C.E. s.n.c. - Pesaro Radiobeacons:

http://www.southernavionics.com
Southern Avionics: (Manufacturers of NDB Transmitters)

http://www.visualizationsoftware.com/gram.html
Spectrogram - a useful programme for beacon dxing!:

http://ssa.freeservers.com/ndbssa.htm
SAA NDB Manufacturers Page:

http://www.qsl.net/sv1xv/lw.htm
The World Below 535 kHz:

http://www.iprimus.ca/~hepburnw/dx/twb.htm
Transcribed Weather Broadcasts List by William Hepburn:

http://www.navcen.uscg.gov/dgps/ndgps/Enhancements0106.htm
US Coast Guard DGPS Information:

http://www.mindspring.com/~longwave/aero_db.htm
US NDB & ILS Database:

http://www.airnav.com/
US Navaids: (A Searchable Database for US Beacons)

http://www.wapf.com/world
Worldwide Airport Path Finder:

10 METRE & HF BEACON WEBSITES AND PROGRAMMES:

HF Beacon chasing can also be a lot of fun, and below you will find a collection of links to various sites which will allow you to download software or frequency lists showing where to find them. A more up to date list, plus links to individual operators sites can be found at my own HF Beacons website link page, which you can find at: http://www.beaconworld.org.uk/hfsite/links.html

http://www.6and10.org.uk
6 and 10 Report:

http://www.taborsoft.com/abw/index.shtml/
'Active Beacon Wizard' Programme:

http://www.wia.org.au/beacons/
Australian Amateur Radio Beacons:

http://go.to/beaconet
BEACONet: A New Amateur Propagation 'Digital' System

http://home.t-online.de/home/knut.najmann/
'Beaclock' Programme (new version 3.0):

http://www.huntting.com/beaconclock/index.html
'Beacon Clock' Programme:

http://sapp.telepac.pt/coaa/
'BeaconSee' Programme:

http://autoinfo.smartlink.net/kq6rh/beacon.zip
Beacon Watch' Programme:

http://home.snafu.de/wumpus/xbjsoft.htm
'BJ Beacon' Programme:

http://www.qsl.net/cx3no/beacons.htm
CX-N020 - Alfredo's Website - nice beacon information!

http://www.benlo.com/dxmon.html/
'DX Monitor' Programme:

http://hem.passagen.se/sm5ajv/DxWatch/dxwatch.htm
DX Watch:

http://www.sral.fi/beacon.htm
Finnish Beacons:

http://www.explore.force9.co.uk/beacons/index.htm
G0AEV's 10 Metre Beacon Pages:

http://www.keele.ac.uk/depts/por/28.htm
G3USF's HF Beacon List:

http://www.grommet.freeserve.co.uk/27-11/ts31.html
Grommets' 10 Metre Beacon Page:

http://ac6v.com/beacons.htm
Ham Radio Beacons:

http://www.hamradio-online.com/1996/jul/10meter.html
Ham Radio Online Beacon List:

http://www.explore.force9.co.uk/6and10/index.htm
Homepage of the 6 & 10 Reporting Club:

http://home.hccnet.nl/w.l.hoogenboom/beacon.html
Hoogenboom Beacons:

http://www.qsl.net/k7qo/ussr.html
K5FO's Russian 40 Metre Beacons:

http://63.110.187.38/bcn.html
KC4DPC's 10 Metre Beacons List:

http://www.qsl.net/la0by/LA-beac.htm
LA0BY Norwegian Beacon List:

http://home.no/la6im/ham_e.html
LA6IM's Norwegian Beacon Maps:

http://www.qsl.net/wd4ngb/10mtr.htm
N5EJS's 10 Metre Beacon List:

http://www.ncdxf.org/beacon.htm
NCDXF/IARU International Beacon Project:

http://www.qsl.net/ok2kkw/okombeacons.htm
OK & OM Beacons:

http://www.qsl.net/oz6om/bcn1099.html
OZ6OM's 6 & 4 Metre Beacon Website:

http://www.qsl.net/pa1are/software.html
PA1ARE's Software Page:

http://home4.swipnet.se/~w-41522/index.html
SM6LKM's Home Page: (Spectrogram)

http://www.qsl.net/sm7nwj/NCDXF-IARU-BeaconMonitoring.html
SM7NWJ's Beacon Monitoring Software:

http://groups.yahoo.com/group/TenMeterBeacons/
Ten Meter Beacons Mailing List:</A>Click here to visit the sign up page!

http://www.explore.force9.co.uk/beacons/idealbeacon.htm
The Ideal 28 MHz Beacon:

http://www.veron.nl/amrad/beacons.htm
Veron/Amrad Beacons:

http://www.qsl.net/wj5o
WJ50 10 Metre List:

http://www.zs5s.com/
ZS5S's HF Beacon Bulletin: (updated monthly)

http://www.qsl.net/g3pto/becon.html
7 MHz Beacons/Markers:

USEFUL SITES FOR OBTAINING NOTAM AND AERONUATICAL PUBLICATIONS:

Jeppesen:	http://www.jeppesen.com/onlinepubs/navdatanot.phtml
Pilots' Atlas:	http://www.absolutezero.de
Pooleys	http://www.pooleys.com
RAF AIDU:	http://www.aidu.mod.uk/
Sporty's Pilot Shop:	http://www.sportys.com/shoppilot/
Transair Pilots Supplies:	http://www.transair.co.uk
U-Flight UK VFR Guide:	http://www.airplan.u-net.com/afe_home.html
United States DoD:	http://www.defenselink.mil/pubs/

SECTION TWO: NDB RELATED PUBLICATIONS & PROGRAMMES:

THE EUROPEAN NDB HANDBOOK 2004 EDITION by Michael Oexner

Now in its fifth year already, the new ENDBH 2004 will give you the most up to date NDB information available. Its over 140 spiral-bound pages in DIN A4 format contain data of more than 4800 active NDBs located throughout Europe, the Northern African countries, and the Near and Middle East. Many of the more frequently heard transatlantic NDBs have been included, as well as NDBs operating from offshore installations such as oil platforms. Moreover the handbook lists widely reported unidentified beacons and irregular call signs, which result from so-called "negative keying". Many a NDB mystery may be solved with this kind of information on hand.

The layout of the NDB data is well known from the previous editions:

Part 1 (the reference list) shows the entries sorted by alphabetical order of the call sign and lists the carrier frequency, the modulation frequency, the authority or company taking care of the NDB, name and location of the NDB, country in ITU code, geographical co-ordinates, distance and Great Circle bearing. **Part 2** of the handbook is sorted in frequency order, **Part 3** in country order, and **Part 4** lists NDBs that have been decommissioned.

As a special benefit to the users of this handbook, the distance and Great Circle bearing are computed for the individual listener's location.

Please don't forget to specify the geographic co-ordinates of your listening post when ordering (recommended format to be used: degrees/minutes/seconds). Please let me know whether you prefer the distance shown either in kilometres or in miles.

To give newcomers an easy start the handbook includes a table showing those NDBs that are nearest to your location. And for those who are unfamiliar with Morse code, a reference table is included.

THE EUROPEAN NDB HANDBOOK CD / 2004 EDITION

The CD contains all parts of the printed version of the ENDBH 2004 in the popular PDF file format. All you will need to read the data is to install the Acrobat Reader software enclosed on the CD (in case you don't have it already). Having the NDB data available on your PC will allow you to easily search for specific entries. And if you would still like a printed version of the handbook, you can print it on your own now.

The CD contains some additional "bonus tracks" which I hope you'll enjoy. This includes some NDB pictures and sounds plus software packages to produce Great Circle maps and to calculate Great Circle distances and bearings, respectively. System requirements are a standard PC with CD-ROM drive and Microsoft Windows 9x or Windows NT4.0 operating systems (it should also run on any of the newer MS Windows operating systems).

PRICE:

The price for the book version of ENDBH 2004 is **EURO 30 / £25 / US-$ 35 each**. This includes postage and packaging for European destinations. US customers have the choice of surface mail delivery for **US-$ 35** or airmail delivery for **US-$ 45**.

The price for the ENDBH 2004 CD version is **EURO 25 / £20 / US-$ 30 each**. This includes postage and packaging for European destinations. US customers have the choice of surface mail delivery for **US-$ 30** or airmail delivery for **US-$ 35**.

HOW TO PAY:

German customers can pay via Bank Transfer. Cash: you can always send your payment in the form of bank notes (Euro, British Pound, US Dollar). If you are using this method though do be sure to take the usual precautions of concealing them well inside your letter. US or Canadian customers can send personal checks, cashier's cheques, or postal money orders made out in US-$. **PAYPAL** - You can also use Paypal to send and receive online payments.

WHERE TO ORDER:

To get your copy, please send your order and advance payment to the following address:

Michael Oexner, Hainfelder Str. 1, D-76835 Roschbach, Germany.

If you require more information about the publication and have access to e-mail you can also contact Michael at the following e-mail address: michael.oexner@web.de

DELIVERY TIME:

All handbooks and CDs will be produced individually, so a production time of 2 weeks should be expected. Surface mail delivery to the US can add another 8 to 10 days.

THE NORTH AMERICAN NDB HANDBOOK / 2004 EDITION by Michael Oexner

Nondirectional beacons (NDBs) are still in good use today as aids for aeronautical and maritime navigation. NDBs are low powered (50 W to 250 W) LW- or MW-transmitters feeding omnidirectional antennas resulting in a relatively small coverage area under daylight conditions. They transmit a callsign consisting of a few alphanumeric characters in slow Morse code, followed by a short silence or a continuous dash, before the callsign will be repeated. During hours of darkness NDBs can be received over much longer distances. By monitoring NDB transmissions interesting data can be collected regarding LF propagation conditions.

The new NANDBH 2004 will give you the most up to date NDB information available. Its over 200 spiral-bound pages contain data of more than 5000 NDBs located throughout North, Central and South America, the Caribbean and the Pacific. Many of the more frequently heard transatlantic NDBs have been included, as well as NDBs operating from offshore installations such as oil platforms. Moreover the handbook lists widely reported unidentified beacons and irregular call signs, which result from so-called "negative keying". Many a NDB mystery may be solved with this kind of information on hand.

The layout of the NDB data is arranged for ease of use: **Part 1** (the reference list) shows the entries sorted by alphabetical order of the call sign and lists the carrier frequency, the modulation frequency, the authority or company taking care of the NDB, name and location of the NDB, country in ITU code, geographical co-ordinates, distance and Great Circle bearing. **Part 2** of the handbook is sorted in frequency order, **Part 3** in country order, and **Part 4** gives details of decommissioned NDBs.

As a special benefit to the users of this handbook, the distance and Great Circle bearing are computed for the individual listener's location.

Please don't forget to specify the geographic co-ordinates of your listening post when ordering (recommended format to be used:

degrees/minutes/seconds). Please let me know whether you prefer the distance shown either in miles or in kilometres. To give newcomers an easy start the handbook includes a table showing those NDBs that are nearest to your location. And for those who are unfamiliar with Morse code, a reference table is included.

THE NORTH AMERICAN NDB HANDBOOK CD / 2004 EDITION

The CD contains all parts of the printed version of the NANDBH 2004 in the popular PDF file format. All you will need to read the data is to install the Acrobat Reader software enclosed on the CD (in case you don't have it already).

Having the NDB data available on your PC will allow you to easily search for specific entries. And if you would still like a printed version of the handbook, you can print it on your own now. The CD contains some additional "bonus tracks" which I hope you'll enjoy. This includes some NDB pictures and sounds plus some useful software packages to produce Great Circle maps or to calculate Great Circle distances and bearings, respectively. System requirements are a standard PC with CD-ROM drive and Microsoft Windows operating systems.

PRICE:

The price for the book version of NANDBH 2004 is **EURO 30 / £25 / US-$ 35 each**. This includes postage and packaging for European destinations. US customers have the choice of surface mail delivery **for US-$ 35** or airmail delivery for **US-$ 45**.

The price for the NANDBH 2004 CD version is **EURO 25 / £20 / US-$ 30 each**. This includes postage and packaging for European destinations. US customers have the choice of surface mail delivery for **US-$ 30** or airmail delivery for **US-$ 35**.

HOW TO PAY:

German customers can pay via Bank Transfer. Cash: you can always send your payment in the form of bank notes (Euro, British Pound, US Dollar). If you are using this method though do be sure to take the usual precautions of concealing them well inside your letter. US or Canadian customers can send personal checks, cashier's cheques, or postal money orders made out in US-$. **PAYPAL** - You can also use Paypal to send and receive online payments.

WHERE TO ORDER:

To get your copy, please send your order and advance payment to the following address:
Michael Oexner, Hainfelder Str. 1, D-76835 Roschbach, Germany.

If you require more information about the publication and have access to e-mail you can also contact Michael at the following e-mail address: michael.oexner@web.de

DELIVERY TIME:

All handbooks and CDs will be produced individually, so a production time of 2 weeks should be expected.

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NON DIRECTIONAL BEACONS OF EUROPE 8th EDITION 2003 - by Robert Connolly

Produced by Robert, the new editor of the quarterly Short Wave Magazine “Maritime Beacons” column, this new edition has been completely re-edited extends to 63 A4 printed pages. It contains details on nearly 3000 beacons with callsign, frequency, location, country, and now includes co-ordinates of most beacons.

The format is similar to earlier editions with introduction chapters giving details of NDBs, Aero section, Marine section, the popular Reverse frequency listing, and DGPS stations in Europe. The geographical coverage has been slightly extended and now covers from the East Coast of Canada to 70 degrees East (edge of Pakistan) and from the Arctic in the North to approx 12 degrees North. The usual easy to use format has been retained with the use of alphabetical / frequency order.

It is comb bound with a splash proof front cover. The price of this new edition is **£8.00 PLUS POSTAGE & PACKING (£2.00 FOR UK / £2.50 AIRMAIL FOR EEC / £3.00 AIRMAIL FOR NON EEC /USA) OR 15 EUROS INC AIRMAIL POSTAGE (EEC EUROPE) / 20 US DOLLARS FOR NON EEC / USA**.

Ordering details are available on Robert's website, or you can contact him at:

Mr R.A.Connolly GI7IVX, 21 Eleastan Park, Kilkeel, County Down, N.Ireland BT34 4DA, United Kingdom.

E-mail: robert@kilkeel7.freeserve.co.uk
URL: http://www.kilkeel7.freeserve.co.uk
URL: http://www.rconnolly.utvinternet.com/

NEW PRODUCT COMING SOON:

A new worldwide NDB listing will be available by this summer and will only be produced as a CD-Rom in either PDF or Excel formats. Price TBA.
Another publication from Robert which may be of interest to LF enthusiasts:

"STUDY CONCERNING THE WEATHER EFFECTS ON LOW FREQUENCY SKYWAVE PROPAGATION"

This new study details Robert's extensive research carried out during 1996/97 into the effect that weather conditions have on LF propagation. The study can be obtained from Robert at the above address for just £3.50p (including P&P in the UK), and Europe £4.50p or $8 US (including Airmail) $10 US to the USA.

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THE NDB ADDRESS LIST 2004

The new edition of this priceless and unique publication is available from March 2004, and is again produced by the Malmoe Shortwave Club. This 48-page A5 booklet lists QSL addresses for a large number of European NDBs, and is probably the only publication of its kind currently available for the use of the dedicated NDB QSL hunter. It lists information such as individual QSL addresses that have worked in the past, and also central addresses, many essential for verification of those waypoint beacons, or beacons that are difficult to find an individual address for.

This publication is available from:

Malmoe Shortwave Club, c/o Jan Thörnblom, Kiviksgatan 5 C, S-214 40 Malmö, Sweden.
E-mail: jan.thoernblom@malmo.mail.telia.com

Price: To be announced, new edition should be available in March 2004, details will appear here when they are available - an essential publication for all NDB QSL Hounds!

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THE BEACON FINDER

Compiled by: Kevin Carey
Contents: Comes ready for 3-ring binding. A new directory of VLF/LF/MF Stations commonly logged in North America. In addition to beacons this guide lists dozens of utility and experimental stations operating outside the 190-535 kHz range.

Available from: Kevin Carey, P.O. Box 56, West Bloomfield, NY 14585, USA.

Price: A companion 3.5" diskette (RTF format) of searchable station listings is also available for **$8.95c** when purchased with the 'Beacon Finder', or **$13.95** separately. Overseas orders should add $3 for postage. You can contact Kevin for further details at: wb2qmy@arrl.net

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NDB LOG 7.4 - NDB LOGGING PROGRAMME

NDBLOG 7.4 - The Database & Logging Program For Non-Directional Beacon Lovers
Produced by: Stan Forsman
Available from: 515A Westchester Drive, Campbell, CA 95008-5046 USA
E-mail: ndblog@mindless.com
Website: http://gatewaylinks.com/NDBLOG/home.htm
Price: **$15 US + $4.95** P & P Elsewhere, e-mail Stan for further details.

A DOS based logging programme, which allows the user to log over 30 different fields of information.

Computer Requirements:
PC with 512K RAM, hard drives with a minimum of 2 MB. More hard drive space will be required as the number and size of databases Increases. Be certain to indicate 3.5" (1.44MB) or 5.25" (1.2MB) diskette.
If you already own an older version of NDBLOG, you can get version 7.4 for $5.00 (US funds) plus shipping.

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ADMIRALTY LIST OF RADIO SIGNALS VOLUME 2 (NP282)

Covers All Marine and some Aero beacons, Time Signals, Position Fixing, RDF Stations.

Published Annually (March) - A4 (approx 350 pages)
Available from most Admiralty Agents (too many to list here - though if you would like to know if there is one in your area e-mail me with your location and I'll check!), a good solution though if you are not near to a Port try the following:

Kelvin Hughes Ltd, Charts and Maritime Supplies, Mail Order Dept. Royal Crescent Road,
Southampton SO14 3NP, England.

Visit their website at: http://www.kelvinhughes.com

Kelvin Hughes Ltd.
Tel: (+44) 01703 223772
Fax: (+44) 01703 330014

Note: They operate a good mail order service, and can supply 'Weekly Notices to Mariners' on subscription, and unlike many Admiralty Agents they will accept credit card orders by telephone!

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RACAL AVIONICS "AERAD FLIGHT SUPPLEMENTS"

The world is covered in four volumes: Europe & Middle East Supplement/Western Hemisphere Supplement/Africa Supplement/Asia, Australasia & Pacific Supplement:

AERAD products can be obtained directly from the Aerad company, but an easier (ie. more enthusiast friendly!) source is the:

Transair Pilot Shop, Shoreham Airport, Shoreham-by-Sea, West Sussex, ENGLAND BN43 5PA.

(You can make mail order purchases with most major credit cards by calling their mail order lines)
From within the United Kingdom:

Tel: 01273 466000
Fax: 01273 462246

For International callers: Fax: 00 44 1273 462246

Hours for ordering: Mon-Friday 0830 to 1830 hours, Saturdays 0900 to 1700, and Sundays 1000 to 1600 hours (all times local!) or 24 hours a day via their website.
Website: http://www.transair.co.uk
Information: info@transair.co.uk

They also have two other shops which are open to the public, the shops at Shoreham and Fairoaks 7 days per week, and the shop in London, Mondays to Saturdays. Check out their website for full details.

And don't forget to ask for a copy of their free catalogue, you can check this out online, or ask for a printed copy at their site or by phone!

NOTE# (Aerad publications contain up to date Aeronautical Beacon, Navaid and ATC information.)

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RAF EN ROUTE SUPPLEMENT

(good source of Aero beacons info, free updates available from their website!)

Address: 1 AIDU, (Aeronautical Information Documents Unit) RAF Northolt, West End Road, Ruislip, Middlesex HA4 6NG, England.

Tel: (+44) 0181 845 2300 Ext: 7510/7209
Website: http://www.aidu.mod.uk/

(ask for a free copy of 'Flight Information Publications Prospectus - but, please note that these are military publications, and might not be sold to residents of certain countries!)

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THE WORLD BELOW 500 kHz

Author: Peter L.Carron Jr.
ISBN: 1 882123 00 X
Pages: Softcover 54 pages.
Published by: Universal Radio Research, 1280 Aida Drive, Reynoldsburg, OH 43068, USA.

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VLF RADIO - THE SOUNDS OF LONGWAVE

(A 60 minute cassette recording)
Recorded by: **Kevin Carey WB2QMY**

Available from: P.O.Box 56, West Bloomfield, NY 14585, USA.
E-mail: wb2qmy@arrl.net
Price: $13.95 (US Dollars) in the US. Contact Kevin for prices elsewhere.

Contains many recordings of all the various sounds, which can be heard on the LF bands, plus many tips for the enthusiast.

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RADIO RAFT VERSION 3.21

A data decoding programme by **François Guillet F6FLT**, this decodes many different such as ACARS, SITOR, ARQ, CW, Packet, PATOR etc. but for most beacon enthusiasts it's the capability to decode DGPS signals that will be of most interest. At present it requires a 'Hamcomm' type interface to feed the signal into the PC. A 'Lite' version of the programme can be downloaded for free from F6FLT's website, but this only has a few of the functions enabled, and registration will be required before DGPS can be decoded with it. The software can be obtained from the following sources:

Available from: **François Guillet F6FLT**
Website: http://perso.wanadoo.fr/radioraft/
E-mail: radioraft@wanadoo.fr

Requirements: At least a 486 PC with MSDOS 6.2, VGA screen and comport. "radioraft" or "Hamcomm" interface required.

Price: £24.99p from UK distributor Pervisell. See list of authorised distributors below for local Prices for your part of the world.

Distributors: (from the list on F6FLT's website)

PERVISELL Ltd. 8 Temple End, High Wycombe, Bucks, HP13 5DR, GREAT BRITAIN.

Tel: +01494 443033 Fax +01494 448236
Email: ham@pervisell.com
Website: http://www.pervisell.com

Also sells six "Hamcomm" type interfaces built in compact cases, without need of external power supply.

SIMONE GRANDICELLI: Via Asiago 27, 62012 Civitanova Marche (MC), ITALY.

Tel: 0335/7553316 Fax: 0733/812759 (Not automatic)
E-mail: grandicelli@liberto.it
Website: http://digilander.iol.it/grandicelli

JJD COMMUNICATION: 9, rue de la Hache, B5, F-14000 CAEN, FRANCE.

Tel: (33) 02 31 95 77 50 Fax: (33) 02 31 93 92 87
Email: jjdcom@mail.cpod.fr
Website: http://www.jjdcom.com

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SKYSWEEPER PRO & STANDARD

A very effective and comprehensive data-decoding programme, which not only decodes DGPS and great number of other data modes, but also runs under most versions of Windows too. Created by Skysweep Technologies, demo versions can be downloaded from the following sites, where the registered copy may also be purchased:

SKYSWEEP TECHNOLOGIES:
Website: http://www.skysweep.com

PERVISELL:
Website: http://www.pervisell.com

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SECTION THREE: PUBLICATIONS COVERING LF AND BEACONS:

“BEACONS/UTILITIES DESK” A monthly column in the UK publication “Medium Wave News”, compiled and edited by David Towers. More details: http://www.mwcircle.org

"BELOW 500 kHz" A monthly column in Monitoring Times edited by Kevin Carey WB2QMY.

"THE EUROPEAN UTILITY NEWSLETTER" This was a monthly newsletter edited by Andreas Ibold, unfortunately it has now ceased publication. The good news though is that the EUNL group has set up a mailing list at Yahoogroups, and European utility enthusiasts can now share the information electronically. To join the group just send a blank mail to: eunl-subscribe@yahoogroups.com or check out Yahoogroups.

"THE LOWDOWN" a monthly bulletin published by the **L**ong **W**ave **C**lub of **A**merica. Further details can be obtained from their web site at the following URL: http://www.lwca.org

"MARITIME BEACONS" a quarterly column of Maritime Beacon Loggings, which appears in Shortwave Magazine. Edited by Robert Connolly, GI7IVX. Appears: March, June, September, and December.

"SECTION NDB" a monthly column devoted to NDBs, edited by Herman Schoemaker and published in the Benelux DX Club magazine "BDXC Bulletin". Further details can be obtained from their web site at the following URL: http://www.425dxn.org/swls/bdxc/

SECTION FOUR: SUPPLIERS OF SPECIALIST LF EQUIPMENT:

WELLBROOK COMMUNICATIONS: (note new address from May 2003)

Address: Wellbrook Communications, The Farthings, Beulah, Llanwrtyd Wells, Powys, Wales LD5 4YD.
Tel: 01591 620316 (from overseas) +44 1591 620316
E-mail: sales@wellbrook.uk.com
Website: http://www.wellbrook.uk.com

(Suppliers of specialist Broadband Magnetic Loop Antennae such as the ALA1530, ALA100 and LFL1010)

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LF ENGINEERING:

Address: 17 Jeffry Road, East Haven, CT 06512, USA..
Website: http://www.lfengineering.com
(supplier of specialist LF receiving equipment - write for their catalogue!)

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SECTION FIVE: SPECIALIST BEACON E-MAIL REFLECTORS:

THE NDB LIST REFLECTOR:

This specialist beacon reflector started in November 1998 as a mainly European based list covering mainly LF Non-Directional Radiobeacons. To date it has grown to approximately 100 members and covers most parts of the world, and though the main topic is NDBs it does also cover beacons of any description such as Single Letter Markers, and HF propagation beacons. We operate more like a club, and hold regular co-ordinated monitoring Events, known as CLE's, and also have a very comprehensive awards scheme to reward levels of personal achievement. If you've read this far you might be the sort of person we're looking for, and if you think you might be why not contact me for a chat and further information, we're always pleased to recruit new members.

How to join:

This is a 'closed' private list, and though membership is open to anyone with an interest in beacons, all applications have to be approved by the list moderators. There are several ways in which you can join, you can contact the list owner (me) or any of the list moderators and ask them to subscribe you, or you can fill in the details at our sign up page (details below), though your application will still have to be approved, and we may ask you a few questions if your e-mail address looks a bit suspicious. This may seem a little draconian, but we're determined not to allow any spammers or flamers to get into our group, and to date we have managed to avoid any such problems by taking this approach. I should also point out that we own our own e-mail reflector and domain, and with no Yahoo type sign up forms to fill in there is no danger of your details being passed on to any spammer lists or commercial/marketing organisations

NDB List Sign Up Page:

http://beaconworld.org.uk/mailman/listinfo/ndblist_beaconworld.org.uk

If you would like to contact me directly just send me a little information about your particular beacon related interests, I'm always very pleased to hear from fellow beacon enthusiasts. Contacting me is easy, just send a mail to me at: alan@beaconworld.org.uk

THE LOWFER REFLECTOR:

This is a long established reflector and members can join this by visiting the QTH.Net website, topics covered include all of the LF bands, Lowfer and Medfer beacons, and some NDB topics. You can join this by visiting the QTH.Net website and signing up there. The url for this is: http://www.qth.net

FARI NELLA NOTTE:

This new list started in 2003, and is compiled by subscribers to the 'Fari nella Notte' group, a small mailing list, which began last January as a virtual Pizzeria for the handful of Italian Beaconeers. It has now grown to a healthy 22 members, many of them quite active. The list is in Italian and has an Italian style, and also produces an excellent list of Italian NDBs – check out: http://italianbeacons.splinder.it/ for more details.

For more information about how to join the group check out their information page at:

http://groups.yahoo.com/group/radiofari/

NDB-DX:

This is a Swedish language e-mail reflector for NDB enthusiasts, and you can find out more about how to join from their information page at: http://groups.yahoo.com/group/ndb-dx

LONGWAVERADIOLISTENING:

This list covers all the signals to be found at these frequencies, including Long Wave Broadcasts, Beacons, Utilities, 136 kHz Ham band, and Lowfers. Details of how to sign up can be found at the following address: http://groups.yahoo.com/groups/longwaveradiolistening

NDBRNA (Non-Directional Beacons Received in North America)

Until very recently this was in the form of a distribution list for the Acrobat or Excel versions of the popular monthly database of active North American beacons, which was produced by Andy Robins. As of June 2004 the system has now been automated and run by Martin Francis of Ontario, and users can now add their data to the file online at Martin's special webpage. The file can still be downloaded in Excel format from the page, but it is now "interactive", so visiting the site will ensure that you always receive the latest copy.

Please help to support this project by adding your own data or corrections, this is a very unique project, which is invaluable to Dxers in North America (and a few of those outside!).

http://www.classaxe.com/dx/ndb/ndbrna

RADIO-SCIENCE OBSERVERS GROUP:

This new group was founded for the benefit of those who rely on NDB communications and longwave radio for their propagation studies.

More information about the group can be found at their Yahoogroups page at:

http://groups.yahoo.com/group/Radio-Science/

HF-BEACONS REFLECTOR:

In February 2001 a new HF beacons e-mail reflector was created by **Steve Reed G0AEV** and **Martin Harrison G3USF** of the RSGB's Propagation Studies Committee, and the **6 & 10 Reporting Club**. Membership is open to anyone with an interest in HF beacon monitoring or operating, and if you are reading this document and aren't already a member it may be of interest to you. I have included full details about how to join this excellent list below:
As a radio amateur believed to be interested in running or monitoring HF beacons, may we invite you to subscribe to a new mailing list: hfbeacons@explore.plus.com

The objective of this list is to facilitate the exchange of information relating to beacons in the HF amateur bands, especially but not exclusively to beacons in the 10m (28MHz) band. Topics covered by this list include: -

- Issues in designing, building and operating beacons
- Beacon frequency allocations and the resolution of frequency conflicts
- Information on new beacons planned or heard
- Posting of data to help keep lists of beacons up to date
- Requests by beacon owners for reception reports
- Analysis of reception reports received
- Results of propagation studies based on beacon monitoring
- Promotion of beacon information resources such as web sites

An email message sent to the list is automatically transmitted to all list members; however only subscribers can receive messages from, or post messages to, the list. Subscription is very simple - just send an empty email message addressed to: hfbeacons-subscribe@explore.plus.com

No subject or other message text is required. You will be sent an automated request to confirm your subscription. This confirmation is used to verify that your email address is correct and to protect you in case someone forges a subscription request in your name.

Once subscribed, you can post a message to the list by addressing an email to hfbeacons@explore.plus.com

You can remove your address from the list at any time by sending a message to:
hfbeacons-unsubscribe@explore.plus.com

Other commands are available to subscribers, but hfbeacons-info@explore.plus.com and hfbeacons-faq@explore.plus.com do not work yet. Please send any requests for information or help to g0aev@explore.plus.com

This list was set up by Steve Reed G0AEV and Martin Harrison G3USF, members of the RSGB's Propagation Studies Committee and co-editors of the Six and Ten Report (which includes monthly reports on 10m beacons heard in the UK). Both actively monitor beacons for use in radio propagation studies. Martin is IARU Region 1 HF Beacon Co-ordinator and maintains G3USF's Worldwide List of HF Beacons, while some of the beacon data Steve compiles can be found on the G0AEV's Beacons web site. URLs for these sites are:

RSGB Propagation Studies Committee:	http://www.keele.ac.uk/depts/por/psc.htm
Six and Ten Report:	http://www.explore.force9.co.uk/6and10/
G3USF's Worldwide List of HF Beacons:	http://www.keele.ac.uk/depts/por/28.htm
G0AEV's Beacons:	http://www.explore.force9.co.uk/beacons/
6 & 10 Report:	http://www.6and10.org.uk

ANOTHER TEN METER BEACON REFLECTOR FOR BEACON OPERATORS:

As of May 2002, another new e-mail reflector for Ten Metre Beacon operators was started at Yahoogroups. Further details can be found at:

http://groups.yahoo.com/group/TenMeterBeacons

Back to Index:

PART THREE: MORSE, ABBREVIATIONS & COUNTRY CODES:

INTRODUCTION:

The sections included in Part Three of this handbook are primarily designed to supply the beacon dxer with a certain amount of additional material, hopefully information which will assist them with their beacon dxing. I had noticed that when using certain ‘official’ publications I had to constantly refer to other publications to find out such information as ITU Country Codes, or ‘special’ Morse characters. The inclusion of the ICAO code identifiers is in response the frustration I frequently feel when using the ‘official’ Aerad publications and find that there is no indication of the country that the beacon is located in other than a 4-figure ICAO code. The list in Section Four will at least allow users of these publications a means of cross checking the first two letters of this code, which is a useful method of quickly finding the country the airport is based in. I though that having all the relevant material in one publication would save the listener a great deal of extra effort, and spare the frustration of trying to find that rare continental morse character at 0300 when you have just heard that exotic station, and can hardly keep your eyes open!

In previous editions of this handbook only the "official" ITU Country Code List was included, but there is a small problem with the "official" list, in that there are only 189 members of the ITU, but well over 300 "radio Countries". This is a problem that has beset a number of us for some time, since many countries don't have an 'official' 3 letter code allocated to them, only to the governing administrations. A good example of this is the United Kingdom, or to give it the full and official title: "The United Kingdom of Great Britain & Northern Ireland". In the ITU Code list the letter 'G' is allocated to the UK, but this not only covers the four separate countries that make up the UK, but also the Channels Islands and the Isle of Man which are not a part of the UK (or even the European Union), but are in fact self governing Crown Dependencies. England, Scotland, Wales and Northern Ireland are, and have been separate countries for centuries, but for the past several hundred years have shared a political administration (though not the legal system). The Channel Islands are not one entity, Jersey is one country, and the Bailiwick of Guernsey covers the islands of Guernsey, Herm, Sark & Alderney. It seems ridiculous to only have the one code for all seven of these countries. The NASWA (North American Short Wave Association) and ARRL (American Radio Relay League) DXCC country lists recognise this point and for radio purposes class them all as separate 'radio countries', the one exception to this is the EDXC (European DX Council) which still classes all seven countries as the 'UK'. This sort of problem occurs with many other countries too, and there is still much confusion about what codes are "official", and which are just ones in "common usage" by Dxers.

The DXA (DX Antwerp) once club tackled this problem and produced a very good list, which recognises many of the radio countries, and they came up with a number of sensible codes to cover this. This list would have been ideal for many beacon enthusiasts, except for the fact that it was partly based on the EDXC Country List, and as such still classed the UK as a country rather than an 'entity' made up of four countries.

To try and address this a number of members of the NDB List e-mail reflector (myself included) attempted to come up with a country list of our own, and after much, effort we decided that one based on a combination of the DXA List, the "official" ITU List, and a small number of additions of our own would be the most useful to us. To fill in the gaps we adopted some of the 3 letter codes issued to International "Postal Countries", the ones allocated to the UK and Channel Islands seemed to offer a very logical choice, and would appear to make far more sense that just 'G, or other ‘single letter codes which aren’t very descriptive'.

Whilst we were about it we also came up with a brand new and original set of codes to cover such difficult to categorise topics as offshore platform beacons, and the numerous "Unidentified" beacons, in my humble opinion these are a very useful way of coding these “oddities”.

Whilst this is not an attempt to convert anyone else from using their favoured and familiar country codes, I did feel that the whole list would certainly be worthy of inclusion in this section along with the “official” listings. The members of the NDB List E-mail Reflector, who spent a lot of time and effort coming up with this new system, feel that we have produced a list which will be very effective for the purposes of beacon logging. I would like to stress though, that this list is purely of our own making, and is not in any way an attempt to get involved in any political questions about nationhood, or any other political disputes, finding an effective and simple way of counting radio countries effectively was our sole motivation for getting involved in this project.

Also added to this section in version 2.0 is the full NDB List Abbreviations List. This is available as a separate publication, but a number of readers said they would like this information to be available under the same cover as everything else. Your wish is my command gentlemen!

CONTENTS:

Part Three is divided into eight separate sections:

Section One - is a listing of the most commonly heard Morse code characters and abbreviations that are likely to be heard in use on the utility frequencies. I have included this here, since a number of continental beacons are also known to transmit characters with ‘umlauts’ and other types of accented letters. Since these may be unfamiliar to most English speaking listeners and not always included in conventional lists, the ‘Morse Punctuation’ section should prove to be quite helpful when you come across an unfamiliar character.

Section Two - The brand new NDB List Country Code List, produced by beacon Dxers for beacon Dxers. In this section countries are listed in continent and alphabetical order.

Section Three - as Section Two, but prefixes are displayed in country code order.

Section Four - I decided that it would be worthwhile producing a file covering all of ICAO codes, since trying to work out what country a beacon or airfield belongs to when using publications like the AERAD, or DoD Flight Supplements can be very frustrating to say the least. By Having the first two letters shown along with the country is belongs to, a four letter airport code, e.g. EGCC can quickly be broken down to 'EG' the UK, 'CC' Manchester. In this section prefixes are listed in alphabetical code order.

Section Five - as Section Four, but prefixes are listed in country name order.

Section Six - contains a list of ITU country codes, and is based on the Official List, which is provided by the ITU (International Telecommunications Union) based in Geneva, Switzerland. This is the list, which is issued to all 189 ITU Members. Countries are given in country order first to enable you to quickly find the correct code.

Section Seven - as Section Two, but in callsign order. This format is added to make it easier for you to look up which country someone else’s reported codes come from.

Section Eight – The full and unedited abbreviations list, if you can’t find it here, let me know and I’ll try to include it in a future edition!

Note#

- It should be noted that in the case of ITU Country Codes, these are likely to change from time to time due to factors such as: countries deciding to change their names; independence; civil war; internal political changes within the country etc. Fortunately changes like this don’t occur too often, but if you would like to keep a check on the latest situation, and you happen to be fortunate enough to have access to the Internet, you can access an up to date list of these from the website of Stan Scalsky (editor of the excellent "Utility World" column in Monitoring Times).

The (URL) address to point your browser to is: http://www.ominous-valve.com/itucode.txt

SECTION ONE: THE MORSE CODE:

Below is a list of the most commonly used Morse characters. For more information on how to go about learning the morse code see the item in Part One of this publication.

THE MORSE ALPHABET

Letter:	Code:	Sound:
A	. _	di-dah
B	_ . . .	dah-di-di-dit
C	_ . _ .	dah-di-dah-dit
D	_ . .	dah-di-dit
E	.	dit
F	. . _ .	di-di-dah-dit
G	_ _ .	dah-dah-dit
H	. . . .	di-di-di-dit
I	. .	di-dit
J	. _ _ _	di-dah-dah-dah
K	_ . _	dah-di-dah
L	. _ . .	di-dah-di-dit
M	_ _	dah-dah
N	_ .	dah-dit
O	_ _ _	dah-dah-dah
P	. _ _ .	di-dah-dah-dit
Q	_ _ . _	dah-dah-di-dah
R	. _ .	di-dah-dit
S	. . .	di-di-dit
T	_	dah
U	. . _	di-di-dah
V	. . . _	di-di-di-dah
W	. _ _	di-dah-dah
X	_ . . _	dah-di-di-dah
Y	_ . _ _	dah-di-dah-dah
Z	_ _ . .	dah-dah-di-dit

MORSE NUMERALS:

Numbers:	Code:	Sound:
1	. _ _ _ _	di-dah-dah-dah-dah
2	. . _ _ _	di-di-dah-dah-dah
3	. . . _ _	di-di-di-dah-dah
4	. . . . _	di-di-di-di-dah
5	. . . . .	di-di-di-di-dit
6	_	dah-di-di-di-dit
7	_ _ . . .	dah-dah-di-di-dit
8	_ _ _ . .	dah-dah-dah-di-dit
9	_ _ _ _ .	dah-dah-dah-dah-dit
0	_ _ _ _ _	dah-dah-dah-dah-dah

ACCENTED CHARACTERS:

As I mentioned in the introduction, many 'accented' morse characters can often be heard on some of the continental beacon IDs, and below you will find a list of the morse characters relating to these. As you will note, some of the characters are common to several European languages, so assumptions about possible locations based purely on these accents should be made with great care.

Letter:	Code:	Sound:
Ä (German)	. _ . _	di-dah-di-dah
Æ (Scandinavian)	. _ . _	di-dah-di-dah
Á or Å (Scandinavian/Spanish)	. _ _ . _	di-dah-dah-di-dah
Ch (Finnish/German/Spanish)	_ _ _ _	dah-dah-dah-dah
Sh (Russian)	_ _ _ _	dah-dah-dah-dah
É (Finnish or French)	. . _ . .	di-di-dah-di-dit
É (Finnish)	. . _ . .	di-di-dah-di-dit
Ñ (Spanish)	_ _ . _ _	dah-dah-di-dah-dah
Ö (German or Scandinavian)	_ _ _ .	dah-dah-dah-dit
Ø (Scandinavian)	_ _ _ .	dah-dah-dah-dit
Ch (Russian)	_ _ _ .	dah-dah-dah-dit
Ü (Finnish or German)	. . _ _	di-di-dah-dah
Yu (Russian)	. . _ _	di-di-dah-dah

PUNCTUATION:

Not included in previous editions, this is now included, mainly because many Amateur Propagation beacons use a number of these terms in their ident messages. Hopefully this will now save you from having to search around for these.

Punctuation:	Code:	Sound:
Full Stop (period)	. _ . _ . _	di-dah-di-dah-di-dah
Comma	_ _ . . _ _	dah-dah-di-di-dah-dah
Colon	_ _ _ . . .	dah-dah-dah-di-di-dit
Interrogation	. . _ _ . .	di-di-dah-dah-di-dit
Slash /	_ . . _ .	dah-di-di-dah-dit
Break =	_ . . . _	dah-di-di-di-dah
Error	. . . .	di-di-di-di-di-di-di-dit
Hyphen -	_ . . . . _	dah-di-di-di-di-dah
Inverted Commas "	. _ . . _ .	di-dah-di-di-dah-dit
Apostrophe '	. _ _ _ _ .	di-dah-dah-dah-dah-dit
Colon :	_ _ _ . . .	dah-dah-dah-di-di-dit
Underline	_ . . _ _ . _	di-di-dah-dah-di-dah
Wait	. _ . . .	di-dah-di-di-dit
Bracket (	_ . _ _ .	dah-di-dah-dah-dit
Bracket)	_ . _ _ . _	dah-di-dah-dah-di-dah
AR (end of message)	. _ . _ .	di-dah-di-dah-dit
VA (end of work)	. . . _ . _	di-di-di-dah-di-dah
VE (understood)	. . . _ .	di-di-di-dah-dit
K (invitation to transmit)	_ . _	dah-di-dah
R (received)	. _ .	di-dah-dit
CT (commence traffic)	_ . _ . _	dah-di-dah-di-dah
de (from)	_ . . .	dah-di-dit dit
SOS (Distress Call)	. . . _ _ _ . . .	di-di-dit-dah-dah-dah-di-di-dit
CQ (General Call)	_ . _ . _ _ . _	dah-di-dah-dit dah-dah-di-dah
73 (best wishes)	_ _ . . . . . _ _	dah-dah-di-di-dit di-di-di-dah-dah
@ (Commat)	. _ _ . _ .	di-dah-dah-di-dah-dit

SECTION TWO: THE NDB LIST COUNTRY CODE LIST

(prefixes listed by continent & alphabetical country order)

The list treats each US State and Canadian province as a separate “radio country”. The same is true of Australian states. Only Russia is divided between continents. The portion west of the Urals is considered part of Europe while that to the east is in Asia. Not all of the countries listed may have active NDBs. Wherever possible, standard International Telecommunications Union (ITU) three-letter country codes have been used. Codes for US and Australian states and Canadian provinces use two letters.

NORTH AMERICA (66)

COUNTRY:		CODE:
ALASKA (US state)		ALS
BERMUDA (UK)		BER
CANADA: (13)		CAN
o Alberta	AB	
o British Columbia	BC	
o Manitoba	MB	
o New Brunswick	NB	
o Newfoundland & Labrador	NL	
o Northwest Territories	NT	
o Nova Scotia	NS	
o Nunavut	NU	
o Ontario	ON	
o Prince Edward Island	PE	
o Quebec	QC	
o Saskatchewan	SK	
o Yukon	YT	
GREENLAND: (Denmark)		GRL
ST PIERRE ET MIQUELON: (France)		SPM
USA: (49 - Alaska & Hawaii counted separately)		USA
o Alabama	AL	
o Arizona	AZ	
o Arkansas	AR	
o California	CA	
o Colorado	CO	
o Connecticut	CT	
o Delaware	DE	
o Florida	FL	
o Georgia	GA	
o Idaho	ID	
o Illinois	IL	
o Indiana	IN	
o Iowa	IA	
o Kansas	KS	
o Kentucky	KY	
o Louisiana	LA	
o Maine	ME	
o Maryland	MD	

o Massachusetts	MA
o Michigan	MI
o Minnesota	MN
o Mississippi	MS
o Missouri	MO
o Montana	MT
o Nebraska	NE
o Nevada	NV
o New Hampshire	NH
o New Jersey	NJ
o New Mexico	NM
o New York	NY
o North Carolina	NC
o North Dakota	ND
o Ohio	OH
o Oklahoma	OK
o Oregon	OR
o Pennsylvania	PA
o Rhode Island	RI
o South Carolina	SC
o South Dakota	SD
o Tennessee	TN
o Texas	TX
o Utah	UT
o Vermont	VT
o Virginia	VA
o Washington	WA
o Washington/District of Columbia	DC
o West Virginia	WV
o Wisconsin	WI
o Wyoming	WY

CENTRAL AMERICA/CARIBBEAN: (35)

ANGUILLA	AIA
ANTIGUA & BARBUDA	ATG
ARUBA	ABW
BAHAMAS	BAH
BARBADOS	BRB
BELIZE	BLZ
CAYMAN ISLANDS	CYM
COSTA RICA	CTR
CUBA	CUB
DOMINICA	DMA
DOMINICAN REPUBLIC	DOM
EL SALVADOR	SLV
GRENADA	GRD
GUADELOUPE	GDL
GUATEMALA	GTM
HAITI	HTI
HONDURAS	HND
JAMAICA	JMC
MARTINIQUE	MRT
MEXICO	MEX
MONTSERRAT	MSR
NETHERLANDS ANTILLES	ATN
NICARAGUA	NCG
PANAMA	PNR
PUERTO RICO (US COMMONWEALTH)	PTR
SAN ANDRES & PROVIDENCIA (COLOMBIA)	SAP
ST BARTHELEMY	BAR

ST KITTS-NEVIS	SCN
ST LUCIA	LCA
ST VINCENT	VCT
SWAN ISLAND (ISLAS DEL CISNE)(HONDURAS)	SWN
TRINIDAD & TOBAGO	TRD
TURKS & CAICOS ISLANDS	TCA
VIRGIN ISLANDS (BRITISH)	VRG
VIRGIN ISLANDS (US)	VIR

SOUTH AMERICA: (18)

ARGENTINA	ARG
BOLIVIA	BOL
BRAZIL	BRA
CHILE	CHL
COLOMBIA	CLM
DESVENTURADOS (CHILE)	DES
ECUADOR	EQA
FALKLAND ISLANDS (MALVINAS)(UK)	FLK
FRENCH GUYANA	GUF
GALAPAGOS (ECUADOR)	GAL
GUYANA	GUY
JUAN FERNANDEZ & ISLA ROBINSON CRUSOE (CHILE)	ROC
PARAGUAY	PRG
PERU	PRU
SAO PAULO	SPO
SURINAME	SUR
URUGUAY	URG
VENEZUELA	VEN

EUROPE: (63)

ALBANIA	ALB
ANDORRA	AND
AUSTRIA	AUT
AZORES (PORTUGAL)	AZR
BEAR ISLAND (BJORNOYA)(NORWAY)	BRI
BELARUS	BLR
BELGIUM	BEL
BALEARIC ISLANDS (SPAIN)	BAL
BOSNIA-HERCEGOVINA	BIH
BULGARIA	BUL
CORSICA (FRANCE)	COR
CROATIA	HRV
CZECH REPUBLIC	CZE
DENMARK	DNK
ENGLAND (UK)	ENG
ESTONIA	EST
FAROE ISLANDS (DENMARK)	FRO
FINLAND	FIN
FRANCE	FRA
GERMANY	DEU
GIBRALTAR (UK)	GIB
GREECE	GRC
GUERNSEY (UK)	GSY
HUNGARY	HNG
ICELAND	ISL
IRELAND	IRL

ISLE OF MAN (UK)	IOM
ITALY	ITA
JAN MAYEN (NORWAY)	JMY
JERSEY (UK)	JSY
KALINIGRAD (RUSSIA)	KAL
LATVIA	LVA
LIECHTENSTEIN	LIE
LITHUANIA	LTU
LUXEMBOURG	LUX
MACEDONIA	MKD
MALTA	MLT
MOLDOVA	MDA
MONACO	MCO
MONTENEGRO (FORMER YUGOSLAVIA)	MON
NETHERLANDS	HOL
NORTHERN IRELAND (UK)	NIR
NORWAY	NOR
ORKNEY ISLANDS (UK)	ORK
POLAND	POL
PORTUGAL	POR
ROMANIA	ROU
RUSSIA (EUROPEAN)	RUS
SAN MARINO	SMR
SARDINIA (ITALY)	SAR
SCOTLAND (UK)	SCT
SERBIA (FORMER YUGOSLAVIA)	SER
SHETLAND ISLANDS (UK)	SHE
SICILY (ITALY)	SCY
SLOVAKIA	SVK
SLOVENIA	SVN
SPAIN	ESP
SVALBARD (NORWAY)	SVB
SWEDEN	SWE
SWITZERLAND	SUI
UKRAINE	UKR
VATICAN STATE	CVA
WALES (UK)	WLS

AFRICA: (68)

ALGERIA	ALG
ANGOLA	AGL
ASCENSION ISLAND (UK)	ASC
BENIN	BEN
BOTSWANA	BOT
BURKINA FASO	BFA
BURUNDI	BDI
CABINDA (ANGOLA)	CAB
CAMEROON	CME
CANARY ISLANDS (SPAIN)	CNR
CAPE VERDE	CPV
CENTRAL AFRICAN REPUBLIC	CAF
CEUTA (SPAIN)	CEU
CHAD	TCD
COMOROS	COM
CONGO-BRAZZAVILLE	COG
CONGO-KINSHASA	COD
DJIBOUTI	DJI
EGYPT	EGY
EQUATORIAL GUINEA	GNE
ERITREA	ERI

ETHIOPIA	ETH
EUROPA ISLAND (FRANCE)	EUR
GABON	GAB
GAMBIA	GMB
GHANA	GHA
GLORIEUSE ISLAND	GLO
GUINEA	GUI
GUINEA-BISSAU	GNB
IVORY COAST	CTI
JUAN DE NOVA ISLAND	JDN
KENYA	KEN
LESOTHO	LSO
LIBERIA	LBR
LIBYA	LBY
MADAGASCAR	MDG
MADEIRA (PORTUGAL)	MDR
MALAWI	MWI
MALI	MLI
MAURITANIA	MTN
MAURITIUS	MAU
MAYOTTE	MYT
MELILLA (SPAIN)	MEL
MOROCCO	MRC
MOZAMBIQUE	MOZ
NAMIBIA	NMB
NIGER	NGR
NIGERIA	NIG
REUNION	REU
RWANDA	RRW
SAO TOME E PRINCIPE	STP
SENEGAL	SEN
SEYCHELLES	SEY
SIERRA LEONE	SRL
SOMALIA	SOM
SOUTH AFRICA	AFS
ST HELENA (UK)	SHN
SUDAN	SDN
SWAZILAND	SWZ
TANZANIA	TZA
TOGO	TGO
TRISTAN DA CUNHA (UK)	TRC
TROMELIN ISLAND	TRO
TUNISIA	TUN
UGANDA	UGA
WESTERN SAHARA	AOE
ZAMBIA	ZMB
ZIMBABWE	ZWE

ASIA: (55)

AFGHANISTAN	AFG
ANDAMAN & NICOBAR ISLANDS (INDIA)	ANI
ARMENIA	ARM
Azerbaijan	AZE
BAHRAIN	BHR
BANGLADESH	BGD
BHUTAN	BTN
BRUNEI	BRU
CAMBODIA	CBG
CHINA (PRC)	CHN
CHRISTMAS ISLAND (AUSTRALIA)	CHR

COCOS (KEELING) ISLANDS (AUSTRALIA)	ICO
CYPRUS	CYP
DIEGO GARCIA (BIOT)(UK)	DGA
GEORGIA	GEO
INDIA	IND
INDONESIA	INS
IRAN	IRN
IRAQ	IRQ
ISRAEL	ISR
JAPAN	JPN
JORDAN	JOR
KAZAKHSTAN	KAZ
KOREA, NORTH	KRE
KOREA, SOUTH	KOR
KUWAIT	KWT
KIRGHIZISTAN	KGZ
LAOS	LAO
LEBANON	LBN
MALAYSIA	MLA
MALDIVES	MLD
MONGOLIA	MNG
MYANMAR (BURMA)	BRM
NAKHICHEVAN (AZERBAIJAN)	NAK
NEPAL	NPL
OMAN	OMA
PAKISTAN	PAK
PHILIPPINES	PHL
QATAR	QAT
RUSSIA (EASTERN)	RSE
SAUDI ARABIA	ARS
SINGAPORE	SNG
SPRATLEY ISLANDS	SPR
SRI LANKA	CLN
SYRIA	SYR
TAJIKISTAN	TJK
TAIWAN (ROC)	TWN
THAILAND	THA
TIMOR	TMP
TURKEY	TUR
TURKMENISTAN	TKM
UNITED ARAB EMIRATES	UAE
UZBEKISTAN	UZB
VIETNAM	VTN
YEMEN	YEM

OCEANIA: (52)

AUSTRALIA (8)	AUS
o Australian Capital Territory (Canberra)	AT
o New South Wales	NW
o Northern Territory	NN
o Queensland	QD
o South Australia	SA
o Tasmania	TA
o Victoria	VI
o Western Australia	WE
CLIPPERTON (FRANCE)	CLI
COOK ISLANDS (NORTHERN)	CKH
COOK ISLANDS (SOUTHERN)	CKS

EASTER ISLAND (CHILE)	PAQ
FIJI	FJI
GUAM (US)	GUM
HAWAII (US STATE)	HWA
HOWLAND & BAKER ISLANDS	HWL
JARVIS	JAR
JOHNSTON ISLAND (US)	JON
KIRIBATI	KIR
LINE ISLANDS (NORTH)	LIN
LINE ISLANDS (SOUTH)	LIS
LORD HOWE ISLAND (AUSTRALIA)	LHI
MARQUESAS ISLANDS (FRANCE)	MAR
MARSHALL ISLANDS	MHL
MIDWAY ISLAND (US)	MDW
MICRONESIA	FSM
MINAMI TORI SHIMA	MTS
NAURU	NRU
NEW CALEDONIA (FRANCE)	NCL
NEW ZEALAND	NZL
NIUE ISLAND	NIU
NORFOLK ISLAND (AUSTRALIA)	NFK
NORTHERN MARIANA ISLANDS (US)	MRA
OGASAWARA	OGA
OKINO TORI SHIMA	OTS
PALAU	PLW
PALMYRA	PLM
PAPUA NEW GUINEA	PNG
PHOENIX ISLANDS	PHX
PITCAIRN ISLAND (UK)	PTC
SAMOA, AMERICAN (US)	SMA
SAMOA, WESTERN	SMO
SOCIETY ISLANDS (TAHITI) (FRANCE)	OCE
SOLOMON ISLANDS	SLM
TOKELAU	TKL
TONGA	TON
TUAMOTU ARCHIPELAGO (FRANCE)	TUA
TUVALU	TUV
VANUATU	VUT
WAKE ISLAND (US)	WAK
WALLIS ET FUTUNA (FRANCE)	WAL

ANTARCTICA: (1)

ATA

INTERNATIONAL WATERS: (7)

NOTE: THIS CATEGORY COVERS ARTIFICIAL STRUCTURES OFFSHORE (OIL DRILLING PLATFORMS, SHIPS, ETC.) IT DOES NOT INCLUDE ISLANDS, EITHER MAN-MADE OR NATURAL.

AFRICA	XOF
ASIA	XOA
CENTRAL AMERICA & CARIBBEAN	XOC
EUROPE	XOE
NORTH AMERICA	XON
OCEANIA	XOP
SOUTH AMERICA	XOS
ANTARCTICA/SOUTH POLAR REGION	XOT

UNIDENTIFIED: (8)

AFRICA (PROBABLE LOCATION)	XUF
ASIA (PROBABLE LOCATION)	XUA
CENTRAL AMERICA & CARIBBEAN (PROBABLE LOCATION)	XUC
EUROPE (PROBABLE LOCATION)	XUE
NORTH AMERICA (PROBABLE LOCATION)	XUN
OCEANIA (PROBABLE LOCATION)	XUP
SOUTH AMERICA (PROBABLE LOCATION)	XUS
ANTARCTICA/SOUTH POLAR REGION	XUT
LOCATION UNKNOWN	XUU

SECTION THREE: THE NDB LIST COUNTRY CODE LIST

(prefixes listed in alphabetical code order)

CODE:	COUNTRY:
ABW	ARUBA
AFG	AFGHANISTAN
AFS	SOUTH AFRICA
AGL	ANGOLA
AIA	ANGUILLA
ALB	ALBANIA
ALG	ALGERIA
ALS	ALASKA
AND	ANDORRA
ANI	ANDAMAN & NICOBAR ISLANDS (INDIA)
AOE	WESTERN SAHARA
ARG	ARGENTINA
ARM	ARMENIA
ARS	SAUDI ARABIA
ASC	ASCENSION ISLAND (UK)
ATA	ANTARCTICA
ATG	ANTIGUA & BARBUDA
ATN	NETHERLANDS ANTILLES
AUS	AUSTRALIA
AUT	AUSTRIA
AZE	AZERBAIJAN
AZR	AZORES (PORTUGAL)
BAH	BAHAMAS
BAL	BALEARIC ISLANDS (SPAIN)
BAR	ST BARTHELEMY
BDI	BURUNDI
BEL	BELGIUM
BEN	BENIN
BER	BERMUDA
BFA	BURKINA FASO
BGD	BANGLADESH
BHR	BAHRAIN
BIH	BOSNIA-HERCEGOVINA
BLR	BELARUS
BLZ	BELIZE
BOL	BOLIVIA
BOT	BOTSWANA
BRA	BRAZIL
BRB	BARBADOS
BRI	BEAR ISLAND (BJORNOYA)(NORWAY)

BRM	MYANMAR (BURMA)
BRU	BRUNEI
BTN	BHUTAN
BUL	BULGARIA
CAB	CABINDA (ANGOLA)
CAF	CENTRAL AFRICAN REPUBLIC
CAN	CANADA
CBG	CAMBODIA
CEU	CEUTA (SPAIN)
CHL	CHILE
CHN	CHINA (PRC)
CHR	CHRISTMAS ISLAND (AUSTRALIA)
CKH	COOK ISLANDS (NORTHERN)
CKS	COOK ISLANDS (SOUTHERN)
CLI	CLIPPERTON (FRANCE)
CLM	COLOMBIA
CLN	SRI LANKA
CME	CAMEROON
CNR	CANARY ISLANDS (SPAIN)
COD	CONGO-KINSHASA
COG	CONGO-BRAZZAVILLE
COM	COMOROS
COR	CORSICA (FRANCE)
CPV	CAPE VERDE
CTI	IVORY COAST
CTR	COSTA RICA
CUB	CUBA
CVA	VATICAN STATE
CYM	CAYMAN ISLANDS
CYP	CYPRUS
CZE	CZECH REPUBLIC
DES	DESVENTURADOS (CHILE)
DEU	GERMANY
DGA	DIEGO GARCIA (BIOT)(UK)
DJI	DJIBOUTI
DMA	DOMINICA
DNK	DENMARK
DOM	DOMINICAN REPUBLIC
EGY	EGYPT
ENG	ENGLAND (UK)
EQA	ECUADOR
ERI	ERITREA
ESP	SPAIN
EST	ESTONIA
ETH	ETHIOPIA
EUR	EUROPA ISLAND (FRANCE)
FIN	FINLAND
FJI	FIJI
FLK	FALKLAND ISLANDS (MALVINAS)(UK)
FRA	FRANCE
FRO	FAROE ISLANDS (DENMARK)
FSM	MICRONESIA
GAB	GABON
GAL	GALAPAGOS (ECUADOR)
GDL	GUADELOUPE
GEO	GEORGIA
GHA	GHANA
GIB	GIBRALTAR (UK)

GLO	GLORIEUSE ISLAND
GMB	GAMBIA
GNB	GUINEA-BISSAU
GNE	EQUATORIAL GUINEA
GRC	GREECE
GRD	GRENADA
GRL	GREENLAND
GSY	GUERNSEY (UK)
GTM	GUATEMALA
GUF	FRENCH GUYANA
GUI	GUINEA
GUM	GUAM (US)
GUY	GUYANA
HND	HONDURAS
HNG	HUNGARY
HRV	CROATIA
HTI	HAITI
HWA	HAWAII (US STATE)
HWL	HOWLAND & BAKER ISLANDS
ICO	COCOS (KEELING) ISLANDS (AUSTRALIA)
IND	INDIA
INS	INDONESIA
IOM	ISLE OF MAN (UK)
IRN	IRAN
IRQ	IRAQ
IRL	IRELAND
ISL	ICELAND
ISR	ISRAEL
ITA	ITALY
JAR	JARVIS
JDN	JUAN DE NOVA ISLAND
JMC	JAMAICA
JMY	JAN MAYEN (NORWAY)
JON	JOHNSTON ISLAND (US)
JOR	JORDAN
JPN	JAPAN
JSY	JERSEY (UK)
KAL	KALINIGRAD (RUSSIA)
KAZ	KAZAKHSTAN
KEN	KENYA
KGZ	KIRGHIZISTAN
KIR	KIRIBATI
KOR	KOREA, SOUTH
KRE	KOREA, NORTH
KWT	KUWAIT
LAO	LAOS
LBN	LEBANON
LBR	LIBERIA
LBY	LIBYA
LCA	ST LUCIA
LHI	LORD HOWE ISLAND (AUSTRALIA)
LIE	LIECHTENSTEIN
LIN	LINE ISLANDS (NORTH)
LIS	LINE ISLANDS (SOUTH)
LSO	LESOTHO
LTU	LITHUANIA
LUX	LUXEMBOURG
LVA	LATVIA

MAR	MARQUESAS ISLANDS (FRANCE)
MAU	MAURITIUS
MCO	MONACO
MDA	MOLDOVA
MDG	MADAGASCAR
MDR	MADEIRA (PORTUGAL)
MDW	MIDWAY ISLAND (US)
MEL	MELILLA (SPAIN)
MEX	MEXICO
MHL	MARSHALL ISLANDS
MKD	MACEDONIA
MLA	MALAYSIA
MLD	MALDIVES
MLI	MALI
MLT	MALTA
MNG	MONGOLIA
MON	MONTENEGRO (FORMER YUGOSLAVIA)
MOZ	MOZAMBIQUE
MRA	NORTHERN MARIANA ISLANDS (US)
MRC	MOROCCO
MRT	MARTINIQUE
MSR	MONTSERRAT
MTN	MAURITANIA
MTS	MINAMI TORI SHIMA
MWI	MALAWI
MYT	MAYOTTE
NAK	NAKHICHEVAN (AZERBAIJAN)
NCG	NICARAGU
NCL	NEW CALEDONIA (FRANCE)
NFK	NORFOLK ISLAND (AUSTRALIA)
NGR	NIGER
NIG	NIGERIA
NIR	NORTHERN IRELAND (UK)
NIU	NIUE ISLAND
NMB	NAMIBIA
NOR	NORWAY
NPL	NEPAL
NRU	NAURU
NZL	NEW ZEALAND
OCE	SOCIETY ISLANDS (TAHITI) (FRANCE)
OGA	OGASAWARA
OMA	OMAN
ORK	ORKNEY ISLANDS (UK)
OTS	OKINO TORI SHIMA
PAK	PAKISTAN
PAQ	EASTER ISLAND (CHILE)
PHL	PHILIPPINES
PHX	PHOENIX ISLANDS
PNR	PANAMA
PLW	PALAU
PLM	PALMYRA
PNG	PAPUA NEW GUINEA
POL	POLAND
POR	PORTUGAL
PRG	PARAGUAY
PRU	PERU
PTC	PITCAIRN ISLAND (UK)
PTR	PUERTO RICO (US COMMONWEALTH)

QAT	QATAR
REU	REUNION
ROC	JUAN FERNANDEZ & ISLA ROBINSON CRUSOE (CHILE)
ROU	ROMANIA
RRW	RWANDA
RSE	RUSSIA (EASTERN)
RUS	RUSSIA (EUROPEAN)
SAP	SAN ANDRES & PROVIDENCIA (COLOMBIA)
SAR	SARDINIA (ITALY)
SCN	ST KITTS-NEVIS
SCT	SCOTLAND (UK)
SCY	SICILY (ITALY)
SDN	SUDAN
SEN	SENEGAL
SER	SERBIA (FORMER YUGOSLAVIA)
SEY	SEYCHELLES
SHE	SHETLAND ISLANDS (UK)
SHN	ST HELENA (UK)
SLM	SOLOMON ISLANDS
SLV	EL SALVADOR
SMA	SAMOA, AMERICAN (US)
SMO	SAMOA, WESTERN
SMR	SAN MARINO
SNG	SINGAPORE
SOM	SOMALIA
SPM	ST PIERRE ET MIQUELON
SPO	SAO PAULO
SPR	SPRATLEY ISLANDS
SRL	SIERRA LEONE
STP	SAO TOME E PRINCIPE
SUI	SWITZERLAND
SUR	SURINAME
SVB	SVALBARD (NORWAY)
SVK	SLOVAKIA
SVN	SLOVENIA
SWE	SWEDEN
SWN	SWAN ISLAND (ISLAS DEL CISNE)(HONDURAS)
SWZ	SWAZILAND
SYR	SYRIA
TCA	TURKS & CAICOS ISLANDS
TCD	CHAD
TGO	TOGO
THA	THAILAND
TJK	TAJIKISTAN
TKL	TOKELAU
TKM	TURKMENISTAN
TMP	TIMOR
TON	TONGA
TRC	TRISTAN DA CUNHA (UK)
TRD	TRINIDAD & TOBAGO
TRO	TROMELIN ISLAND
TUA	TUAMOTU ARCHIPELAGO (FRANCE)
TUN	TUNISIA
TUR	TURKEY
TUV	TUVALU
TWN	TAIWAN (ROC)
TZA	TANZANIA
UAE	UNITED ARAB EMIRATES
UGA	UGANDA

UKR	UKRAINE
URG	URUGUAY
USA	USA
UZB	UZBEKISTAN
VCT	ST VINCENT
VEN	VENEZUELA
VIR	VIRGIN ISLANDS (US)
VRG	VIRGIN ISLANDS (BRITISH)
VTN	VIETNAM
VUT	VANUATU
WAK	WAKE ISLAND (US)
WAL	WALLIS ET FUTUNA (FRANCE)
WLS	WALES (UK)
XOA	ASIA
XOC	CENTRAL AMERICA & CARIBBEAN
XOE	EUROPE
XOF	AFRICA
XON	NORTH AMERICA
XOP	OCEANIA
XOS	SOUTH AMERICA
XOT	ANTARCTICA/SOUTH POLAR REGION
XUA	ASIA (PROBABLE LOCATION)
XUC	CENTRAL AMERICA & CARIBBEAN (PROBABLE LOCATION)
XUE	EUROPE (PROBABLE LOCATION)
XUF	AFRICA (PROBABLE LOCATION)
XUN	NORTH AMERICA (PROBABLE LOCATION)
XUP	OCEANIA (PROBABLE LOCATION)
XUS	SOUTH AMERICA (PROBABLE LOCATION)
XUT	ANTARCTICA/SOUTH POLAR REGION
XUU	LOCATION UNKNOWN
YEM	YEMEN
ZMB	ZAMBIA
ZWE	ZIMBABWE

SECTION FOUR: ICAO LOCATOR CODES

(as used in Aerad Supplements)

Prefixes given in Alphabetical Code Order:

Section One:

AG	Solomon Islands
AN	Nauru
AP	Christmas Island
AP	Cocos Island
AY	Papua New Guinea
BG	Greenland
BI	Iceland
CY	Canada
DA	Algeria

DB	**Benin**
DF	**Burkina Faso**
DG	**Ghana**
DI	**Ivory Coast**
DN	**Nigeria**
DR	**Niger**
DT	**Tunisia**
DX	**Togo**
EB	**Belgium**
EB	**Luxembourg**
ED	**Germany**
EE	**Estonia**
EF	**Finland**
EG	**United Kingdom**
EG/SF	**Falkland Islands**
EH	**Netherlands**
EI	**Ireland**
EK	**Denmark**
EK	**Faroe Islands**
EN	**Norway**
EP	**Poland**
ES	**Sweden**
EV	**Latvia**
EY	**Lithuania**
FA	**Republic of South Africa**
FB	**Botswana**
FC	**Congo**
FD	**Swaziland**
FE	**Central African Republic**
FG	**Equatorial Guinea**
FH	**Ascension Island**
FI	**Mauritius**
FJ	**Diego Garcia**
FK	**Cameroon**
FL	**Zambia**
FM	**Comores & Mayotte Islands**
FM	**Madagascar & Reunion Island**
FN	**Angola**
FO	**Gabon**
FP	**Sao Tome & Principe**
FQ	**Mozambique**
FS	**Seychelles**
FT	**Chad**
FV	**Zimbabwe**
FW	**Malawi**
FX	**Lesotho**
FY	**Namibia**
FZ	**Zaire**
GA	**Mali**
GB	**Gambia**
GC	**Canary Isles**
GE	**Spanish Morocco**
GF	**Sierra Leone**
GG	**Guinea Bissau**
GL	**Liberia**
GM	**Morocco**
GO	**Senegal**
GQ	**Mauritania**
GU	**Guinea**
GV	**Cape Verde**

HA	Ethiopia	
HB	Burundi	
HC	Somalia Republic	
HD	Djibouti	
HE	Egypt	
HH	Eritrea	
HK	Kenya	
HL	Libya	
HR	Rwanda	
HS	Sudan	
HT	Tanzania	
HU	Uganda	
KA	United States	Plus: KB, KC, KD, KF, KG, KH, KI, KJ, KL, KM, KO, KP, KR, KS, KT.
LA	Albania	
LB	Bulgaria	
LC	Cyprus	
LD	Croatia	
LE	Spain	
LF	France	
LG	Greece	
LH	Hungary	
LI	Italy	
LJ	Slovenia	
LK	Czech Republic	
LL	Israel	
LM	Malta	
LO	Austria	
LP	Portugal	
LP	Madeira	
LP	Azores	
LQ	Bosnia	
LR	Romania	
LS	Switzerland	
LT	Turkey	
LU	Moldova	
LW	Macedonia	
LX	Gibraltar	
LY	Yugoslavia (now Serbia & Montenegro)	
LZ	Slovak Republic	
MB	Caicos Islands	
MD	Dominican Republic	
MG	Guatemala	
MH	Honduras	
MK	Jamaica	
MM	Mexico	
MN	Nicaragua	
MP	Panama & Canal Zone	
MR	Costa Rica	
MS	El Salvador	
MT	Haiti	
MU	Cuba	
MW	Cayman Islands	
MY	Bahamas	
MZ	Belize	
NC	Cook Islands	
NF	Fiji	
NF	Tonga	
NG	French Oceania	Plus: NL, NT, NW.
NG	Kiribati	

NG	**Tuvalu**
NI	**Niue Island**
NS	**Samoa (Western & American)**
NV	**Vanuatu**
NZ	**New Zealand**
OA	**Afghanistan**
OB	**Bahrain**
OE	**Saudi Arabia**
OI	**Iran**
OJ	**Jordan**
OK	**Kuwait**
OL	**Lebanon**
OM	**United Arab Emirates**
OO	**Oman**
OP	**Pakistan**
OR	**Iraq**
OS	**Syria**
OT	**Qatar**
OY	**Yemen Arab Republic**
PA	**Alaska**
PC	**Phoenix Island**
PG	**Mariana Islands**
PH	**Hawaiian Islands**
PJ	**Johnston Island**
PK	**Marshall Islands**
PL	**Line Island**
PM	**Midway Islands**
PT	**Caroline Islands (Pacific)**
PW	**Wake Island**
RC	**Taiwan**
RJ	**Japan** **Plus: RO**
RK	**Korea (South)**
RP	**Philippines**
SA	**Argentina**
SB	**Brazil**
SC	**Chile**
SE	**Ecuador**
SF/EG	**Falkland Islands**
SG	**Paraguay**
SK	**Colombia**
SL	**Bolivia**
SM	**Surinam**
SO	**French Guinea**
SP	**Peru**
SU	**Uruguay**
SV	**Venezuala**
SY	**Guyana**
TA	**Antigua (Leeward Islands)**
TB	**Barbados**
TF	**Fort de France**
TG	**Grenada**
TI	**Virgin Islands**
TJ	**Puerto Rico**
TK	**St Kitts (Leeward Islands)**
TL	**Windward Islands**
TN	**Aruba (Netherlands Antilles)**
TN	**Bonaire (Netherlands Antilles)**
TN	**St Maarten (Netherlands Antilles)**

TN	**Willemstad (Netherlands Antilles)**		
TT	**Trinidad & Tobago**		
TX	**Bermuda**		
UA	**Kazakhstan**		
UA	**Kyrgystan**		
UB	**Azerbaijan**		
UG	**Armenia**		
UG	**Georgia**		
UH	**Russia**	**Plus:**	**UI, UL, UM, UN, UR, US, UU, UW.**
UK	**Ukraine**		
UM	**Belarus**		
UR	**Russia (West of Moscow)**		
UT	**Tajikistan**		
UT	**Turkmenistan**		
UT	**Uzbekistan**		
VA	**India**	**Plus:**	**VE, VI, VO**
VC	**Sri Lanka**		
VD	**Cambodia**		
VG	**Bangladesh**		
VH	**Hong Kong**		
VL	**Lao PDR**		
VM	**Macao**		
VN	**Nepal**		
VQ	**Bhutan**		
VR	**Maldives**		
VT	**Thailand**		
VV	**Vietnam**		
VY	**Myanmar**		
WA	**Indonesia**	**Plus:**	**WI,WR.**
WB	**Malaysia & Brunei**	**Plus:**	**WM.**
WS	**Singapore**		
YA	**Australia**	**Plus:**	**YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YV, YW, YY.**
ZB	**China (People's Rep.)**	**Plus:**	**ZG, ZH, ZL, ZS, ZU, ZW, ZY**
ZK	**Korea (North)**		
ZM	**Mongolia**		

SECTION FIVE: ICAO LOCATOR CODES

(as used in Aerad Supplements)

Prefixes in Country Order:

Afghanistan:	**OA**	
Alaska:	**PA**	
Albania:	**LA**	
Algeria:	**DA**	
Angola:	**FN**	
Antigua:	**TA**	**(Leeward Islands)**
Argentina:	**SA**	
Armenia:	**UG**	
Aruba:	**TN**	**(Netherlands Antilles)**
Ascension Island:	**FH**	
Australia:	**YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YV, YW,YY**	
Austria:	**LO**	

Azerbaijan:	**UB**	
Azores:	**LP**	
Bahamas:	**MY**	
Bahrain:	**OB**	
Bangladesh:	**VG**	
Barbados:	**TB**	
Belarus:	**UM**	
Belgium:	**EB**	
Belize:	**MZ**	
Benin:	**DB**	
Bermuda:	**TX**	
Bhutan:	**VQ**	
Bolivia:	**SL**	
Bonaire:	**TN**	**(Netherlands Antilles)**
Bosnia:	**LQ**	
Botswana:	**FB**	
Brazil:	**SB**	
Bulgaria:	**LB**	
Burkina Faso:	**DF**	
Burundi:	**HB**	
Caicos Islands:	**MB**	
Canada:	**CY**	
Cambodia:	**VD**	
Cameroon:	**FK**	
Canary Isles:	**GC**	
Cape Verde:	**GV**	
Caroline Islands (Pacific):	**PT**	
Cayman Islands:	**MW**	
Central African Republic:	**FE**	
Chad:	**FT**	
Chile:	**SC**	
China (People's Republic):	**ZB, ZG, ZH, ZL, ZS, ZU, ZW, ZY**	
Christmas Island:	**AP**	
Cocos Islands:	**AP**	
Colombia:	**SK**	
Comores & Mayotte Islands:	**FM**	
Congo:	**FC**	
Cook Islands:	**NC**	
Costa Rica:	**MR**	
Croatia:	**LD**	
Cuba:	**MU**	
Cyprus:	**LC**	
Czech Republic:	**LK**	
Denmark:	**EK**	
Diego Garcia:	**FJ**	
Djibouti:	**HD**	
Dominican Republic:	**MD**	
Ecuador:	**SE**	
Egypt:	**HE**	
El Salvador:	**MS**	
Equatorial Guinea:	**FG**	
Eritrea:	**HH**	
Estonia:	**EE**	
Ethiopia:	**HA**	
Falkland Islands:	**EG/SF**	
Faroe Islands:	**EK**	
Fiji:	**NF**	
Finland:	**EF**	

Fort de France:	**TF**
France:	**LF**
French Guiana:	**SO**
French Oceania:	**NG, NL, NT, NW**
Gabon:	**FO**
Gambia:	**GB**
Georgia:	**UG**
Germany:	**ED**
Ghana:	**DG**
Gibraltar:	**LX**
Greece:	**LG**
Greenland:	**BG**
Grenada:	**TG**
Guatemala:	**MG**
Guinea:	**GU**
Guinea-Bissau:	**GG**
Guyana:	**SY**
Haiti:	**MT**
Hawaiian Islands:	**PH**
Honduras:	**MH**
Hong Kong:	**VH**
Hungary:	**LH**
Iceland:	**BI**
India:	**VA, VE, VI, VO**
Indonesia:	**WA, WI, WR**
Iran:	**OI**
Iraq:	**OR**
Ireland:	**EI**
Israel:	**LL**
Italy:	**LI**
Ivory Coast:	**DI**
Jamaica:	**MK**
Japan:	**RJ, RO**
Johnston Island:	**PJ**
Jordan:	**OJ**
Kazakhstan:	**UA**
Kenya:	**HK**
Kiribati:	**NG**
Korea (North):	**ZK**
Korea (South):	**RK**
Kuwait:	**OK**
Kyrgystan:	**UA**
Latvia:	**EV**
Lao PDR:	**VL**
Lebanon:	**OL**
Lesotho:	**FX**
Liberia:	**GL**
Libya:	**HL**
Line Island:	**PL**
Lithuania:	**EY**
Luxembourg:	**EB**
Macao:	**VM**
Macedonia:	**LW**
Madagascar & Reunion Island:	**FM**
Madeira:	**LP**
Malaysia & Brunei:	**WB, WM**

Malawi:	**FW**	
Maldives:	**VR**	
Mali:	**GA**	
Malta:	**LM**	
Mariana Islands:	**PG**	
Marshall Islands:	**PK**	
Mauritania:	**GQ**	
Mauritius:	**FI**	
Mexico:	**MM**	
Midway Islands:	**PM**	
Moldova:	**LU**	
Mongolia:	**ZM**	
Morocco:	**GM**	
Mozambique:	**FQ**	
Myanmar:	**VY**	
Namibia:	**FY**	
Nauru:	**AN**	
Nepal:	**VN**	
Netherlands:	**EH**	
New Zealand:	**NZ**	
Nicaragua:	**MN**	
Niger:	**DR**	
Nigeria:	**DN**	
Niue Island:	**NI**	
Norway:	**EN**	
Oman:	**OO**	
Pakistan:	**OP**	
Panama & Canal Zone:	**MP**	
Papua New Guinea:	**AY**	
Paraguay:	**SG**	
Peru:	**SP**	
Philippines:	**RP**	
Phoenix Island:	**PC**	
Poland:	**EP**	
Portugal:	**LP**	
Puerto Rico:	**TJ**	
Qatar:	**OT**	
Republic of South Africa:	**FA**	
Romania:	**LR**	
Russia:	**UH, UI, UL, UM, UN, UR, US, UU, UW,**	
Rwanda:	**HR**	
Samoa (Western & American):	**NS**	
Sao Tome & Principe:	**FP**	
Saudi Arabia:	**OE**	
Senegal:	**GO**	
Seychelles:	**FS**	
Sierra Leone:	**GF**	
Singapore:	**WS**	
Slovak Republic:	**LZ**	
Slovenia:	**LJ**	
Solomon Islands:	**AG**	
Somalia Republic:	**HC**	
Spain:	**LE**	
Spanish Morocco:	**GE**	
Sri Lanka:	**VC**	
St.Kitts:	**TK**	**(Leeward Islands)**
St.Maarten:	**TN**	**(Netherlands Antilles)**

Sudan:	**HS**
Surinam:	**SM**
Swaziland:	**FD**
Sweden:	**ES**
Switzerland:	**LS**
Syria:	**OS**
Tanzania:	**HT**
Taiwan:	**RC**
Tajikistan:	**UT**
Thailand:	**VT**
Togo:	**DX**
Tonga:	**NF**
Trinidad & Tobago:	**TT**
Tunisia:	**DT**
Turkey:	**LT**
Turkmenistan:	**UT**
Tuvalu:	**NG**
Uganda:	**HU**
Ukraine:	**UK**
United Arab Emirates:	**OM**
United Kingdom:	**EG**
United States of America:	**KA, KB, KC, KD, KF, KG, KH, KI, KJ, KL, KM, KO, KP, KR, KS, KT.**
Uruguay:	**SU**
Uzbekistan:	**UT**
Vanuatu:	**NV**
Venezuela:	**SV**
Vietnam:	**VV**
Virgin Islands:	**TI**
Wake Island:	**PW**
Willemstad:	**TN** **(Netherlands Antilles)**
Windward Islands:	**TL**
Yemen Arab Republic:	**OY**
Yugoslavia:	**LY**
Zaire:	**FZ**
Zambia:	**FL**
Zimbabwe:	**FV**

SECTION SIX: “OFFICIAL” ITU COUNTRY CODES (Listed In Country Order)

COUNTRY:	**ITU CODE:**
Adelie Land	**ADL**
Afghanistan	**AFG**
Albania	**ALB**
Algeria	**ALG**
American Samoa	**SMA**
Andorra	**AND**
Angola	**AGL**
Argentina	**ARG**
Anguilla	**AIA**
Antigua & Barbuda	**ATG**
Armenia	**ARM**
Aruba	**ABW**

Ascension	ASC
Australia	AUS
Austria	AUT
Azerbaijan	AZE
Azores	AZR
Bahamas	BAH
Bahrain	BHR
Bangladesh	BGD
Barbados	BRB
Belgium	BEL
Benin	BEN
Bermuda	BER
Belarus	BLR
Belize	BLZ
Bhutan	BTN
Bolivia	BOL
Bosnia & Herzegovina	BIH
Botswana	BOT
Brazil	B
British Virgin Islands	VRG
Brunei Darussalam	BRU
Bulgaria	BUL
Burkina Faso	BFA
Burundi	BDI
Cambodia	CBG
Cameroon	CME
Canada	CAN
Cape Verde	CPV
Cayman Islands	CYM
Central African Republic	CAF
Chad	TCD
Chagos Islands	BIO
Chile	CHL
China	CHN
Christmas Island	CHR
Cocos (Keeling) Islands	ICO
Cook Island	CKH
Colombia	CLM
Comoros	COM
Congo	COG
Congo Democratic Republic	COD
Costa Rica	CTR
Cote D'Ivorie	CTI
Croatia	HRV
Crozet Archipelago	CRO
Cuba	CUB
Cyprus	CYP
Czech Republic	CZE
Denmark	DNK
Diego Garcia	DGA
Djibouti	DJI
Dominica	DMA
Dominican Republic	DOM
Easter Island	PAQ
East Timor	TMP
Ecuador	EQA
Egypt	EGY
El Salvador	SLV
Equatorial Guinea	GNE

Eritrea	**ERI**
Estonia	**EST**
Ethiopia	**ETH**
Falkland Islands	**FLK**
Faroe Islands	**FRO**
Fiji	**FJI**
Finland	**FIN**
France	**F**
French Polynesia	**OCE**
Gabon	**GAB**
Gambia	**GMB**
Georgia	**GEO**
Germany (Deutschland)	**D**
Ghana	**GHA**
Gibraltar	**GIB**
Greece	**GRC**
Greenland	**GRL**
Grenada	**GRD**
Guadeloupe	**GDL**
Guam	**GUM**
Guatemala	**GTM**
Guiana	**GUF**
Guinea	**GUI**
Guinea-Bissau	**GNB**
Guyana	**GUY**
Haiti	**HTI**
Honduras	**HND**
Hong Kong	**HKG**
Howland Island	**HWL**
Hungary	**HNG**
Iceland	**ISL**
India	**IND**
Indonesia	**INS**
Iran	**IRN**
Iraq	**IRQ**
Ireland	**IRL**
Israel	**ISR**
Italy	**I**
Japan	**J**
Jamaica	**JMC**
Jarvis Island	**JAR**
Johnston Island	**JON**
Jordan	**JOR**
Kazakhstan	**KAZ**
Kenya	**KEN**
Kerguelen	**KER**
Kiribati	**KIR**
Korea (South)	**KOR**
Korea (North)	**KRE**
Kuwait	**KWT**
Kyrgyzstan	**KGZ**
Lao P.D.R.	**LAO**
Latvia	**LVA**
Lebanon	**LBN**
Lesotho	**LSO**
Liberia	**LBR**

Libya	LBY
Liechtenstein	LIE
Lithuania	LTU
Luxembourg	LUX
Macao	MAC
Macedonia (former Yug.Republic)	MKD
Madagascar	MDG
Madeira	MDR
Malawi	MWI
Malaysia	MLA
Maldives	MLD
Mali	MLI
Malta	MLT
Marion Islands	MRN
Marshall Islands	MHL
Martinique	MRT
Mauritania	MTN
Mauritius	MAU
Mayotte	MYT
Mexico	MEX
Micronesia	FSM
Midway Islands	MDW
Moldova	MDA
Monaco	MCO
Mongolia	MNG
Montserrat	MSR
Morocco	MRC
Mozambique	MOZ
Myanmar	BRM
Namibia	NMB
Nauru	NRU
Nepal	NPL
Netherlands	HOL
Netherlands Antilles	ATN
New Caledonia	NCL
New Zealand	NZL
Nicaragua	NCG
Niger	NGR
Nigeria	NIG
Niue	NIU
Norfolk Island	NFK
Northern Marianas	MRA
Norway	NOR
Oman	OMA
Pakistan	PAK
Palau	PLW
Palmyra Island	PLM
Panama	PNR
Papua New Guinea	PNG
Paraguay	PRG
Peru	PRU
Philippines	PHL
Phoenix Islands	PHX
Pitcairn	PTC
Poland	POL
Portugal	POR
Puerto Rico	PTR
Qatar	QAT

Reunion	REU
Rodrigues	ROD
Romania	ROU
Russia	RUS
Rwanda	RRW
Saint Helena	SHN
Saint Kitts & Nevis	SCN
Saint Lucia	LCA
Saint Paul & Amsterdam	AMS
Saint Pierre & Miquelon	SPM
Saint Vincent & Grenadines	VCT
San Marino	SMR
Sao Tome & Principe	STP
Saudi Arabia	ARS
Senegal	SEN
Seychelles	SEY
Sierra Leone	SRL
Singapore	SNG
Slovakia	SVK
Slovenia	SVN
Solomon	SLM
Somalia	SOM
South Africa	AFS
Spain (Espana)	E
Sri Lanka	CLN
Sudan	SDN
Suriname	SUR
Swan Islands	SWN
Swaziland	SWZ
Sweden	S
Switzerland	SUI
Syria	SYR
Tajikistan	TJK
Tanzania	TZA
Thailand	THA
Togo	TGO
Tokelau	TKL
Tonga	TON
Trinidad & Tobago	TRD
Tristan da Cunha	TRC
Tunisia	TUN
Turkey	TUR
Turkmenistan	TKM
Turks & Caicos Islands	TCA
Tuvalu	TUV
Uganda	UGA
Ukraine	UKR
United Arab Emirates	UAE
United Kingdom	G
United States	USA
US Virgin Islands	VIR
Uruguay	URG
Uzbekistan	UZB
Vanuatu	VUT
Vatican	CVA
Venezuala	VEN
Vietnam	VTN
Wake Island	WAK
Wallis & Futuna	WAL

Western Samoa	SMO
Yemen	YEM
Yugoslavia	YUG
Zambia	ZMB
Zimbabwe	ZWE

SECTION SEVEN: "OFFICIAL" ITU COUNTRY CODES (Listed In Callsign Order)

ITU CODE:	COUNTRY:
ABW	Aruba
ADL	Adelie Land
AFG	Afghanistan
AFS	South Africa
AGL	Angola
AIA	Anguilla
ALB	Albania
ALG	Algeria
AMS	Saint Paul & Amsterdam
AND	Andorra
ARG	Argentina
ARM	Armenia
ARS	Saudi Arabia
ASC	Ascension
ATG	Antigua & Barbuda
ATN	Netherlands Antilles
AUS	Australia
AUT	Austria
AZE	Azerbaijan
AZR	Azores
B	Brazil
BAH	Bahamas
BDI	Burundi
BEL	Belgium
BEN	Benin
BER	Bermuda
BFA	Burkina Faso
BGD	Bangladesh
BHR	Bahrain
BIO	Chagos Islands
BIH	Bosnia & Herzegovina
BLR	Belarus
BLZ	Belize
BOL	Bolivia
BOT	Botswana
BRB	Barbados
BRM	Myanmar
BRU	Brunei Darussalam
BTN	Bhutan
BUL	Bulgaria
CAF	Central African Republic
CAN	Canada
CBG	Cambodia
CHL	Chile
CHN	China
CHR	Christmas Island
CKH	Cook Island

CLM	Colombia
CLN	Sri Lanka
CME	Cameroon
COD	Congo Democratic Republic
COG	Congo
COM	Comoros
CPV	Cape Verde
CRO	Crozet Archipelago
CTI	Cote D'Ivorie
CTR	Costa Rica
CUB	Cuba
CVA	Vatican
CYM	Cayman Islands
CYP	Cyprus
CZE	Czech Republic
D	Deutschland (Germany)
DGA	Diego Garcia
DJI	Djibouti
DMA	Dominica
DNK	Denmark
DOM	Dominican Republic
E	Espana (Spain)
EGY	Egypt
EQA	Ecuador
ERI	Eritrea
EST	Estonia
ETH	Ethiopia
F	France
FLK	Falkland Islands
FRO	Faroe Islands
FIN	Finland
FJI	Fiji
FSM	Micronesia
G	United Kingdom
GAB	Gabon
GDL	Guadeluope
GEO	Georgia
GHA	Ghana
GIB	Gibraltar
GMB	Ganbia
GNB	Guinea-Bissau
GNE	Equatorial Guinea
GRC	Greece
GRD	Grenada
GRL	Greenland
GTM	Guatemala
GUF	Guyana
GUI	Guinea
GUM	Guam
GUY	Guyana
HKG	Hong Kong
HND	Honduras
HNG	Hungary
HOL	Netherlands
HTI	Haiti
HRV	Croatia
HWL	Howland Island

I	Italy
ICO	Cocos (Keeling) Islands
IND	India
INS	Indonesia
IRL	Ireland
IRN	Iran
IRQ	Iraq
ISL	Iceland
ISR	Israel
J	Japan
JAR	Jarvis Island
JMC	Jamaica
JON	Johnston Island
JOR	Jordan
KAZ	Kazakhstan
KEN	Kenya
KER	Kerguelen
KGZ	Kyrgystan
KIR	Kiribati
KOR	Korea (South)
KRE	Korea (North)
KWT	Kuwait
LAO	Lao P.D.R.
LBN	Lebanon
LBR	Liberia
LBY	Libya
LCA	Saint Lucia
LIE	Liechtenstein
LSO	Lesotho
LTU	Lithuania
LUX	Luxembourg
LVA	Latvia
MAC	Macao
MAU	Mauritius
MCO	Monaco
MDA	Moldova
MDG	Madagascar
MDR	Madeira
MDW	Midway Island
MEX	Mexico
MHL	Marshall Islands
MKD	Macedonia (former Yug.Republic)
MLA	Malaysia
MLD	Maldives
MLI	Mali
MLT	Malta
MNG	Mongolia
MOZ	Mozambique
MRA	Northern Marianas
MRC	Morocco
MRN	Marion Islands
MRT	Martinique
MSR	Montserrat
MTN	Mauritania
MWI	Malawi
MYT	Mayotte
NCG	Nicaragua
NCL	New Caledonia

NFK	Norfolk Island
NGR	Niger
NIG	Nigeria
NIU	Niue
NMB	Namibia
NOR	Norway
NPL	Nepal
NRU	Nauru
NZL	New Zealand
OCE	French Polynesia
OMA	Oman
PAK	Pakistan
PAQ	Easter Island
PHL	Philippines
PHX	Phoenix Islands
PLW	Palau
PLM	Palmyra Island
PNR	Panama
PNG	Papua New Guinea
POL	Poland
POR	Portugal
PRG	Paraguay
PRU	Peru
PTC	Pitcairn
PTR	Puerto Rico
QAT	Qatar
REU	Reunion
ROD	Rodrigues
ROU	Romania
RRW	Rwanda
RUS	Russia
S	Sweden
SCN	Saint Kitts & Nevis
SDN	Sudan
SEN	Senegal
SEY	Seychelles
SHN	Saint Helena
SLM	Solomon
SLV	El Salvador
SMA	American Samoa
SMO	Western Samoa
SMR	San Marino
SNG	Singapore
SOM	Somalia
SPM	Saint Pierre & Miquelon
SRL	Sierra Leone
STP	Sao Tome & Principe
SUI	Switzerland
SUR	Suriname
SVK	Slovakia
SVN	Slovenia
SWN	Swan Islands
SWZ	Swaziland
SYR	Syria
TCA	Turks & Caicos Islands
TCD	Chad
TGO	Togo
THA	Thailand
TJK	Tajikistan

TKL	**Tokelau**
TKM	**Turkmenistan**
TMP	**East Timor**
TON	**Tonga**
TRD	**Trinidad & Tobago**
TRC	**Tristan da Cunha**
TUN	**Tunisia**
TUR	**Turkey**
TUV	**Tuvalu**
TZA	**Tanzania**
UAE	**United Arab Emirates**
UGA	**Uganda**
UKR	**Ukraine**
URG	**Uruguay**
USA	**United States**
UZB	**Uzbekistan**
VCT	**Saint Vincent & Grenadines**
VEN	**Venezuala**
VIR	**US Virgin Islands**
VRG	**British Virgin Islands**
VTN	**Vietnam**
VUT	**Vanuatu**
WAK	**Wake Island**
WAL	**Wallis & Futuna**
YEM	**Yemen**
YUG	**Yugoslavia**
ZMB	**Zambia**
ZWE	**Zimbabwe**

SECTION EIGHT: THE NDB LIST ABBREVIATIONS LIST

Below is a list of common, and not so commonly used abbreviations, which may be found in postings on the NDB List, aeronautical publications or charts, and in radio club bulletins. This edition only contains a limited number of entries, but is only intended for the use of beacon enthusiasts. If readers can contribute any more items for future editions - non-english terms will be especially appreciated - these will be very useful to our list members, and to beacon enthusiasts in general. We'll be very happy to receive all contributions, and there's no reason why we can't produce our own original abbreviations as well, after all, if these help to make postings easier then why shouldn't we?

Some of the terms shown are rarely used, or even outdated, but are shown anyway as they may prove useful someday. Some are taken from 'official' publications, and are often only used by a specific service, but since we've often noticed that these are usually the hardest ones to track down when you do need them, we've decided to include them anyway.

ABBREVIATION:	MEANING OR USAGE:
A1A	On-off keying of the unmodulated carrier - requires BFO to be switched to the 'ON' position all the time (if your receiver doesn't have a BFO it should be switched to the 'CW' position).
A2A	On-off keying of modulating audio frequency during the identification period, when the carrier is either continuous or keyed with an audio frequency and the BFO switched off. There is a modulating audio frequency on the carrier during the DF period, when the BFO may be switched on or off.
AAF	Army Air Field.
AB	Airbase.

ABB.	Abbreviations.
A.Bn	Aerodrome Beacon.
AC	Alternating Current.
ACC	Area Control Centre.
A/C	Aircraft.
ACT	Australia Central Time.
A/D	Aerodrome.
A/D	Analog/Digital.
Addn.	Addition.
Addr.	Address.
ADF	Automatic Direction Finder.
[ADMIN]	Message relating to the operating of the NDB List or Group.
AENA	Aeropuertos Españoles y Navegación Aérea. (Spanish Aviation Authority)
AERAD	Flight Information Publication produced by Racal Aerad.
AET	Australia Eastern Time.
Af.	Africa.
AF	Audio Frequency.
AFAIK	As Far As I Know.
AFB	Air Force Base.
AFC	Automatic Frequency Control.
AFD	Airport Facility Directory.
AFIS	Aerodrome Flight Information Service.
afld	Airfield.
AFOD	US Army Flight Operations Detachment.
AFSK	Audio Frequency Shift Keying - A digital mode of radio communications where the RF carrier stays on the air throughout the transmission and a modulating audio tone is shifted in frequency.
AFTN	Aeronautical Fixed Telecommunications Network.
A/G	Air/Ground communication station.
AGC	Automatic Gain Control.
AGL	Above Ground Level.
agn	Again.
AGT	Argentina Standard Time.
AHP	Army Heliport.
AIC	Aeronautical Information Circular.
AIDU	Aeronautical Information Documents Unit (RAF).
A Index	An average daily measurement of geomagnetic field activity. Produced by taking the 3 hourly 'K' index measurements and averaging them.
AIP	Aeronautical Information Publication.
AIS	Aeronautical Information Service.
AL2004	'NDB Address List 2004' publication, produced by Malmoe Shortwave Club.
ALC	Automatic Level Control (often used with Tape Recorders).
ALRS	Admiralty List of Radio Signals.
AM	Amplitude Modulation.
ANG	Air National Guard.
ant	Antenna.
Ap	Planetary 'A' Index.
ARB	Air Reserve Base.
ARRL	American Radio Relay League.
ART	(Arabic) Egypt Standard Time. 5/1 ~ 10/1
As.	Asia.
asap	As Soon As Possible.
ASCII	American Standard Code for Information Interchange.
ASL	Above Sea Level.
AST	Alaska Standard Time.
ATC	Air Traffic Control.
ATCC	Air Traffic Control Centre.
ATCRBS	Air Traffic Control Radar Beacon System.
ATIS	Automatic Terminal Information Service.
ATS	Air Traffic Services.
ATTN	Attention.
AV	Audio/Visual.
AVC	Automatic Volume Control (often used with Tape Recorders).

Awg	American Wire Gauge.
AWIB	Aerodrome Weather Information Broadcast.
AWOS	Automated Weather Observing System.
Awy	Airway.
az	Azimuth.
AZ	Arizona (USA).
B	Beam.
BAA	British Airports Authority.
Baken	German and Dutch name for Beacon.
Balise	French name for Beacon.
BBCM	BBC Monitoring Service.
BCB	Broadcast Band.
BCD	Binary Coded Decimal.
BCL	Broadcast Listener.
bcns	Beacons.
bcst	Broadcast.
Bd	Baud.
Beaconeer	Person who dx's beacons.
BET	Brazil Eastern Time.
BFO	Beat Frequency Oscillator.
Big Donut	The Auroral ring caused by the geomagnetic field which appears over the North and South Poles.
Birdie	Spurious signal internally generated within a radio receiver
bk	Break.
BNC	Bayonet Niell-Concelman - Bayonet describes the coupling mechanism, while Neill and Concelman were the inventors of the N and C coax connectors.
Boat Anchor	Antique ham radio equipment. Usually so named because of weight and size.
BPF	Band Pass Filter.
BPS	Bits Per Second.
brg	Bearing.
BST	British Summer Time.
BST	Bangladesh Standard Time.
btw	By The Way (used in e-mail)
C	Continuously running radiobeacon.
C	Celcius/Centigrade (degrees).
c/a	Central Address.
CAA	Civil Aviation Authority (UK).
CAA	Civil Aviation Administration (Finland).
CAL	Calibration Beacon/Station.
Cans	Headphones.
CAm.	Central America/Caribbean.
Carrier	Unmodulated output of a radio transmitter.
CAT	Central African Time.
CCW	Coherent CW.
cd	Card (QSL).
CET	Central European Time.
CF	Centre Frequency.
cfm	Confirm.
Ch	Channel.
Chan	Channel.
Chirp	Changes in the carrier frequency of a Morse code transmitter, usually caused by power supply problems.
CIL	Commissioners of Irish Lights.
CIO	Carrier Insertion Oscillator.
CIS	Commonwealth of Independent States.
civ	Civilian Airport Beacon.
clbr	Calibration.
CLE	Co-ordinated Listening Event.
clsd	Closed.
CLWSU	Canadian Long Wave Searchable Database.
clg	Calling.

CMOS	Complementary-symmetry Metal-Oxide Semiconductor.
CNT	Canada Newfoundland Time.
Co.	County.
com	Communication.
Comsn	Commissioned.
CON	Consol Beacon.
CONUS	Continental United States.
CONDX	Conditions (abbreviation).
cps	Cycles Per Second.
CRS	Coastal Radio Station.
c/s	Callsign
CST	Central Standard Time.
CTT	China Taiwan Time.
CW	Continuous Wave (Morse Code).
D	Dipole.
DAID	Dash After ID.
DAT	Digital Audio Tape.
daylt	Daylight.
DBID	Dash Before ID.
dB	Decibel (1/10 of a Bel); unit for the ratio of two power measurements.
dBc	In terms of RF signals, dBc is Decibels relative to the carrier level.
dBd	Decibels above or below a dipole antenna.
dBi	Decibels above or below an isotropic antenna.
dc	Direct Current.
dd	Used to signify 'day' in two digit format e.g. dd = 12 or 06 (12th or 6th).
de	From (CW Abbreviation).
DE	Delaware (USA).
decom	Decommissioned.
Deg	Degrees.
DERA	Defence Evaluation and Research Agency (UK).
DF	Direction Finding.
DFS	Deutsche Flugsicherung (German Civil Aviation Organisation).
DGAC	La Direction de l'Aviation Civile (French Civil Aviation Authority).
DGPS	Differential Global Positioning System.
dip.	Dipole.
dist	Distance.
D-layer:	Lowest region of the ionosphere found approximately 25 to 55 miles above the Earth
DM	Deutsche Mark (former German currency).
DME	Distance Measuring Equipment.
DND	Department of National Defence (Canada).
DoD	US Department of Defense.
dp	Dipole.
DPSK	Differential Phase Shift Keying; a form of BPSK where only data transitions are transmitted.
Drift:	Slow, gradual change in the frequency of a transmitter or receiver.
DRM	Digital Radio Mondiale (new digital BC system for MW & SW).
DSB	Double Side Band.
DSP	Digital Signal Processing.
DST	Daylight Saving Time.
DSWCI	Danish Short Wave Club International.
DT	Daylight Saving Time.
DTL	Delta Loop.
DVD	Digital Versatile Disc.
DVM	Digital Volt Meter.
DVOR	Doppler VOR.
DX	Term used to describe a signal received from a long distance, or from a rarely heard station.
(e)	If this letter is heard after an ident ,it often means there is a problem with the transmitter. This extra (e) will alert the beacon operators to the problem, and inform users that the NDB is operating on its ‘emergency’, or back-up TX.

E	East.
EAT	Eastern African Time.
ECSSB	Exalted-Carrier Single SideBand.
ECT	European Central Time.
EE	English Language.
EET	Eastern European Time.
EIRP	Effective Isotropic Radiated Power.
E-Layer:	Region of the ionosphere found approximately 55 to 90 miles above Earth
elev	Elevation.
ELF	Extremely Low Frequencies (3 to 30 kHz)
Elmer	A mentor, an experienced operator who tutors newer operators.
ELT	Emergency Locator Transmitter.
EMF	Electro Motive Force.
EMI	Electro Magnetic Interference.
EMP	Electro Magnetic Pulse. An extremely high-energy magnetic field.
ENDBH	European NDB Handbook (book).
ENE	East North East.
enrt	Enroute.
EPIRB	Emergency Position Indicating Radio Beacon.
eqpt	Equipment.
erp	Effective Radiated Power.
emrp	Effective Monopole Radiated Power.
enr	En Route Beacon.
es	CW abbreviation for 'and'.
ESE	east South East.
est	Estimated.
EST	Eastern Standard Time.
Eu.	Europe.
EUNL	European Utility Newsletter (no longer published, now the EUNL Reflector).
EUR	Europe
EURO	New European currency used by many EC countries.
f	Folder (QSL).
F	Fahrenheit (degrees).
FAA	Federal Aviation Administration.
FAQ	Frequently Asked Questions.
Fax	Facsimile.
fcst	Forecast.
F/D	Full Data (Full Detailed).
F/DL	Full Data Letter.
FEC	Forward Error Correction.
FET	Field Effect Transistor.
FF	French Language.
FFT	Fast Fourier Transform.
FIH	Flight Information Handbook.
FIR	Flight Information Region.
FIS	Flight Information Service.
F-Layer:	Region of the ionosphere found approximately 90 to 400 miles above Earth.
FLIP	Flight Information Publication.
FLO	Forsvarets Logistikkorganisasjon
FM	Frequency Modulation.
FM	Fan marker.
fo	Foto (photo).
FPSO	Floating Production, Storage and Offloading system.
freq.	Frequency.
Fri	Friday.
FRP	Federal Radionavigation Plan.
FSK	Frequency Shift Keying.
FSS	Flight Service Station.
ft.	Feet.
FTP	File Transfer Protocol.
F/UP	Follow Up.
FWIW	For What it's Worth.

FWL	Full Wave Loop.
FYI	For Your Information.
Gas	Gas Platform Beacon.
GaAs	Gallium Arsenide. The material used in high-speed semiconductors.
GB	Great Britain.
GBP	UK Pounds Sterling.
[GEN]	Genral information (used in NDB List Subject headers).
GG	German Language.
GLA	General Lighthouse Authority.
Glonass	Global Navigation Satellite System.
GMT	Greenwich Mean Time (almost identical to UTC).
gnd	Ground (earth).
govt.	Government.
GP	Ground Plane.
GP	Glide Path.
GPS	Global Positioning System.
Green Stamp	Slang term used to denote a dollar bill when sent with a QSL card or report.
gud	CW abbreviation for 'good'.
GWEN	Ground Wave Emergency Network.
H+	Hours Plus (minutes).
H24	Beacon Operational 24 Hours a day.
HAND	Have A Nice Day.
HCDX	Hard Core DX Club.
HF	High Frequency (Short Wave Band 3000 to 30,000 kHz).
HiFER	Low power ‘experimenters’ beacon band around 13 MHz)
HJ	Sunrise to Sunset.
HN	Sunset to Sunrise.
HO	Service available to meet operational requirements.
H/P	Heliport.
HPF	High Pass Filter.
HQ	Headquarters.
Hr	Hour.
Hrs	Hours.
HST	Hawaii Standard Time.
HT	High Tension (power).
HTML	Hyper Text Mark up Language (used to write web pages).
HU	Hours Unknown.
HV	Hours Variable.
HWV	Half Wave Vertical.
HX	No specific operating hours.
Hz	Hertz (cycles per second).
i	Information.
IAA	Irish Aviation Authority.
IALA	International Association of Lighthouse Authorities.
IARU	International Amateur Radio Union.
I.Bcn.	Ident Beacon.
IBP	International Beacon Project.
IC	Integrated Circuit.
ICAO	International Civil Aviation Organisation.
ID	Ident.
Ident	Identification signal /Callsign.
IET	Indiana Eastern Standard Time.
IF	Intermediate Frequency (e.g. IF Filter).
IF Shift	Another form of passband tuning.
IMHO	In My Humble Opinion.
IMO	International Maritime Organisation. IMO International Maritime Organisation
II	Italian Language.
ILS	Instrument Landing System.
IM	Inner Marker.
Imho	In My Humble (Honest) Opinion.

IMO	International Maritime Organisation.
INRAD	International Radio Corporation (US Company which manufactures IF Filters).
Info.	Information.
INT.	International.
Intl.	International.
Inv	Inverted Keying.
INV	Inverted Vee Antenna.
IoM	Isle of Man.
IR	Infra Red.
IRC	International Reply Coupon.
IRCA	International Radio Club of America (covers MW Broadcasts).
Is.	Isle or Island(s).
Isl.	Isle or Island(s).
IST	India Standard Time.
ITU	International Telecommunications Union.
IW	International Waters.
JFET	Junction Field Effect Transistor.
JJ	Japanese Language.
joi	Joint Civil/Military beacon.
JST	Japan Standard Time.
kHz	Kilohertz (thousands of cycles per second).
K Index	A 3 hourly measurement of geomagnetic field activity.
km.	Kilometre.
KST	Korea Standard Time.
Kts	Knots.
kw	Kilowatts.
KY	Kentucky (USA).
K9AY	Special directional type of antenna designed by K9AY.
L	Compass Locator.
L	Unit of Inductance.
LAN	Local Area Network.
Lat	Latitude.
LC	Inductance & Capacitance (LC Circuit etc.).
LCD	Liquid Crystal Display.
Lctr	Locator (NDB).
LDGPS	Local DGPS.
LED	Light Emitting Diode.
LF	Low Frequency (30 to 300 kHz).
LFR	Low Frequency Radio Range.
LH	Lighthouse.
LLA	Local Lighthouse Authority.
LLZ	ILS Localiser.
LMM	Compass Locator at the Middle Marker ILS.
LMT	Local Mean Time.
LOC	Locator Beacon (NDB having instrument approach procedure published).
LOC	Localizer (for instrument approach procedures only).
LOC	Grid Locator Square (used by many Amateur Radio Beacon Lists).
lol	Laughs Out Loud (used in e-mails).
LOM	Compass Locator situated at the Outer Marker ILS.
Long	Longtitude.
Loop	Type of 'directional' Aerial used by many beacon dxers.
LORAN	Long Range Air Navigation System.
LOWFER	Low Power Experimental Band in the USA.
LPF	Low Pass Filter.
LSB	Lower Side Band.
LST	Local Standard Time.
lt	Letter.
LT	Low Tension (power).
Lt.	Light (House).
Lt.Ho	Lighthouse.

Lt.V	Light Vessel (or Light Ship).
LUF	Lowest Usable Frequency.
LW	Long Wave.
LW	Long Wire.
LWCA	Long Wave Club of America.
M.	Magnetic.
m.	Miles.
mag	Magnetic.
mag brg	Magnetic Bearing.
mar	Maritime Beacon.
MARKER	Repetitive Signal sent to keep a channel active.
mb	Millibars (barometric pressure reading measurement system).
Mb	Megabyte.
MCW	Modulated Continuous Wave. A fixed audio tone which modulates a carrier, this was an older method of sending Morse code.
MD	Minidisc (recordable disc).
ME	Middle East.
MEDFER	Low Power Experimental Band below the MW BC Band in the USA.
MET	Middle East Time.
MF	Medium Frequency (300 to 3000 kHz).
MHz	Megahertz (millions of cycles per second).
mil	Military Airport Beacon.
MIT	Midway Islands Time.
mkr	Marker.
ML	Magnetic Loop.
MLS	Microwave Landing System.
MM	Middle Marker ILS.
mm	Used to signify 'month' in two digit format e.g. mm = 06 (June)
MoD	Ministry of Defence.
Mon	Monday.
MOSFET	Metal Oxide Semiconductor Field Effect Transistor.
.mpeg	type of audio file used by computers).
mp3	.mpeg (type of computer audio file).
MRN	Automated Marine Observation.
ms	Mint Stamps.
MSK	Minimum Shift Keying.
MSL	Mean Sea Level.
MST	Mountain Standard Time.
MT	Monitoring Times.
Mtrs.	Metres (or Meters).
MUF	Maximum Usable Frequency.
MUN.	Municipal.
MV	Magnetic Variation.
MWC	Medium Wave Circle.
MWN	Medium Wave News (monthly publication of MWC)
N	North.
N	New - used in NDB List postings to indicate first time reception.
NA (or N.A.)	North America.
NAAS	Naval Auxiliary Air Station.
NAF	Naval Air Facility.
NAm.	North America.
NAS	Naval Air Station.
Natl.	National.
NATS	National Air Traffic Services (UK).
NAT	North Atlantic (ICAO region).
nav	Navigational.
Navaid	Navigation Aid.
NAVTEX	Navigational and meteorological warning broadcast service.
NB	Noise Blanker.
N/C	No Category.

NCDXF	Northern California DX Foundation.
ND	North Dakota (USA).
NDB	Non Directional Radiobeacon.
NDBE	Non Directional Beacons of Europe (book).
N/DL	No Data Letter.
NE	North East.
neg	Negative Keying.
NET	Near East Time.
NGR	National Grid Reference.
NiCad	Nickel Cadmium. Often used when referring to a type of rechargeable battery
NiMH	Nickel Metal Hydride. Often used when referring to a newer type of rechargeable battery.
NIST	National Institute of Standards and Technology.
nm.	Nautical Miles.
NNE	North North East.
NNW	North North West.
NOAA	National Oceanic and Atmospheric Administration.
Non A1A	Operates in much the same way as A1A (rarely used nowadays!)
Non A2A	Continuous carrier with on-off keying of a modulating audio frequency. Similar to A2A mode except that the receiver must have the BFO switched off during the identification period, and on during the DF period .
NOTAM	NOtice To AirMen.
NR	No Reply.
NRC	National Radio Club (US MW Broadcast Listeners Club)
NS	North Sea.
NS	Naval Station.
NST	New Zealand Standard Time.
Null	The point at which the received signal is at its weakest when tuned with a directional aerial such as a Loop.
NW	North West.
O	Ouest (French for West)
Oc.	Oceania.
Offset	The distance that the audible ident is spaced from the carrier.
OH	Ohio (USA).
Ohm	Unit of resistance.
OID	Oidentifierad - Swedish term used to describe UNIDS.
Oil	Oil Platform Beacon.
OM	Outer Marker.
om	Old Man (CW term for male operator).
OMEGA	Very Low Frequency Radio Navigation System.
OMN	Omni-directional.
ON	Ontario (Canada).
OOS	Out of Service.
Op.	Operator.
Ops	Operations.
O/R	On request.
OT	Off Topic.
OT	Other Times.
OT	Old Timer (Often used on Ham Bands).
OTS	Out Of Service.
OWF	Optimum Working Frequency.
PA	Power Amplifier.
PB	Private Beacon.
PBS	Passband Shift.
PBT	Passband Tuning.
PC	Personal Computer.
PCB	Printed Circuit Board.
PCM	Pulse Code Modulation.
P/DL	Partial Data Letter.
pep	Peak Envelope Power.

PFC	Prepared Form Card.
Pitch	The frequency of the received audio tone.
PLB	Personal Locator Beacon.
PLC	Power Line Carrier.
PLL	Phase Locked Loop.
pls	Please.
PLT	Pakistan Lahore Time.
PNT	Phoenix Standard Time.
POL	Polarisation.
Pooleys	Pooley's Flight Guide.
Posn	Position.
PP	Portuguese Language.
PPC	Pre Prepared Card.
ppm	Parts Per Million.
pps	Pulse Per Second.
pri	Private Airfield Beacon.
PRT	Puerto Rico and US Virgin Islands Time.
PSK	Phase Shift Keying.
PST	Pacific Standard Time.
PSTN	Public Switched Telephone Network.
PSU	Power Supply Unit.
pvt	Private.
pwr	Power.
QDM	The Magnetic Heading for is.....
QFE	If the altimeter subscale is set to read ..... millibars the instrument will indicate height above aerodrome elevation (above threshold runway number.....)
QIP	QSL Information Pages – http://www.schoechi..de.qip.html
QLD	Queensland (Australia).
QNH	If the altimeter subscale is set to read …….. millibars, the instrument will Indicate elevation if on the ground at that station.
QSB	Fading, or disturbance to propagation.
QRA	Location.
QRA Locator	Method of dividing the world into identifiable squares.
QRG	Frequency.
QRM	Normally used when referring to 'man made' interference.
QRN	Normally used when referring to static or 'natural' interference.
QRP	Low power.
QRT	Stop Sending.
QSB	Fading, used when describing effect on incoming signal.
QSL	Verification of Reception.
QTH	Location or Headquarters.
RA	Radiocommunications Agency (UK).
RAC	Radio Amateurs of Canada.
RACON	Radar Beacon.
RADAR	Radio Detection & Ranging.
Radiofari	Radio Beacon (Italian lang.).
RAF	Royal Air Force (UK).
RAM	Random Access Memory (Computer Term).
RBI	Relative Bearing Indicator.
RC	Non-directional Radiobeacon (as marked on Maritime and Aero charts).
rcpt	Reception.
rcvr	Receiver.
RD	Directional Radiobeacon.
RDF	Radio Direction Finder.
rdo	Radio.
RDSS	Radiodetermination-Satellite Service.
ref.	Reference.
REG.	Regional.
RF	Radio Frequencies.
RFI	Radio Frequency Interference.
RIS	Radio Investigation Service (UK - Interference Investigators).

RIT	Receiver Incremental Tuning.
RMI	Radio Magnetic Indicators.
RMS	Root Mean Square.
RN	Royal Navy (UK).
RNAV	Area Navigation (generic acronym for any device capable of aircraft guidance between pilot-defined waypoints.
ROBN	Radio Beacon.
ROM	Read Only Memory (Computer Term).
ROTFL	Rolls On The Floor Laughing.
Rot Lt.	Rotating Light or Beacon.
rp	Return Postage.
rpt	Report.
rqst	Request.
RR	Russian Language.
RR	Radio Regulation (number).
RSGB	Radio Society of Great Britain.
RST	Readability, Signal, Tone - system of measuring signal quality.
R/T	Radio Telephony.
rtn	Return.
RW	Rotating Pattern Radiobeacon.
RWY	Runway.
RX	Receiver.
S	South.
S	Sequenced Radio Beacon.
(S)	Summer.
SA (or S.A.)	South America.
SAm.	South America.
SASE	Self Addressed Stamped Envelope.
Sat	Saturday.
SD	Sloping Dipole.
SE	South East.
SF	Solar Flux.
SFI	Solar Flux Index.
SID	Sudden Ionospheric Disturbance.
SINAD	Signal to noise and distortion ratio.
SINPO	(code for: Signal, Interference, Noise, Propagation and Overall.
SITA	Société Internationale Télécommunique Aéronautique.
SITOR	Mode used for Navtex - (e.g. SITOR Mode B).
SK	Silent Key (deceased).
sked	Schedule.
SLB.	Single Letter Beacons.
SLHFB	Single Letter High Frequency Beacon.
SLHFM	Single Letter High Frequency Marker.
SLM	Single Letter Markers.
SMD	Surface Mount Device.
S/N	Signal to Noise.
SNAFU	Situation Normal All Fouled Up *(the clean version).*
SPB.	Sea Plane Base.
SPDT	Single Pole Double Throw (switch).
Sprog (Sproggie)	Slang title commonly used to describe a spurious signal, or unwanted harmonic or product.
SPST	Single Pole Single Throw (switch).
SR	Sunrise.
SS	Sunset.
SS	Spanish Language.
SSB	Single Sideband.
SSE	South South East.
SSN	Sunspot Number.
SST	Solomon Standard Time.
SSW	South South West.
STD	Stacked Turnstile Dipole.
sti	Sticker.

STN.	Station.
Sun	Sunday.
SW	South West.
swg	Standard Wire Gauge.
SWM	Short Wave Magazine.
SWR	Standing Wave Ratio.
TACAN	Tactical Air Navigation Equipment.
T/A	Trans Atlantic.
TAS	Tasmania (Australia).
TCXO	Temperature Compensated crystal (Xtal) Oscillator.
TD	Turnstile Dipole.
[TECH]	Technical – (subject header used in NDB List postings).
T/E	Trans Equatorial.
temp.	Temperature.
temp.	Temporary.
tfc	Traffic.
Thru	Through.
Thu	Thursday.
T/I	Trans Indian Ocean.
T/P	Trans Pacific.
TIA	Thanks In Advance.
TMA	Terminal Control Area.
TN	True North.
TNX	Thanks.
TRL	Triangular Loop.
TST	Call letters often sent by an NDB on TEST.
TU	Thank You.
Tu	Tuesday.
tu	To You.
Tube	US term for a vacuum tube (usually referred to as a 'valve' in Europe).
Tue	Tuesday.
TVI	Television Interference.
TVOR	Terminal VOR (low power).
TWB	Transcribed Weather Broadcast.
TWEB	Transcribed Aviation Weather Broadcast.
TWR	Tower Control.
TX	Transmitter.
UEDD	Utilitaires En Dessous De 1600 kHz (book).
UFN	Until Further Notice.
UK	United Kingdom of Great Britain & Northern Ireland.
uknw	Unknown.
UKP	UK Pound.
UKSMG	United Kingdom Six Metre Group.
ULF	Ultra Low Frequencies (300 Hz to 3 kHz)
UN	United nations.
UNID	Unidentified Beacon.
USB	Upper Side Band.
UT	Universal Time.
UTC	Universal Time Coordinated.
US	United States.
u/s	Unservicable.
USA	United States of America.
USAF	United States Air Force.
USD	US Dollar.
USMC	United States Marine Corps.
USN	United States Navy.
UT	Universal Time (utc).
V	Vertical.
VA	Volt Amperes - a measure of apparent power.
VAC	Volts Alternating Current.

vc	Viewcard.
VCC	Supply Voltage (positive).
VD	Vertical Dipole.
VDF	VHF Direction Finding.
Vert.	Vertical Antenna.
VFO	Variable Frequency Oscillator.
VHF	Very High Frequency.
VLF	Very Low Frequency (3 to 30 kHz).
VMOS	Vertical Metal Oxide Semiconductor.
VOR	VHF Omni-directional Radio Range.
VORTAC	VOR & TACAN (co-located).
VOT	VOR Receiver Test facility.
VRB	Voice Rotating Beacon.
v/s	Verification Signer.
VST	Vietnam Standard Time.
vy	Very.
w	Watts.
W	West.
(W)	Winter.
W	Windom.
Waypoint	Position in space usually on aircraft's flight plan.
Wed	Wednesday.
WEF	With Effect From.
WNTM	Weekly Notices To Mariners.
WNW	West North West
WP	Waypoint.
wpm	Words Per Minute.
WPT	Waypoint.
WSW	West South West.
W/T	Wireless Telegraphy.
WUN	World Utility Network (internet utility radio club).
WWSU	World Wide Search Utility (Navaid Database search software)
WWV	US Time Signal Station located in Colorado.
WWVH	NIST radio station (broadcasts time signals from Hawaii).
WX	Weather.
XFMR	Transformer.
XMTR	Transmitter.
X-Tal	Crystal.
XYL	Ex-Young Lady (Wife)
Y	Yagi.
Yds.	Yards.
YL	Young Lady.
yy	Used to signify 'year' in two digit format e.g. yy = 99 0r 01 (1999 or 2001)
yyyy	Used to signify 'year' in four digit format e.g. yyyy = 1999 or 2001
Z or 'zulu'	UTC (Universal Time Coordinated).
Zero Beat	This is the point at which the heterodyne, or tone becomes almost inaudible when tuning an AM carrier with the receiver switched to the SSB or CW positions (and also allows you to hear any weaker stations which may also be operating on the same channel!). It can usually be found when tuned onto the carrier frequency, eg. between the upper and lower sidebands.
10M	10 Metre Band (28 MHz).
10Mtrs	(As above).
51	Good Luck.
7030	AOR 7030 receiver.
73	Best wishes (CW Abbreviation used at end of messages).
88	Love & Kisses (CW Abbreviation used at end of messages to opposite sex).

PROVINCE & STATE ABBREVIATIONS:

Below is a list of commonly used state abbreviations. These lists were obtained from the US and Canadian Post Office sites so should be reasonably accurate. Since we now have many members in these countries it seemed worthwhile including them here, so that other members could quickly make a check of loggings to see which state a particular logging was from. I'm sure that many other countries use similar types of state abbreviations, and if your country has them but is not included below I would love to hear from you so that I can include them in future versions of this publication.

Note# These state and province abbreviations should not be confused with ITU Country codes, which are listed in a different publication.

CANADA:

AB	-	Alberta.
BC	-	British Colombia.
MB	-	Manitoba.
NB	-	New Brunswick.
NL	-	Newfoundland & Labrador.
NS	-	Nova Scotia.
NT	-	Northwest Territories.
NU	-	Nunavut.
ON	-	Ontario.
PE	-	Prince Edward Island.
QC	-	Quebec.
SK	-	Saskatchewan.
YT	-	Yukon.

UNITED STATES & U.S. OVERSEAS POSSESSIONS:

AL	-	ALABAMA
AK	-	ALASKA
AS	-	AMERICAN SAMOA
AZ	-	ARIZONA
AR	-	ARKANSAS
CA	-	CALIFORNIA
CO	-	COLORADO
CT	-	CONNECTICUT
DE	-	DELAWARE
DC	-	DISTRICT OF COLUMBIA
FM	-	FEDERATED STATES OF MICRONESIA
FL	-	FLORIDA
GA	-	GEORGIA
GU	-	GUAM
HI	-	HAWAII
ID	-	IDAHO
IL	-	ILLINOIS
IN	-	INDIANA
IA	-	IOWA
KS	-	KANSAS
KY	-	KENTUCKY
LA	-	LOUISIANA
ME	-	MAINE
MI	-	MARSHALL ISLANDS
MD	-	MARYLAND
MA	-	MASSACHUSETTS
MI	-	MICHIGAN
MN	-	MINNESOTA
MS	-	MISSISSIPPI
MO	-	MISSOURI
MT	-	MONTANA
NE	-	NEBRASKA
NV	-	NEVADA
NH	-	NEW HAMPSHIRE
NJ	-	NEW JERSEY
NM	-	NEW MEXICO
NY	-	NEW YORK
NC	-	NORTH CAROLINA
ND	-	NORTH DAKOTA
MP	-	NORTHERN MARIANA IS.
OH	-	OHIO
OK	-	OKLAHOMA
OR	-	OREGON
PW	-	PALAU
PA	-	PENNSYLVANIA
PR	-	PUERTO RICO
RI	-	RHODE ISLAND
SC	-	SOUTH CAROLINA
SD	-	SOUTH DAKOTA
TN	-	TENNESSEE
TX	-	TEXAS
UT	-	UTAH
VA	-	VIRGINIA
VI	-	VIRGIN ISLANDS
VT	-	VERMONT
WA	-	WASHINGTON
WV	-	WEST VIRGINIA
WI	-	WISCONSIN
WY	-	WYOMING

INTERNET ETIQUETTE: (NETIQUETTE)

Since 'smileys' tend to pop up frequently in postings to e-mail reflectors, and because I've had a number of queries about them, on this page you will find a list of 'smiley faces' or 'Netiquette' (Internet Etiquette) “emoticon” Icons. Some of these are used frequently, but others are very obscure and I've never seen half of them in a mail, but if you're a 'newbie' to the Internet, or want to know what they mean (or if they're rude). These should help a little:

:)	--	Smiling face (sometimes shown as:) **:-)** or ☺
:(	--	Sad face
;)	--	Winking
:o	--	Shocked ("ooh!")
:O	--	Very shocked
:D	--	Laughing or grinning
:P	--	Sticking out tongue
>:)	--	Devilish (smiling)
O:)	--	Angelic (smiling)
:-*	--	Kiss
:-&	--	Angry
~:-)	--	A baby
[:-)	--	A skinhead
{{{:-)	--	A beehive hairdo
$:-)	--	Mr Quiff
(:-)	--	Baldy
c|:-)	--	City gent
#:-)	--	Kevin, the scruffy teenager (UK TV comedy character used to send up teenagers- worth including for that reason alone!)
=:-)	--	Mohican
?:-)	--	Mr Quiff II
+(:-)	--	Alien
|x|:-)	--	Ninja
[o]:-)	--	Kamikaze
@:-)	--	Doctor saying "open wide"
3:-)	--	Werewolf or Devil

If you tilt your head to the left all should become clear...

Back to Index:

PART FOUR: A LITTLE BIT OF BEACON HISTORY:

INTRODUCTION:

The main purpose of this handbook was always considered to be a guide aimed mainly at newcomers to the hobby, containing the sort of information which many new beacon Dxers want to know, and where to find the additional data that they need. In fact, for the first few editions it was known as "An Introduction to Beacon Dxing", and the title only evolved into "The Beacon Hunter's Handbook" when it started to get so big that it resembled a book more than a set of data-sheets! As time as gone on I have continued to add new section and chapters, usually as a result of receiving queries about particular aspects of the hobby from people who have read previous editions, or suggestions for new sections, or, as often happens, sometimes whilst I am working on some other project I suddenly think that it might make a useful addition to the handbook. All ideas and suggestions are filed away, and as this is (and probably always will be) a 'work in progress', I will always try to add new sections as and when spare time permits.

One suggestion has come up more than others, especially from newcomers to the hobby, is "When did beacons first start, and have they always been the way they are now? This is not an easy question to answer simply because I don't know all of the answers, but as I was already working on a project about how the old Marine NDB system used to work pre-1992, I thought it might be useful to include it here, and also include whatever other historical information I could find. This is by no means a 'definitive' beacon history, and I would certainly welcome any further information, which could fill in many of the gaps. Marine beacons where such an important part of the hobby prior to their closure (there are still a small number remaining, but probably not for long!), that it does seem well worth reminding people of how the Marine systems worked, and just what a lot of fun that hunting them could be.

First though, a little information about the introduction of the marine radiobeacons, which was found in a very interesting article about Lighthouses on the US National Park Service website. This stated that in 191 the first experimental radiobeacon was installed in a lighthouse, with the first automatic radiobeacon coming into service in the United States in 1928. The Commissioner for Irish Lights, the body responsible for marine navaids in the Irish Republic say on their website that they have been providing radiobeacons since the first one was established at Mizen Head in 1931, these continued until the radiobeacon service closed down on the 1st February 1999, and was replaced by the DGPS service.

More about this as I find it!

The following is a personal view of Marine Beacon Dxing from the mid 1970s, to the present day, rather than a complete record of all the world's Marine Beacon operation. It might well interest people to know how things used to be, and how things changed during the early to late 90s, a sad period for us Marine Beacon enthusiasts!

HAPPENINGS TEN YEARS TIME AGO:

First off my apologies to the Yardbirds for nicking their song title, secondly, since it's now 2003 it should now be eleven years ago and not ten years. Due to too many other distractions and projects it took me a lot longer to finish writing this than I had originally intended. Anyway, I think I'll just stick with the original title as it was "10 years" when I wrote the bulk of the article, I liked the Yardbirds, and it also sounds good! ☺

FROM THE NEW TO THE OLD:

In earlier sections of this book I was promoting the possibilities of DGPS Dxing as something to replace the rapidly vanishing Marine Beacons, and whilst I was writing it I couldn't help thinking about just how much fun chasing Marine Beacons was just a decade ago, and how sad it is that so little now remains of what was always one of my favourite areas of beacon dxing.

When I started using the PC to log my catches back in 1997 I decided to start from scratch and count anything heard after that date as a 'new' beacon, since I had no desire to try and computerise all of my old hand-written logs, let alone try and dig them out from all of their hiding places. As a result most of my old logs have lain around totally ignored for the last five years, gathering dust and gradually disappearing into

old cardboard boxes in the attic. Recently however, I was sorting out a few old box files which had been taking up space in my shack, in an effort to find my very old Datong catalogue, and lo and behold, up turned an old plastic document wallet containing a full sheet of logs from the 1st of January 1992. This folder also contained several maps, which had been photocopied from an old 1985 issue of 'Cruising' magazine, and these showed the locations of the old Marine beacon chains in the UK and some of the nearer European countries. There were also a number of copies of the quarterly 'Marine Beacons' column in the UK commercial radio publication 'Short Wave Magazine', these had all appeared in the 1989 to 1991 period.

After re-reading all of this material and having a good old trip down memory lane, I thought it might be of interest to some of the newer members to see what the scene was like in those days, and perhaps also give some of the veteran dxers a reminder of what goodies we had to listen to in the pre-DGPS days. Below is a look at my logs from that period, a list of active beacons, and attached are some copies of the beacon chain maps.

1992 - AN INFAMOUS YEAR FOR MARINE BEACON FANS:

1992 started off well, my first dx session of the New Year showed good conditions and plenty of activity on the band. Having seen in the New Year I was obviously 'first footing' the band, and my logs show that I was in the shack until around 0340 am (not much change there then!). At that time I was blissfully unaware that the whole Marine Beacon scene would be very different by the time that 1992 ended and the New Year of 1993 arrived here.

APRIL FOOLS:

Although most of this Topic will concentrate on the events of the 1st of January 1992, it's worth explaining about the big change that took place on the 1st of April that year. This was a change, which would see the disappearance of many beacon chains , and the closure or frequency change of many of the remaining beacons.

BREAKING THE CHAINS:

For many years nearly all of the Marine Beacons had operated in 'chains' (not the metal variety), that is, four or six beacons would all share a single frequency and operate for a set period, generally the full sequence would last for around 6 minutes before repeating itself once again. Many of these chains would be arranged in such a way as to cover a specific area of coastline (see attached map), and this chain would then serve the vessel as it navigated its way around, or along that stretch of coast.

Below is an example of one of these chains, and the type of sequence in which it would generally operate. At that time the Marine bandplan covered the frequencies 285 to 315 kHz:

BARRA HEAD GROUP: (down the West Coast of Ireland, Scilly Isles, north coast of France - circa 1985)

Bcn No	Name:	Range:	kHz:	Ident:	Sequence:	Mode:	
1	Barra Head Lt.	200nm	308.0	BD	1	A2	
2	Tory Island	100nm	308.0	TY	2	A2	
3	Eagle Island	200nm	308.0	GL	3	A2	
4	Mizen Head	200nm	308.0	MZ	4	A2	
5	Round Island	200nm	308.0	RR	5	A2	
6	Pte de Creac'h	100nm	308.0	CA	6	A2	(France)

Mode A2 = Carrier frequency with modulating audio frequency during DF period; on-off keying of a carrier frequency and modulating audio frequency during identification.

TIMING SEQUENCE:

Beacon 1 operates at: 00 mins, and 06, 12, 18, 24, 30, 36, 42, 48, 54
Beacon 2 operates at: 01 mins, and 07, 13, 19, 25, 31, 37, 43, 49, 55
Beacon 3 operates at: 02 mins, and 08, 14, 20, 26, 32, 38, 44, 50, 56
Beacon 4 operates at: 03 mins, and 09, 15, 21, 27, 33, 39, 45, 51, 57
Beacon 5 operates at: 04 mins, and 10, 16, 22, 28, 34, 40, 46, 52, 58
Beacon 6 operates at: 05 mins, and 11, 17, 23, 29, 35, 41, 47, 53, 59

AFTER THE BIG SHAKE UP:

Post April 1st 1992 (and yes, I did think it was all a big April Fool's Day prank when I first heard that the change would take place on that date), the Marine bandplan was slightly different, the new system covered 283.5 to 315.0 kHz, and this consisted of 64 channels at 500 Hz spacing, with 283.5 being Channel 0 and 315.0 being Channel 63. In place of the chains most remaining beacons now had their own single channel and operated continuously with an ident format of typically 47 seconds of Long Dash and 13 seconds of Identification. Again during the big shake up this system was changed, and below you can see the ID format used in both the pre 1992 and post 1992 systems in most of Europe, Russia, Africa and the Middle East:

Old System: (Total 60 seconds)

Identification	3 to 6 times:	22 seconds
Long Dash:		25 seconds
Identification	1 or 2 times:	8 seconds
Silent Period:		5 seconds

New System: (Total 60 seconds)

Identification: at least twice:	13 seconds
Long Dash:	47 seconds

Though most of the chains vanished in 1992, a small number did survive (and still do) in some areas, such as Russia and other parts of Eastern Europe.

Listening to chains was always fun, and the changing conditions allowed monitoring of more distant beacons during the silent periods, or when one of the more distant beacons in the chain wasn't propagating.

To finish this section let us take a look at the status of some of the beacons shown in the Barra Head Chain after the changes had taken place:

(all previously on 308.0 kHz)

Call:	Location:	kHz:	Mode:	Range:	
BD	Barra Head Lt.	(closed)			
TY	Tory Island	313.0	A1A	100nm	
GL	Eagle Island	307.0	A1A	100nm	
MZ	Mizen Head	300.0	A1A	100nm	
RR	Round Island	289.5	A1A	150nm	(Scilly Isles, UK)
CA	Pte de Creac'h	301.0	A1A	100nm	(France)

THE LOGS:

Alas, I didn't log many of the beacons in the 308.0 kHz chain on the night of the 1st, as so often happens I ignored most of the 'locals' in favour of the more distant catches. Anyway, for the sake of history and as a memorial to all these sadly missed marine Beacons, below are some of my logs for the opening day of January 1992:

Date: 1st January 1992

kHz:	Call:	UTC:	Location:	ITU:
287.3	CM	0247	Cromer Lt.	G
287.3	LV	0251	Dudgeon LV.	G
289.6	SM	0248	Pointe de St. Mathieu	F
298.8	RD	0334	Roches Douvres Lt.	F
298.8	AD	0335	Ameland	HOL
298.8	ÖG	0336	Olands Sodra Grund Lt.	S
298.8	SP	0338	Start Point	G
298.8	QS	0339	Casquets LH	F
298.8	OB	0340	Hoburg Lt.	S
301.1	HO	0328	Hirsholm Main Lt.	S
301.1	WK	1358	Wicklow Head Lt.	IRL
301.1	CN	1358	Cregneish	GM
301.1	SR	1401	Skerries LH	GW
303.4	FB	1357	Flamborough Head Lt.	G
303.4	SJ	1358	Souter Lt.	GM
303.4	LT	1359	Longstone LH	G
303.4	FP	1400	Fife Ness Point	GM
308.0	RR	0320	Round Island	G
310.3	ÜA	0309	UNID	
310.3	AL	0310	Pointe de Ailly LH	F
310.3	DU	0312	Dungeness Lt.	G
310.3	FI	0317	Cabo Finisterre	E
310.3	FS	0115	Kaklgrund Lt.	D
312.6	PT	1432	Souter Lt. Calibration Svc.	G

As can be seen from the logs above, some fairly unusual and non-standard frequencies were used in those days. Amongst some of the other chains the following frequencies were listed as in use:

285.0	287.3	289.6	291.9	294.2	296.5	298.8
301.1	303.4	305.7	308.0	310.3	312.6	313.5

On the next page you will find a list of known beacon chains operating around the UK, Ireland, northern France, Sweden, and the Low Countries in the late 1980s/early 1990s:

MARINE BEACON CHAINS (circa 1989):

(**Note#** Each beacon chain takes its name from beacon No 1 in the sequence)

Nab Tower Chain: **0002**

312.6 A2A(1052Hz)

No.	Name	Ident	Range	Seq
0002	Nab Tower	NB	10	1,3,5
0847	Cherbourg	RB	20	2,4,6

Chichester Bar Chain: **0003**

303.4 A2A (444 Hz)

No.	Name	Ident	Range	Seq
0003	Chichester	CH	10	1.4
0001.5	Brighton	BM	10	2.5
0150	Newhaven	NH	10	3.6
0008	Poole	P0	10	3.6

Bill of Portland Lt. Chain: **0010**
291.9 A2A (670 Hz)

No.	Name	Ident	Range	Seq
0010	Portland Bill	PB	50	1
0004	St Catherine's Pt	CP	50	2
0839	Cap d'Antifer	TI	50	3
0841	Le Harve Lanby	LH	30	4
0843	P de Ver	ÉR	20	5
0846	P de Barfleur	FG	70	6

Penlee Point Chain: **0014**
298.8 A2A (545 Hz)

No.	Name	Ident	Range	Seq
0014	Penlee Pt	PE	50	1
0013	Start Pt	SP	70	2
0159	Casquets	QS	50	3
0854	Roches Douvres	RD	70	4
0856	Ile Vierge	VG	70	5
0015	Lizard	LZ	70	6

Skerries Lt Chain: **0033**
301.1 A2A (752 Hz)

No.	Name	Ident	Range	Seq
0033	Skerries	SR	50'	1
0032	Bardsey	IB	30	2
0183	Wicklow Hd	WK	70	3
0051	Cregneish	CN	50	4
0045	Point of Ayre	PY	50	5
0189	South Rock Lt V	SU	50	6

Walney Island Lt Chain: **0041**
287.3 A2A (950 Hz)

No.	Name	Ident	Range	Seq
0041	Walney Is.	FN	30	1.4
0034	Point Lynas	PS	40	2.5
0047	Douglas	DG	50	3.6

Pladda Lt, Arran Island Chain: **0059**
294.2 A2A (545 Hz)

No.	Name	Ident	Range	Seq
0059	Pladda	DA	30	1
0191	Mew 1	MW	50	2
0192	Altacarry Hd	AH	50	3
0066	Rhinns of Islay	RN	70	4
0067	Hyskeir	OR	50	5
0073	Eilean Glas	LG	50	6

Barra Hd Lt, Berneray Chain: **0069**

308 A2A (1052 Hz)

No.	Name	Ident	Range	Seq
0069	Barra Hd	BO	200/70	1
0197	Tory I	TY	100/70	2
0199	Eagle I	GL	200/100	3
0179	Mizen Hd	MZ	200/100	4
0018	Round I	RR	200/100	5
0857	Pte de Creach	CA	100	6

Cape Wrath Lt Chain: **0077**

298.8 A2A (846 Hz)

No.	Name	Ident	Range	Seq
0077	Cape Wrath	CW	50	1
0075	Butt of Lewis	BL	150	2,5
0081	Muckle Flugga	MF	150/70	3,6
0079	Sule Skerry	LK	100/70	4

Kinnairds Hd Lt Chain: **0095**

291.9 A2A(1052Hz)

No.	Name	Ident	Range	Seq
0095	Kinnairds Hd	KD	100/70	1,4
0087	N Ronaldsay	NR	100/70	2
0089	Swilkie Pt	OM	50	3,6
0086	Sumburgh Hd	SB	70	5

Girdle Ness Lt Chain: **0097**

310.3 A2A (444 Hz)

No.	Name	Ident	Range	Seq
0097	Girdle Ness	GD	50	1,4
0103	Fife Ness	FP	50	2,5

Souter Lt Chain: **0113**

303.4 A2A (950 Hz)

No.	Name	Ident	Range	Seq
0113	Souter Lt	SJ	70	1.4
0119	Flamborough Hd	FB	70	2
0109	Longstone	IT	20	5
0105	Isle of May	LM	100/70	6

Smiths Knoll Lt Vessel Chain **0131**

287.3 A2A(670Hz)

No.	Name	Ident	Range	Seq
0131	Smiths Knoll Lt Vessel	SK	50	1
0229	Goeree Lt	GR	50	2
0125	Dudgeon Lt Vessel	LV	50	3

0135	Outer Gabbard Lt Vessel	GA	50	4
0127	Cromer	CM	50	5
0225	N Hinder Lt Vessel	NR	50	6

Falls Lt Vessel Chain: **0142**

305.7 A2A(600 Hz)

No.	Name	Ident	Range	Seq
0142	Falls Lt Vessel	FS	50	1
0223	W Hinder Lt Vessel	WH	20	3
0217	Oostende	OE	30	4
0825	Calais	CS	20	5
0144	S.Foreland	SD	30	6

Ballycotton Lt Chain: **0181**

296.5 A2A (444 Hz)

No.	Name	Ident	Range	Seq
0181	Ballycotton	BN	50	1
0180	Kinsale	OH	50	2
0021	Lundy	LS	50	3
0026	Nash Pt	NP	50	4
0029	South Bishop	SB	50	5
0182	Tuskar Rock	TR	50	6

Slyne Head Lt Chain: **0201**

289.6 A2A (395 Hz)

No.	Name	Ident	Range	Seq
0201	Slyne Hd	SN	50	1,3,5
0203	Loop Hd	LP	50	2,4,6

Zeebrugge Mole Lt Chain: **0219**

296.5 A2A

No.	Name	Ident	Range	seq
0219	Zeebrugge Mole	ZB	5	1.2
0215	Nieuwpoort	NP	5	4.5

Ijmuiden Front Lt Chain: **0237**

294.2 A2A

No.	Name	Ident	Range	Seq
0237	Ijmuiden	YM	20	1.4
0231	Hoek van Holland	HH	20	2.5
0243	Eierland	ER	20	3.6

Vileland Lt Chain: **0245**
308 A2A

No.	Name	Ident	Range	Seq
0245	Vlieland Lt	VL	70	1
0279	Deutsche Bucht Lt. Vessel	DB	10	4
0241	Texel Lt Vessel	HK	50	5
0275	Elbe Lt Float	EL	10	6

Ameland Lt **0247**
298.8 A2A

No.	Name	Ident	Range	Seq
0247	Ameland	AD	20	1,3,5
0259	Borkum Little BE	20	2,4,6,	

Wangerooge Lt Chain: **0264**
291.9 A2A

No.	Name	Ident	Range	Seq
0264	Wangerooge	WE	30	1,3,5
0265	Alte Weser	AR	10	2,4,6

Rote Kliff Lt Kampen, Sylt Chain: **0287**
301.1 A2A

No	Name	Ident	Range	Seq
0287	Rote Kliff	RF	20	1,3,5
0274	Gr Vogelsand	VS	10	2,4,6,

Cap Gris Nez Lt Chain: **0827**
310.3 A2A (752 Hz)

No.	Name	Ident	Range	Seq
0827	Cap Gris Nez	GN	30	1,4
0149	Royal Sovereign	RY	50	2
0837	Pointe d'Ailly	AL	50	3
0829	Cap d'Alprech	PH	20	5
0147	Dungeness	DU	30	6

Cap Fréhel Lt Chain: **0850**
305.7 A2A

No.	Name	Ident	Range	Seq
0850	Cap Fréhel	FÉ	20	1,3,5
0167	La Corbiere	CB	20	2,4,6

Rosédo It, Ile Bréhat Chain: **0852**

294.2 A2A

No.	Name	Ident	Range	Seq
0852	Rosédo	DO	10	1.5
0849	Le Grand Jardin	GJ	10	2.6

Eckmühl Lt. Pointe de Penmarc'h Chain: **0865**

Na.	Name	Ident	Range	Seq
0865	Eckmühl	ÜH	50	1
0875	St Nazaire	NZ	35	2
0859	Pte St Mathieu	SM	20	3
0866	Pte de Combrit	CT	20	4

Belle Ile, Goulphar Lt Chain: **0873**

303.4 A2A

No.	Name	Ident	Range	Seq
0873	Belle Ile	BT	100	2
0863	Ile de Sein	SN	70	3
0891	Pte de la Coubre	LK	100	4
0883	Les Baleines	BN	50	6

AND FINALLY:

With that look back at the beacon scene of ten years ago we end this nostalgic trip to the past. In the decade that followed we saw chains disappear, beacons closed or moved up slightly in frequency whilst DGPS beacons were co-sited and tested, and finally the closure of large numbers of marine beacons, usually at the start of each year. Now very few remain, and their futures also look very uncertain. We know now that the Italian Marine Beacons closed at the start of 2003, and it seems very likely that the remaining Spanish beacons won't be too far behind either. Better catch as many of these as you can, whilst you can, and if possible try and make recordings of a few of them for posterity - I wish I'd done that 10 years ago, but I thought they would be around forever in those days and never bothered!☹

Most of these beacons may be gone, but they should never be forgotten, I hope my putting this bit of the past down in writing has helped to do that in some small way.

As this publication continues to develop I shall hopefully be able to add more information about the history of Non Directional Beacons, as and when it becomes available. If anyone reading this has any information about the history of NDBs, which they would like to see included here in future editions, I would certainly love to hear from you. I do have some information, but it may take me some to verify its accuracy, so keep a look out for edition 2.0, which hopefully will appear sometime in early 2004.

In the next section you will find a list of the beacons operating around the late eighties/early nineties period in the UK, Ireland, France, Belgium, Netherlands and Germany. Some are Aero beacons and are still around today, sadly all of the Marine beacons listed here have now been closed down since 1999.

BEACONS LISTED IN THE 1992 CRUISING ALMANACS/ADMIRALTY LISTS

All beacons listed are Marine beacons, and now closed unless otherwise indicated)

(Aero beacons are shown in brackets, Aero beacons which have changed status since 1992 are also shown)

Morse Ident	Freq kHz	Bn.No.	RDF Beacon	
AD	298.8	2047	Ameland	
AH	294.2	0192	Altacarry Head Lt. Ho. (Rathlin East)	
AL	310.3	0837	Point d'Ailly	
ALD	383.0	0161	Alderney	(AERO)
AP	370.5	0031	Aberporth	(AERO)
AR	291.9	0265	Alte Weser	
BC	287.3	0855	Bloscon Roscoff	
BD	308.0	0069	Barra Head	
BE	298.8	0259	Borkum Little Lt. Ho	
BF	308.0	0257	Borkumriff Lt.V.	
BHD	318.0	0012	Berry Head	(AERO-CLOSED)
BI	298.8	0075	Butt of Lewis Lt. Ho.	
BM	303.4	0001.5	Brighton Marina	
BN	296.5	0181	Ballycotton Lt.	
BN	303.4	0883	Les Baleines Lt. Ho.	
BPL	278.5	0039	Blackpool	(AERO-Now 420.0)
BS	313.5	0845	Port en Bessin	
BST	316.0	0862	Lanveoc/Poulmic	(AERO)
BT	303.4	0873	Belle lle-Goulpar Lt. Ho	
BY	287.3	0083	Bressay Lt. Ho (Shetlands)	
CA	308.0	0857	Pte deCreach, Ushant	
CB	305.7	0167	La Corbiere Lt.	
CDF	363.5	0025	Cardiff/Rhoose	(AERO)
CH	303.4	0003	Chichester Bar	
CM	287.3	0127	Cromer	
CN	301.1	0051	Cregneish (I.O.M.)	
CP	291.9	0004	St. Catherine's Point	
CR	287.3	0160	Channel Lt. V.	
CS	305.7	0825	Calais Main Lt.	
CT	289.6	0866	Pte. De Combrit	
CW	298.8	0077	Cape Wrath Lt. Ho.	
DA	294.2	0059	Pladda Lt. Ho.	
DB	308.0	0279	Deutsche Bucht Lt. V.	
DG	287.3	0047	Douglas (I.O.M.)	
DHE	397.2	0277	Helgoland	
DK	294.2	0823	Dunkerque Lt. Buoy	
DO	364.5	0078	Dounreay/Thurso	(AERO)
DO	294.2	0852	Rosedo Lt. lie de Brhat	
DU	310.3	0147	Dungeness	
EC	287.3	0166	St. Helier	
EL	308.0	0275	Elbe Lt. F.	
ÉR	294.2	0243	Eierland	
ER	291.9	0843	Pointe de Ver	
EU	330.0	0836	Le Treport	
EX	337.0	0011	Exeter	(AERO)
FAW	370.0	0006	Fawley/Hythe	(AERO-CLOSED)
FB	303.4	0119	Flamborough Head Lt. Ho	
FÉ	305.7	0850	Cap Frehel	
FG	291.9	0846	Pte. de Barfleur	
FN	287.3	0041	Walney Island	
FP	310.3	0103	Fife Ness Pt.	
FS	305.7	0142	Falls Lt.V.	

GA	287.3	0135	Outer Gabbard Lt V.	
GD	310.3	0097	Girdle Ness	
GJ	294.2	0849	St. Malo Grand Jardin	
GL	308.0	0199	Eagle Island	
GN	310.3	0827	Cap Gris Nez	
GR	287.3	0229	Goeree	
GUR	361.0	0163	Guernsey	(AERO-CLOSED)
GY	321.0	0848	Granville	(AERO-CLOSED)
GV	364.0	0235	Valken Burg/Scheveningen	(AERO-CLOSED)
GX	289.6	0871	Ile de Groix/Pen Men Lt. Ho.	
GY	285.0	0162	Castle Breakwater St. Peter Port	
HH	294.2	0231	Hoek Van Holland	
HK	308.0	0241	Texel Lt. V.	
HRN	394.0	0007	Hurn (Bournemouth)	(AERO-CLOSED)
HS	294.2	0117	Heugh Lt. Ho.	
IB	301.1	0032	Bardsey	
JEV	390.0	0267	Jever	(AERO)
JEY	367.0	0165	Jersey East	(AERO-CLOSED)
JW	329.0	0168	Jersey West	(AERO)
KD	291.9	0095	Kinnairds Head Lt. Ho.	
KH	312.6	0185	Kish Bank	
KLY	378.0	0184	Killiney	(AERO)
KS	370.0	0093	Kinloss	(AERO)
LG	294.2	0073	Eilean Glas. Lt. Ho.	
LH	291.9	0841	Le Havre	
LHO	346.0	0840	Le Havre/Octeville	(AERO)
LK	303.4	0891	Pte. de laCoubre	
LK	298.8	0079	Sule Skerry	
LM	303.4	0105	May Island	
LN	345.5	0853	Lannion/Servel	(AERO-Now 359.0)
LOR	294.2	0869	Lorient/Lann-Bihoue	(AERO)
LP	289.6	0203	Loop Head Lt. Ho.	
LS	296.5	0021	Lundy Island S. Lt. Ho.	
LT	303.4	0109	Longstone Lt.Ho.	
LT	358.0	0834	Le Touquet	(AERO)
LU	255.5	0101	Leuchars	(AERO-CLOSED)
LV	287.3	0125	Dudgeon Lt. V.	
LZ	298.8	0015	Lizard	
MF	298.8	0081	Muckle Flugga Lt. Ho. (N. Unst)	
MK	275.0	0821	Calais-Dunkirk	(AERO)
MP	373.0	----	Cherbourg	
MT	398.0	0874	St. Nazaire/Montair	(AERO)
MW	294.2	0191	Mew Island Lt. Ho.	
MZ	308.0	0179	Mizen Head	
NB	312.6	0002	Nab Tower	
ND	397.0	0133	Great Yarmouth/N. Denes	(AERO-Now 417.0)
NDO	256.0	0270	Nordholz	(AERO-Now 372.0)
NF	301.1	0141	North Foreland	
NH	303.4	0150	Newhaven	
NK	296.5	0107	Inchkeith	
NP	296.5	0215	Nieuwpoort W. Pier Lt.	
NP	296.5	0026	Nash Point Lt.	
NR	291.9	0087	North Ronaldsay Lt. Ho.	
NR	287.3	0225	Noord Hinder	
NZ	289.6	0875	St. Nazaire-St. Gildes Lt. Ho.	
OE	305.7	0217	Oostende Rear Lt. Ho.	
OH	296.5	0180	Old Head of Kinsale	
OM	291.9	0089	Stroma Swilkie Pt. Lt. Ho.	
OR	294.2	0067	Hyskeir/Oigh-Sgeir (Small Islands)	
OTR	335.0	0120	Ottringham	(AERO-CLOSED)
PB	291.9	0010	Portland Bill	
PE	298.8	0014	Penlee Point	
PH	310.3	0829	Cap d' Alprech Lt.	

PH	333.0	0016	Penzance Heliport	(AERO)
P0	303.4	0008	Poole Hbr.	
PR	298.8	0877	Ile du Pilier Lt. Ho.	
PS	287.3	0034	Point Lynas	
PWK	355.0	0055	Prestwick	(AERO-Now PIK)
PY	301.1	0045	Point of Ayre (I.O.M.)	
QS	298.8	0159	Casquets	
RB	312.6	0847	Cherbourg Ft. de 'Quest	
RD	298.8	0854	Roches Douvres	
RE	291.9	0887	La Rochelle, Tourelle, Richelieu Lt. Ho.	
RF	301.1	0287	Kampen Rote Kliff, Sylt	
RN	294.2	0066	Rinns of Islay	
RR	308.0	0018	Round Island	
RSH	326.0	0187	Dublin (Rush)	(AERO)
RWY	359.0	0049	Ronaldsway (I.O.M.)	(AERO)
RY	310.3	0149	Royal Sovereign Lt. Tr.	
SB	353.5	0851	St. Brieuc	(AERO)
SB	296.5	0029	South Bishops Lt. Ho.	
SB	291.9	0086	Sumburgh Head	
SHD	383.0	0096	Scotstown Head	(AERO)
SJ	303.4	0113	Souter Lt.	
SK	287.3	0131	Smiths Knoll Lt. V.	
SLT	286.0	0285	Westerland/Sylt	(AERO-Now 387.0)
SM	289.6	0859	Pte. St. Mathieu Lt. Ho.	
SM	356.5	0019	Saint Mawgan	(AERO)
SN	303.4	0863	Ile de Sein	
SN	289.6	0201	Slyne head	
SND	362.5	0138	Southend	(AERO)
SO	291.9	0881	Les Sables Dobonne (Tr. do Ia Chaume It. Ho.)	
SP	298.8	0013	Start Point	
SPY	381.0	0239	Amsterdam (Spijkorboor)	(AERO-CLOSED)
SR	301.1	0033	Skerries Lt. Ho.	
SS	315.5	0082	Scatsta	(AERO)
STM	321.0	0017	St. Mary's	(AERO)
STN	669.5	0074	Stornoway	(AERO-Now 431.0)
STU	400.0	0030	Strumble	(AERO-CLOSED)
SU	301.1	0189	South Rock Lt. V.	
SUM	351.0	0085	Sumburgh/(Shetlands)	(AERO-Now SBH)
SW	294.2	0858	Ouessant SW	
SWN	320.5	0027	Swansea	(AERO)
TI	291.9	0839	Cap d' Antifer	
TR	296.5	0182	Tusker Rock Lt. Ho.	
TY	308.0	0197	Tory Island	
UH	289.6	0865	Eckmuhl Lt. H. Pte. de Penmarc'h	
UK	312.6	0137	Sunk Lt. V.	
VG	298.8	0856	Ile Vierge	
VL	308.0	0245	Vlieland	
VS	301.1	0274	Grosser Vogelsand	
WAL	331.5	0035	Wallasey	(AERO-CLOSED)
WE	291.9	0264	Wangerooge Lt. Ho.	
WH	305.7	0223	West Hinder Lt. V.	
WIK	344.0	0091	Wick	(AERO)
WK	301.1	0183	Wicklow Head	
WTD	398.0	0181.5	Waterford	(AERO Now 368.0)
YE	312.6	0879	Ile d'Yeu Main Lt. Ho.	
YM	294.2	0237	ljmuiden	
ZB	296.5	0219	Zeebrugge Mole Lt. Ho.	

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CREDITS & SOURCES:

Much of the information in this publication was obtained from the following sources, my thanks to everyone concerned for their assistance. A special word of thanks to Andy Robins for all his hard work on the NDB List Landlist, this was a major task, and the results certainly speak for themselves.

My apologies if I've missed anyone off, I'm sure this was accidental rather than intentional, and if your credit isn't here do let me know so that I can add it to the next edition! :-)

Admiralty List of Radio Signals Volume 2
Admiralty List of Radio Signals Volume 8
Alex Wiecek
Andy & Russ Robins
Brian Keyte
CSI Wireless DGPS Database
Dale Hughes (thanks for use of photographs)
European NDB Handbook
Godfrey Bradshaw
IALA DGNSS Database
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Martin Francis
Michael Oexner (Editor of the European & North American NDB Handbooks)
NDB List Reflector
North American NDB Handbook
Pooley's Flight Guide
Radio Navigation by J.A. Terras
Roelof Bakker
Roger Caird
Robert Connolly GI7IVX
Royal Air Force Flight Information Publications (FLIPS)
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Steve McDonald VE7SL
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Various Websites
Walter Blanchard