

UK SAR OPERATORS GROUP
COMMUNICATIONS WORKING GROUP

LAND SAR COMMUNICATIONS MANUAL

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1 INTRODUCTION

- 1.1 This manual provides a land search and rescue (SAR) overview of radio communications in the United Kingdom (UK). A short historical review gives the background to a brief section on present issues and expectations. The main content lies in the sections dealing with the practical use and care of the radios and their ancillary equipment and this is followed by a section on Radio Telephony (R/T) procedure. This manual should be used in conjunction with the *Implementation and Control of the United Kingdom VHF High Band Land Search and Rescue Radio Channels* and the *Standard Operating Procedure* documents, both of which may be found on the UK SAR Web Site at www.uk-sar.org

2 LAND SAR RADIO COMMUNICATIONS DEVELOPMENT, 1941 - 2005

2.1 *Then . . .*

- 2.1.1 To the best of our knowledge, radios were not used by UK mountain rescuers prior to World War II. During the war years and for some time after, the Royal Air Force Mountain Rescue Team communications equipment used for co-ordinating incidents consisted of CW (Morse Code) transmitter-receivers, similar to those used in Lancaster bombers. This meant that only trained operators - Wireless Operators (the term 'Wop' is still used today) could use the set – provided the temperamental radios worked, that is. The 'hill-sets' used in the 50s weighed more than today's team rucksacks. They were so inefficient and ineffectual that reciprocal routes during training were popular, for the sole reason that sets could be hidden at pre-arranged spots near the beginning of each party's route and recovered by the party coming the other way! In practical terms, teams were usually called out by the local 'bobby' until the early 1970s.
- 2.1.2 During the mid-sixties, much lighter and more compact transistorised radios became available and these revolutionised mountain rescue communications. For the first time, teams could reliably talk by radio to each other and later in the decade, to helicopters. In many ways, our communications have changed little since then. There is a learning point here, because those early hill-sets' transmitting power was only 200 milliwatts (0.2 of a watt), compared with today's 5 watts, yet the aerials were optimised, vehicle and Base or Incident Control Point (ICP) radio aerials elevated and the performance fell not far short of the system as it is now – the point here is that if these techniques were used with the new radios, *far better* results would be achieved. For the record, using such as the Ultras and Pye Bantams of yore, communications from North Wales to the Lake District and the Peak District were commonplace, every-weekend events and on one occasion, Craig Cwm Syllyn in North Wales to Ben Nevis was recorded. The frequency then in use was 86.325MHz (AM), low band VHF.
- 2.1.3 In the late 80s the Scottish Mountain Rescue Teams (MRTs), by virtue of the Scottish Office granting them Channel 53a, moved from the national low band channel to the marine band part of the spectrum. The Scottish teams had realised that the marine band radios were at least as efficient in the hills, were cheaper than their low band equivalents and technical advances came through more quickly on these sets. Unfortunately, it meant that once again the Scots and the English were not speaking! Meanwhile, the English / Welsh MRTs on low band changed from Amplitude Modulation (AM) to Frequency Modulation (FM). They officially remained on low band and the Scots stayed on marine band (also FM) until 2004,

although some English and Welsh teams have been using a few marine band radios for ground to air communications during the past few years.

2.2 Now . . .

2.2.1 With the advent of the UK Land SAR Band Plan, nearly all land SAR teams and associated assets should have radios that are compatible throughout the UK. Only a few teams have not completed their migration from low band.

2.2.2 The UK Land SAR Band Plan has been designed to provide more flexibility and, crucially on major or multiple incidents, more capacity or throughput. The previous system had very few channels available and on major incidents these were quickly saturated. During multiple incidents, they were subject to interference from adjacent teams working on other incidents. The new band plan requires that, in addition to the Team Working Channel (TWC) for normal use, an Emergency Calling Channel (ECC) be monitored, so as to provide a universal method of contact to every party or unit deployed on incidents or training. The ECC has caused a bit of head-scratching in some quarters but is nothing new in concept. Nearly every other similar network, for example, marine band and aeronautical groupings, all have similar distress and calling channels so that whatever happens, every radio station and party can be contacted on a common channel. Therefore, the ECC can be used to call one, several or all parties within hailing range to instruct them to, for example, make contact on a specific channel, switch off lights, call off a search, be aware of a live microphone ('hot mike') on another channel, identify where a casualty is or to direct a helicopter during a major incident. Adoption of the band plan will mean change and require a degree of flexibility from team members. The fact that the radios have been programmed with so many channels does not mean many channels need to be used for much of the time; they are available to team members, *when an urgent need arises*, to be able to communicate with other agencies and teams. On every recent major incident, the universal complaint by rescue and emergency services has been poor communications, saturated channels and the inability to interoperate with other agencies. By using the new radios and the band plan to best effect, this system should overcome most of these failings. The normal mountain rescue incident, the bread and butter of teams' everyday existence, has not been forgotten, however. Teams will be able to use their designated TWC when working in their operational areas (with a member of each party monitoring the ECC). If working in adjacent areas, and under direction from the communication controller(s), they can use their own or the resident team's channel, or use a combination of both. Provision has been built into the band plan to enable message traffic to be automatically relayed over peaks and ridges, down into the next glen or valley or on to the next peaks. Thus the range of the system can be usefully extended. For the most part, a team member will still just have one radio and operate on one channel. That another party member is listening on the ECC on another radio is not a new concept either; many are familiar with a party member monitoring the 'helicopter' channel on another radio.

2.2.3 Of the emergency services, the police have been the driving force for moving from their former analogue equipment to a new digital service using Terrestrial Trunked Radio (TETRA) technology. This service is called 'Airwave', though it has been called other things. Once 'roaming' has been enabled, Airwave will soon be capable of linking a policeman in Inverness with another in Torquay. Police control rooms are routinely included in force operations talk groups and national hailing talk groups only. They can monitor most other talk groups on request. Airwave utilises many of the principles used by mobile phone networks but has, in

addition, all-informed nets, group calling and secure (encrypted) speech. Other Emergency Services and government agencies have or will become 'sharers' in the network. From the SAR perspective, the TETRA system was evaluated for general use by land SAR, but cost, security factors and poor coverage in areas where land SAR teams generally operate precluded its universal adoption. However, some Airwave radios will be issued and, through the interfacing of systems, land SAR will benefit and be able to use the best features of analogue and digital technology for the common good. Indeed, some land SAR teams are already operational on the system, either directly using TETRA handsets, or, via their land SAR analogue VHF sets, through an interfacing device that changes analogue to digital and vice versa. Thus, 'Gateways' can be used to relay a VHF analogue message to the TETRA protocol, either to the Incident Control Point (ICP), the police control room, or anywhere that the particular Airwave talk-group is programmed to terminate. One of Airwave's features is that, unlike previous police communications systems, it will be able to span police force borders and this feature alone makes it much more flexible for SAR purposes than its predecessor.

2.3 Tomorrow . . .

2.3.1 Developments in radio communications occur at bewildering speed and it is impossible to be sure of which direction they will lead, even in the near future. The laws of physics stay the same, however, and it is likely that land SAR radio communications will migrate space-wards if we are to improve the coverage and efficiency of our networks. Voice communications will remain at the core of our needs, but increasingly, data in the form of medical telemetry and video photography are likely to become more important. Textual logging and messaging using voice recognition and links between ICPs and co-ordination centres can be expected to become the norm, probably over Broadband Satellite Virtual Private Networks (VPN). It must be realised, however, that these and other technical solutions, in theory 'good ideas', have first to be accepted and embraced by the rescuers at the sharp end. All too often we see totally impractical technical engineering solutions foisted upon those who do the work, by commercial companies with vested interests, or from those who have insufficient experience of the problems faced by the practitioners. On the other hand, the users should try to embrace positive change, co-operate, and give new ideas and equipment a fair chance.

3 RADIO COMMUNICATIONS: GENERAL

3.1 Radio communications, in all its forms, is vital to the efficiency and safety of land rescue teams; this is particularly true during MRT incidents and training in harsh weather conditions. As the MRT environment is probably the most challenging in terms of difficulty with radio communications, the mountain and moorland setting has here been used as the template, on the premise that other environments will normally be more benign.

3.2 It is a truism that good knowledge and use of communications are fundamental to SAR and as valuable a skill as any other needed by team members. Communication problems are often blamed on equipment or systems' failure but, more often than should be the case, the problem lies with the operator. Each team member must strive to become a proficient communicator who can wring the best performance from the radio equipment and be able to manipulate and improvise where the situation demands - so that the message really can get through when it matters.

- 3.3 Nearly all have endured frustrating communication failures such as: the inability to contact a vehicle for a time or labour-saving pickup; the helicopter that flies past, uncontactable, when your party is miles away from base after completing the search area; having a badly injured casualty who needs urgent evacuation, but being unable to communicate this to anyone, and being unable to contact another agency that has the critical resources needed.
- 3.4 A common thread linking all the major incidents of the last few decades has been the inability to intercommunicate between the different SAR and Emergency Services. From Lockerbie to Boscastle, and during innumerable land searches, communication limitations have been the SAR forces' Achilles heel.
- 3.5 To be really successful, the communications network must be capable of extending reliable two-way communications, from the first informant, all the way through the police, Aeronautical Rescue Co-ordination Centre (ARCC) and team communications links - to the most remote party leader and then all the way back again, if necessary. This said, the basics must first be right and our most basic link is that between the ICP and the deployed parties.

4 VHF RADIO FUNDAMENTALS

- 4.1 The hand-portable radio is commonly called the 'hill-set' and sometimes, a 'pack set'. With care and proper use, a modern UK SAR band plan hill-set will provide efficient communication with other land SAR parties, vehicles, ICP, bases, helicopters and, when needs be, with other SAR and Emergency Service agencies. It is a powerful tool.
- 4.2 The vehicle sets generally have more transmitting power but, other than the controls being different and the aerial being mounted on the roof of the vehicle (the best and most efficient place for it), the principles are the same. If a vehicle is to be used as a mobile base, it can be made far more effective if elevated aerials are used. If the vehicle has only one radio installed, a hill-set (or even hill-sets) with a compact mast, suitable aerials and adaptors can be used to provide extra channel capability.
- 4.3 Land SAR radio communications are conducted in the Very High Frequency (VHF) part of the radio spectrum. VHF signals act rather like light in that they provide line-of-sight communications; if the aerials of two sets are intervisible, communication between the radios is generally possible. It is the aerial that the signal is finally transmitted from and initially received by, not the microphone or any other part of the set. More so than light, VHF signals can curve round corners, be bent over sharp ridges and in some cases be reflected by the sides of mountains, metal roofs etc., instead of being absorbed by them. Some of these VHF phenomena can be very localised - move a few feet or even inches and communication can be entirely lost, or indeed, regained.
- 4.4 Radios will normally receive and transmit on one channel at a time. Channels are narrow radio frequency paths; for example, Channel 53a is currently of 25kHz bandwidth, centred on 158.650MHz. That means that it occupies all the frequencies between 158.6375MHz and 158.6625MHz, i.e. 12.5kHz either side of 158.650MHz. When it becomes a 12½kHz channel in 2009, it will take up only 6¼kHz either side of 158.650MHz. The narrower the bandwidth, the more channels available. However, the bandwidth designated for each channel is fixed, managed and controlled by Ofcom. Most modern radios can be programmed to use both 25 and 12½kHz bandwidths, and although it is sometimes possible at reduced performance to mix

incompatible radios with 25 and 12½kHz bandwidths on the same channel, it is neither recommended nor permitted.

- 4.5 When a radio transmits, all the other radios within range on the same channel will receive the signal. If another radio operator transmits on the same channel and at the same time, all the receiving users within range will usually hear distorted and unreadable noise as the two transmitted signals interfere with each other. So, within a radio network, only one radio should transmit on that channel at any one time. The use of good radio procedure will increase throughput, maximise usage and minimise problems, but another way to increase capacity still further is to use more than one channel, just as other telephone numbers and lines are used for different, but parallel conversations. The best way of increasing throughput is to use different radios on single, different channels.
- 4.6 It is possible for the radios to 'scan' a number of channels, but the moment the radio receives a signal or even interference on a channel, it will normally be held on that channel, unable to receive other channels until it begins to scan again. If other radios in the party are scanning the same channels, all the radios will stop on that channel. The sets will hold on the channel until the signal or interference stops, because the radios are programmed to delay for a short time after activity on that channel has ceased, to allow time for the operator to respond on the same channel. During this time, no other channel in the party will be monitored until the transmission stops and the delay time has passed. If the party's radios are close together and one of the operators responds, none of the radios will resume scanning and the loudspeakers may well create feedback and distortion. This feedback comes from the received signal on one or more radio speaker-microphones (speaker-mikes) being re-inserted into the transmitting microphone, quickly becoming louder, more distorted and unreadable. Most team members like to know what is happening on an incident, but using the scan facility is usually not the answer as they will all effectively be listening to the same channel, neglecting the others. In a party with more than one radio, it is simpler and more effective to monitor single channels with different radios and this is particularly so in poor weather conditions. Scanning uses more power and shortens battery endurance.

5 HILL-SET BASICS

- 5.1 By using simple checks and operating techniques, the radio equipment and radio communication can be made significantly more reliable.
- 5.2 **Batteries** *More land SAR communication failures are caused by faulty or discharged batteries than any other single cause.*
- 5.2.1 Adopt a set routine to ensure batteries are fully charged by placing them on charge immediately upon return from an incident because the radio may be needed much sooner than anticipated.
- 5.2.2 Check the battery contacts are clean on both battery and radio before re-connecting.
- 5.2.3 Check the battery is fully charged before fitting. To ensure a full charge, it is a good idea to remove the newly charged battery from the charger, let it 'cool' for an hour, and place on charge again. Do not leave batteries on chargers for extended periods and do not leave a radio

with attached battery switched on and with the battery charging (unless the manual specifies this is possible) because it will not charge properly.

- 5.2.4 If the radio is to be used in winter ensure that the battery type is suitable for operating efficiently in cold temperatures.
- 5.2.5 It is good practice, particularly during the winter months, to carry a spare battery.
- 5.2.6 Place the spare battery in a separate plastic bag to ensure the terminals are insulated; not with sticky tape as that leaves a non-conducting residue. Note: terminals that are short-circuiting with metal climbing gear are explosive and an air safety hazard.
- 5.2.7 Scanning uses considerably more battery power and so shortens battery endurance.
- 5.2.8 From time to time, use a battery conditioner instead of the normal charger.

5.3 Physical Security *Loose items will not work properly and can be lost. Aerials are particularly vulnerable.*

- 5.3.1 Check the external loudspeaker-microphone is secure and serviceable.
- 5.3.2 Check the battery is correctly connected.
- 5.3.3 Check the aerial connection is secure. Pack-mounted aerials are more effective; if one is used, ensure the helical set-mounted aerial is available as a spare.

5.4 Radio Checks and general usage *There is no point in relying upon an unserviceable radio.*

- 5.4.1 Before or shortly after setting out, check the radio with base, or even better, with a party that is already on the hill. Conduct the check conveniently close to base so that you can easily return to exchange an unserviceable radio.
- 5.4.2 Ensure the radio is on the correct channel and 'lock' the buttons, if possible, so that the channel cannot be changed accidentally. Deliberately take a few seconds to double-check these settings.
- 5.4.3 Check the volume levels are correct for the prevailing environmental conditions. Note: turning up the volume control has no effect on the transmitted power.
- 5.4.4 If there is a high or low 'transmit' power setting, consider using low power. The reasons for this are: battery power will be saved (transmitting uses much more power than receiving); the risk of interference to other users will be greatly reduced and this setting can provide an early warning of going out of range, whilst still retaining the option of switching to the high power setting. If communications become difficult, issue a warning that there is chance of being out of radio contact, adding an estimated restoration time, if possible.
- 5.4.5 Radios (and mobile phones) adversely affect avalanche transceivers when on search mode. Ensure avalanche searchers have radios and mobile telephones switched off. It is good

practice to have a member in sight of potential avalanche dangers and the searchers, but out of avalanche danger and with a couple of radios (ECC and TWC) standing watch.

5.5 Squelch *Just because the set is silent does not mean it is not receiving calls.*

- 5.5.1 This little-understood control is invaluable for receiving poor or fluctuating signals. The squelch threshold level is pre-adjusted on most modern sets with the aim of suppressing the irritating atmospheric hiss, yet leaving the set sensitive enough to receive signals that are only slightly stronger than the ambient atmospheric 'floor' noise level. Unfortunately, the floor level changes and if it exceeds the squelch threshold, the annoying and persistent hiss will be heard. The net effect of this is usually that the operator will eventually turn the volume right down to escape the noise, unfortunately to the level where incoming messages cannot be heard. Alternatively, if the squelch threshold level has been set too high, the set will be 'deaf' as the squelch will only open, permitting the incoming message to be heard, if the high threshold level is exceeded. If the squelch threshold level is not exceeded by the incoming signal, it makes no difference how loud the radio's volume setting has been set, as nothing will come through.
- 5.5.2 To explain how the control can be used, consider a moving SAR vehicle with whom you are trying to communicate. Under these conditions it is quite common to receive an intermittent signal that is impossible to read as half of it is squelched! This is caused by the signal coming to the aerial via two or more routes; perhaps one is coming direct and another is reflected off a rock wall. The distance travelled by the signals is different, the phase is therefore different and so the signals can, in turn, alternatively boost and cancel each other out.
- 5.5.3 To overcome this, the easiest answer is for both stations to hold position and for one to move to and then hold at the strongest signal position, often only a matter of feet or inches.
- 5.5.4 However, to have both stations hold position is often impracticable. If this is the case, manually 'lift' or 'open' the squelch by operating the squelch control so that the atmospheric hiss is heard. Though the signal level will still fluctuate, the distant station may well now be readable. Be aware that the other station will probably have to do the same to hear your transmissions.

5.6 Aerial Polarisation. *Just as one can make light appear stronger or weaker with polarised lenses, the same is true for radio signals with aerial polarisation.*

- 5.6.1 It is advantageous for *all* aerials to be vertical on rucksacks, vehicles, bases and ICPs.
- 5.6.2 Reflected signals can sometimes change polarisation. It is worthwhile bending forward or back to change the aerial direction if signals are weak, holding where the signal is strongest. Though this sounds ridiculous (and it can look odd), it is often effective.

5.7 Aerial Height *Within reason, the higher the aerial above the surrounding ground, the greater the range.*

- 5.7.1 As well as being vertical, the aerial should be as high as possible – on top of the rucksack if it is a set-top aerial – and, to minimise signal absorption by the body, as far from the body as practicable.

- 5.7.2 Standing on rocks, trig points or any other structure can crucially enhance range. An aerial more than 5 feet above the ground makes a positive difference. Even holding the radio as high as possible, with its aerial vertical above the head, will improve range.
- 5.7.3 Standing in the middle of a bridge may well significantly improve range.
- 5.7.4 When practicable, use a pack-mounted counterpoise aerial for greater range and efficiency. This type of aerial has two aerials pointing in opposite directions. One of these, the side marked 'E' or with the short helical aerial, should point downwards.
- 5.7.5 The golden rule is to elevate the aerial and keep it vertical for better performance.

5.8 Carrying the Radio *Efficient, Comfortable and Protected.*

- 5.8.1 A simple and effective means of carrying the radio is to tuck it into the top, rear of the rucksack with the aerial sticking vertically out of the top. This fulfils the requirements of height and keeps the aerial as far from the body as possible. It is important that the radio is fairly accessible in case channel change or other adjustment is needed and to allow the speaker-mike cable to extend loosely under the arm to the rucksack's shoulder strap. Alternatively, the radio can be placed in the rucksack or even on a rucksack shoulder-strap if protected by a case, connected to a more electrically efficient pack-mounted counterpoise aerial strapped vertically to the rear of the rucksack. Even if protected by a case, a radio fastened to the shoulder will be colder and more exposed to trauma and the elements than one in the rucksack.
- 5.8.2 The speaker-mike lead should be slack under the arm, allowing body twisting and stretching without the lead becoming taut and with surplus enough to permit the optimum mouth-to-mike distance. When receiving, the speaker volume should be loud enough to easily cope with the prevailing noise and wind conditions. Each person should find the ideal mouth-to-mike distance and position. It is recommended that the microphone be turned side-on to the mouth, just to the side of the mouth so that exhaled air does not create wind noise, at a distance of 2 – 3 inches. Adjust for optimum from that starting position. Finding and using this position is well worth doing, as it can make all the difference between good and unreadable communications. In windy conditions, shield the mike with a hand or jacket hood.
- 5.8.3 It is also recommended that rucksacks be modified using thick cord across each of the shoulder straps. The speaker-mikes can then be securely suspended from the horizontal cord. When carrying one radio as is normal, clip the mike on the left shoulder strap if right-handed, and vice-versa if left-handed. When called on the radio, it is really poor operating procedure to delay response by more than a few seconds. If the mike is stowed in the pocket or clipped to the rucksack body, it may not be heard and retrieval takes a long time. At best a 'Say again' is required and at worst, it is not unusual for the sender to become impatient and to call again just as the recipient finally gets it together and responds. Neither will hear the other and it is easy to imagine the chaos and wasted air time that results. A further disadvantage of stowing a mike in a jacket pocket is that the mike cable may be over-stretched when the rucksack is removed. In the final analysis, the important issue of how to carry the radio is a matter of choosing the least of several evils. Some contrasting examples follow: Using speaker mikes allow the radios to be stowed remotely, protected in the rucksack, but this

introduces potential weaknesses such as cable stresses at the junctions with the radio and speaker-mike, although it also provides an additional option in that the radio's microphone can be used if the external mike fails. A radio stowed in the rucksack is less prone to impacts and inclement weather, but less accessible to change channel or volume. Pack-mounted aerials improve transmission and reception performance, but can be inconvenient when climbing and are less robust. From the body's (more vitally, the brain's) signal absorption perspective, it is much safer to use the radio in the rucksack than it is to transmit from the set itself, with the aerial dangerously near to the eye and brain.

- 5.8.4 Some radios and batteries are more vulnerable to cold conditions than others. If there is a choice, choose the battery type that is most resistant to cold and place the radio in a bubble-wrap bag, though beware of condensation. The liquid displays of some radios can go blank when it is very cold. This does not necessarily mean that the radios are faulty, just that the displays are temporarily blank! Warm the radio and the display will usually reappear. If one channel is being used, the radio will stay on that channel and there are no complications. This is another reason for 'keeping it simple' and shunning the scan function.
- 5.8.5 Switch the radio (and all other electronic equipment) off before entering a helicopter and remember to switch it back on again after disembarking.
- 5.8.6 Do not transmit near fuel stations and near explosives – this includes when near aircraft crashes.

6 USING RADIOS IN VEHICLES *Road Safety comes first.*

- 6.1 The driver should not operate radios while the vehicle is moving; leave that to a passenger.
- 6.2 Both TWC and ECC should be monitored. The best way of achieving this is to use two radios, each with its dedicated channel. If the vehicle has only one radio, a hill-set can be pressed into service to monitor the ECC - preferably using a spare vehicle aerial and adaptor provided for this purpose.
- 6.3 If incoming messages are intermittent, stop when it is safe to do so and ask the other station to hold position where communications is adequate.
- 6.4 SAR traffic takes priority and should not be obscured by recreational music or commercial broadcast radio.

7 USING BASE OR CONTROL RADIOS AT THE INCIDENT CONTROL POINT (ICP)

- 7.1 Plan ahead to provide this capability. Train team members who possess the necessary operating skills, interest and competence as ICP operators.
 - 7.1.1 A pool of members with the right credentials should be trained for this demanding task. It is important for incidents that the operators have had experience in the field and are familiar and empathetic with what those at the 'sharp end' are experiencing. It is preferable that they are familiar with the geography of the area, and can correctly pronounce the local place-names, Team members are often less than impressed with members lacking field experience at Base or ICP, even if the latter are only relaying instructions.

- 7.1.2 Comprehensive written logs must be kept for 6 years after the incident. Computer logging is a convenient way of achieving this, but beware of the legal requirement that logs must stay as originally written. Computer printed logs that have been signed, witnessed and dated during or just after the incident should suffice.
- 7.1.3 Audio recording is useful, but difficult to fully implement. It is to be hoped that voice recognition software with the ability to convert radio conversations to text will soon be available as that would greatly simplify matters.
- 7.1.4 From the radio standpoint, it is essential that there is one radio per channel in use available at the ICP. Remember that hill-sets or mobile radios can double as base sets. Use the minimum transmit power consistent with adequate communications and connect to an elevated aerial with appropriate vertical or horizontal separation to minimise interference.
- 7.1.5 The ICP can be either a vehicle or the Team Base, but the dedicated communications vehicle is often more effective as it shortens and minimises the lines of communication and can allow the team leader and incident controllers to join with other SAR and Emergency Services at the appropriate ICP. By operating from a distant fixed base, despite all its benefits of comfort and terrestrial telephone links, the reliability of the links is often compromised and more links are needed. Usually, the shorter the distance, the better the communications.
- 7.1.6 The Band Plan and its associated SOP should be followed as closely as possible in order to maintain uniformity and avoid chaos.
- 7.1.7 Radio Operators need rest, so a roster should be organised in good time. Allow adequate time for a comprehensive hand-over so that the information 'thread' is not lost during personnel changes.

8 SIMPLEX, HALF-DUPLEX AND DUPLEX CHANNELS

- 8.1 Simplex channels are single channels. Rather like single track roads, they can only handle one transmission at a time.
- 8.2 Half-Duplex channels. These are two channels which, like dual carriageway roads, send on one channel and receive on another. However, the radios (and the users?) can only handle one transmission at a time and effectively, this reduces it to the same throughput as simplex.
- 8.3 Duplex, or Full Duplex as it is sometimes called, provides true, simultaneous, two-way communications. Although repeaters are capable of this, the terminal radios and their users are not. Telephones and Mobile Telephones provide a full duplex link.

9 DUPLEX REPEATERS AND SIMPLEX REBROADCAST

- 9.1 This terminology is confusing to many and contested by some experts. Nevertheless, the above terms will be used for the time being. Both systems use other channels to feed relay devices placed in dominant positions with the purpose of increasing coverage and range.

- 9.2 Duplex Repeaters: This is a method of using two channels in a way that can be likened to two dual carriageways joined by a roundabout - the repeater being the roundabout. From the ICP, channel A is used for transmit and B for receive. The repeater receives on A and transmits on B to the deployed parties. The parties transmit on A and the repeater transmits the message down to the ICP on B. Using this method, adjacent parties cannot speak direct to each other, they have to go through the repeater. If the repeater cannot be accessed by any party or parties, they cannot communicate with anyone. For the deployed users, this is the more sophisticated system, but in the mountain rescue environment it can easily fall apart. If the system fails, the ECC can be used to recover the situation.
- 9.3 Simplex Rebroadcast: This system can be likened to two single-track roads joined by a roundabout. The ICP transmits **and** receives on A and the deployed parties transmit **and** receive on B. The throughput is broadly the same as the duplex repeater and parties can all talk to each other on the familiar TWC, in addition to being able to speak to the ICP through the rebroadcast unit, a big advantage. However, if a party has to talk with another party that is out of its TWC range, it has to go through the ICP who has to manually relay. Rebroadcast units are often referred to as 'rebros'. The system has the advantage for mountain rescue use that deployed parties only have to use the familiar, simple and effective simplex TWC to speak to other parties and the ICP. The ICP can increase its flexibility by also monitoring the TWC on another radio, thereby covering close-in parties that may not be able to access the rebro.

10 CTCSS - (CONTINUOUS TONE CONTROLLED SQUELCH SYSTEM).

- 10.1 This acronym is usually understood only by radio 'buffs'. In basic terms, the system uses a number of sub-audible tone sets or codes, in the range of 67 to 254 Hz, to prevent other users who are using the same channel from interrupting a radio conversation. The sub-audible tones are activated each time the microphone transmit button is pressed. When programmed on 'receive', the radio will only respond to incoming signals using the same CTSS tone set. This feature does not prevent anyone from hearing a coded transmission, it merely filters out other transmissions on the channel that do not have the same channel tone set. The use of CTCSS can have other advantages with regard to interference, particularly when 'scanning' is employed and its use on SAR channels will probably increase, particularly when repeaters are involved. However, its disadvantages can outweigh its advantages unless universally available and, just as with the scanning facility, it has to be carefully applied - a definite case of, 'horses for courses'. It should be noted that although CTCSS can stop interference on a channel, it is not a magic device for allowing more than one transmission at a time to be made on it. Many SAR users are unlikely to have CTCSS available on their radios.

11 LINK STATIONS, OR 'LINKS'.

- 11.1 These are simply team members who are dispatched in a vehicle or on foot to a prominent location, with the purpose of extending the normal radio coverage. They receive and manually relay messages on to parties who would normally be out of range of the ICP or some other parties. Whilst rebros and repeaters are more efficient for this purpose once set up, team members are more adaptable.

12 AIRWAVE GATEWAYS

- 12.1 These relay devices are prominently located within Airwave network coverage where they can be used to extend the range and user-base of both Airwave and land SAR coverage. They change the digital Airwave protocol into the analogue VHF signals used by the land SAR radios and the process is reversed when the land SAR radio transmissions are received by the Gateway, whereupon they are relayed back on the Airwave talk-group to their intended destination(s) in the digital TETRA format.

13 TRANSMITTING TECHNIQUES

- 13.1 The RSVPC mnemonic provides a simple guide for R/T communications.

R Rhythm **S** Speed **V** Volume **P** Pitch **C** Content

- 13.1.1 **Rhythm** Maintain the natural rhythm used in conversation to help make the message intelligible. Avoid saying 'er' or 'um' while thinking.
- 13.1.2 **Speed** Speak steadily and at medium speed so as to avoid an unintelligible jumble of words from speaking too quickly or losing rhythm when too slow.
- 13.1.3 When it is known that the recipient will write down an element of the message, leave much larger spaces between short phrases. To get an idea of how long the gaps should be, try writing down your own message. Most operators transmit too quickly under these circumstances. Experienced operators often transmit phrases twice when the receiving operator is writing.
- 13.1.4 **Volume** Speak at an ordinary conversational level to avoid distortion with the mike-to-mouth distance kept constant. Without sacrificing rhythm, every word should be clearly spoken and the voice must not fade away on the last part of the phrase.
- 13.1.5 **Pitch** Use a pitch that is a little higher than usual to aid reception, especially in poor conditions. Maintain an even pitch, being especially conscious of the last syllable of words where the natural tendency is to lower the pitch.
- 13.1.6 **Content** Think about what is going to be said and how it can be said before pressing the transmit button. A good maxim is, 'Select brain before engaging mouth.' The radio is for communicating but, particularly during busy incidents, consider whether the message is really necessary; unimportant messages can wait until later. Nevertheless, during exercises and at other times, R/T practice is essential and operators should be at ease when using the radio.
- 13.2 If another station is being received by your radio, do not transmit across it as to do so will interfere with its traffic. If unable to make an urgent transmission on the TWC due to heavy traffic, then use the ECC.
- 13.3 Keep messages short so as not to hinder other traffic and to save battery power.

- 13.4 Leave a few seconds' pause after the last transmission with a station so that other users can transmit urgent information.
- 13.5 Generally, do not use personal greetings ('Good morning', 'Thank you', 'Please', etc.) except on arrival and departure of, e.g. a helicopter or another team. Please use discretion on this point. However, foul language or swearing on the radio is unacceptable and expressly forbidden in radio regulations.
- 13.6 Always bear in mind that messages may be heard by a casualty or friends, so be tactful and do not transmit a casualty's name. Bystanders and the press commonly overhear transmissions and this should be assumed to be the case at all times. Other SAR agencies are also users of the UK SAR Band plan. Mobile phones are more discreet than radio for personal or casualty information, provided that there is not a loudspeaker connected at the other end – check at the beginning of the conversation.
- 13.7 A radio should be kept switched on even if it is suspected that it is not working correctly.
- 13.8 If direct contact with the intended party is not possible, consider the possibility of relaying via another station. If this is unsuccessful, use the 'Transmitting blind' procedure (section 14.11).
- 13.9 If one is unable to contact any other station, broadcast information such as location and/or intentions from time to time (Situation Reporting, 14.5). Keep these transmissions brief, because the receiver may be faulty and they may be cutting across other users. Even if no reply is received, it should be assumed that the radio is working. This tactic does not apply to passing instructions; decide on the merits and possible confusion that may arise if there is doubt that a message has been received.
- 13.10 If there is need to establish the readability of transmission or if in doubt as to the functioning of the radio, call another station and carry out a radio check.

14 BASIC RADIO TELEPHONY (R/T) PROCEDURE

- 14.1 What follows has been compiled to encourage best practice. Many experienced users may frown on the inclusion of, omission of or preference for certain usages; this has been done to promote a standardized R/T procedure but does not imply criticism of other good practice.

14.2 Callsigns

- 14.2.1 The list of registered callsigns is available on the UK SAR Website and in the Mountain & Cave Rescue Directory published by Mountain Rescue, England and Wales.
- 14.2.2 The use of team callsigns suffixed by personal names has become the norm on many teams and it would now be hard (and unpopular) to change this system. Though it appears to be a simple method of identifying individuals, names are often unclear and if there are four 'Bobs' on a team, a suffix to a suffix usually has to be employed. The use of numbers has much to recommend it: logging and multiple party calling is much easier and more logical. Some teams in S Wales are using a combined unique callsign and numbering system, aiding identification and simplifying logging. The emphasis should be on simplicity however, and callsigns like A6-76 should be avoided.

14.2.3 **Team Callsign.** This is used throughout the following to indicate the team's callsign. It must always be used in transmissions.

14.2.4 The following are also used to identify specific stations.

14.2.4.1 General callsign for all radios on the radio net is '**All Stations**'. If a helicopter or other teams are present use '**All Team Callsign Stations**'. This would usually be initiated by Base and will often be used as a recall at the completion of an exercise or callout. Replies should be requested with '**All Stations, . . ., Acknowledge, Over**'. Base or Control stations would log and check receipt from all stations in order, calling again specific stations who did not respond the first time and then asking prominent hill parties to relay for the remainder. This is one of several advantages of using numerical callsign suffixes (e.g. Dundonnell 5) as it is easy to answer in order.

14.2.4.2 '**Unknown Station**' should be used when it is not known who has been heard or who is calling.

14.3 Establishing Contact

14.3.1 An initial call should be made and received in the following manner with station-being-called repeated. The channel in use should be quoted on the first transmission so that there is no ambiguity. This is particularly true of the Emergency Calling Channel (ECC) and Ground to Air (G2A) channels.

Team Callsign Base, Team Callsign Base, This Is Team Callsign 1, Channel Six Two Alpha, Over

14.3.2 '**This Is**' should be used for every transmission. It is worthwhile justifying the reasons for this. "This Is" takes less than ½ a second to say, is much clearer than 'From' and is the international standard. Because it is expected in every transmission, it is instantly recognizable, even in poor reception conditions. It opens the receiving radio's squelch and the receiving ear has synchronized by the time the call sign following it is spoken. When transmitting, "This Is" gives the brain the moment it needs to compose the rest of the message.

14.3.3 After the initial calls, the called station may be omitted but the calling station continues to give its callsign. This means that even when another station comes into range, or switches on, it can be certain who is calling, at any stage of the exchange.

A typical exchange would be :

Team Callsign 1, Team Callsign 1, This Is Team Callsign 2, Over.

Team Callsign 2, This Is Team Callsign 1, Over.

This Is Team Callsign 2, Request you wait at the LandRover for Team Callsign 3 and then return to Base, Over.

This Is Team Callsign 1, Wilco, Out.

- 14.3.4 Often, when traffic between stations is light and the signal path known to be satisfactory, there is no need to carry out an initial transmission as described above. Use the distant callsign twice and then pass your brief message.
- 14.3.5 End words are '**Over**', used when a response is expected, or '**Out**', used when a response is neither expected nor required. These should never be used together to conclude a transmission as they contradict each other.
- 14.3.6 If, following the repetition of an initial transmission to establish contact no reply is received, finish by using, e.g. **Team Callsign Base**, This Is **Team Callsign 2** Nothing Heard, Out.

14.4 Radio checks

- 14.4.1 Test transmissions should be carried out before leaving or a short distance from base. This checks the serviceability of the sets and confirms to the Base or Control who is deployed.
- 14.4.2. The readability of the transmission should be classified using the following signal strength and readability scale:

Table 1

Signal Strength	Readability
Loud	Clear
Good	Readable
Fair	Distorted
Weak	Negative readable
Very Weak	
Fading	

Explained in more detail:

Very strong, very clear signal (exceptional)	=	Loud and Clear (it is <i>never</i> this good!)
Good, clear signal (the norm)	=	Good, Readable
Good strength, but garbled signal	=	Good, but Distorted
Fair strength, and readable signal	=	Fair, Readable
Weak, but clear signal	=	Weak, Readable
Weak and fading signal	=	Weak, Fading
Very weak, unreadable	=	Negative Readable

- 14.4.3. An example of a radio check would be as follows:

Team Callsign Base, **Team Callsign Base**, This Is **Team Callsign 1**, Radio Check, Over **Team Callsign 1**, This Is **Team Callsign Base**, Good, Readable, Over This Is **Team Callsign 1** Good, Readable, Out.

- 14.4.4 Should a short range radio check be inferior to Good, Readable, then it is up to the operator of the radio giving the poor signal to carry out a comprehensive serviceability check. Team members should take the appropriate action and Base should resist giving advice unless an obvious solution can be seen, e.g. 'Try to make contact on the ridge.'

14.5 Situation Reporting

- 14.5.1 It is important that radio contact can be maintained and that personnel locations are known. If more than about 30 minutes has elapsed without communication, a short situation report (sitrep) should be transmitted to base. This could include current location by landmark or place-name, grid reference, bearing, or simply proceeding to a particular point.

Team Callsign Base, Team Callsign Base, This Is Team Callsign 3, We have reached The Old Man of Coniston and proceeding to Levers Water, Over.

or

Team Callsign Base, Team Callsign Base, This Is Team Callsign 3, We are at Grid 273978, proceeding to Grid 279991, Over.

Team Callsign 3 This Is Team Callsign Base, Roger, Out.

14.6 Station temporarily unable to deal with a message

- 14.6.1 If a radio operator is unable immediately to deal with a message, '**Wait**' may be used. Example:

Team Callsign 5, This Is Team Callsign Base, Wait, Out.

- 14.6.2 *Callsign 5* must wait a short time (seconds) until the base operator is ready. If the delay is to be longer than about 30 seconds, then '**Wait**' should be appended with the number of minutes, e.g. '**Wait 5**' indicates a five minute delay until a reply will be given. Operators should avoid the overuse of this pro-word; those on the hill will not appreciate such an instruction, especially on a cold, windy night.

14.7 Repetition

- 14.7.1 Use '**Say Again**' to request repetition of all or part of your transmission. This may be made more specific using '**All After**', '**All Before**', '**All Between**', '**Word After**', '**Word Before**'. Example:

Team Callsign 5, This Is Team Callsign 4, Change of plan, Ascending Moel Siabod, then going to Cnicht and descending by path to PYG, Over.

Team Callsign 4, This Is Team Callsign 5, Say Again . .

- a) All After descending, Over. c) Word After ascending, Over.
b) All Before Cnicht, Over. d) Word Before then going, Over.

In answer to c:

This Is *Team Callsign 4*, I Say Again Moel, I Spell Mike Oscar Echo Lima, Moel, Over.

This Is *Team Callsign 5*, Roger, Out.

- 14.7.2 Note: if *Team Callsign 4* had used *Team Callsign 5* twice in the first transmission, and then repeated difficult words or even the whole message twice, overall transmission time would be saved.

14.8 Verifying a message

- 14.8.1 Use 'Verify' to request verification and 'Read Back' to make sure that a message has been received correctly. Example:

Team Callsign 3, This Is *Team Callsign 4*, Casualty found at Grid 229721, Over.
Team Callsign 4, This Is *Team Callsign 3*, Verify Grid 229721, Over.
This Is *Team Callsign 4*, Correct, Over.

Or, if the grid reference is incorrect:

(*Team Callsign 4*, This Is *Team Callsign 3*, Verify Grid 239721, Over.)
This Is *Team Callsign 4*, Negative, Grid 229721, I Say Again Grid 229721, Over.
This Is *Team Callsign 3*, Roger, Out.

- 14.8.2 There may still be doubt in the mind of *Team Callsign 4* that *Team Callsign 3* has the correct grid reference so the exchange may go as follows:

(*Team Callsign 4*, This Is *Team Callsign 3*, Verify Grid 239721, Over.)
This Is *Team Callsign 4*, Negative, Grid 229721, Read Back Grid 229721, Over
This Is *Team Callsign 3*, I Read Back Grid 229721, Over
This Is *Team Callsign 4*, Correct, Out

14.9 Using a relay

- 14.9.1 If communications between two stations are difficult or unworkable, it may be possible to use another station as a relay. Use 'Relay To', 'Relay Through Me', 'From' and 'Out To You'. Example:

Team Callsign 6, *Team Callsign 6*, This Is *Team Callsign 9*, Report your location, Over.
(five second pause)
Team Callsign 6, *Team Callsign 6*, This Is *Team Callsign 9*, Report your location, Over.
(five second pause then request relay through a station known to be in contact with Callsign 6)
Team Callsign 2, *Team Callsign 2*, This Is *Team Callsign 9*, Relay To *Team Callsign 6*,
Report your location, Over.
(acknowledge)
**Team Callsign 9*, This Is *Team Callsign 2*, Wilco, Out To You.
(relay message)
Team Callsign 6, This Is *Team Callsign 2*, From *Team Callsign 9*, Report your location, Over.
(send reply)
Team Callsign 2, This Is *Team Callsign 6*, My location Grid 418932, Over.
(acknowledge)
**Team Callsign 6*, This Is *Team Callsign 2*, Your location Grid 418932, Out to You.
(relay reply)
Team Callsign 9, This Is *Team Callsign 2*, From *Team Callsign 6*, Location Grid 418932,
Over.
(acknowledge)
Team Callsign 2, This Is *Team Callsign 9*, Roger, Out.

- 14.9.2 Where communications are good and operators are proficient, this can be shortened; the lines marked '*' could be omitted. If it is information not requiring an answer that is to be passed, the relay should contact the originator of the message and state '**Message Passed**'.

14.10 Offering to relay a message

- 14.10.1 A station may offer to relay a message using '**In Contact With**'. Example:

Team Callsign 2, Team Callsign 2, This Is Team Callsign 1, Over.

(five second pause)

Team Callsign 2, Team Callsign 2, This Is Team Callsign 1, Over.

(five second pause then station with known contact with both 1 and 2 may offer to relay)

Team Callsign 1, This Is Team Callsign 5, In Contact With Team Callsign 2, Relay through me, Over.

Team Callsign 5, This Is Team Callsign 1, Relay To Team Callsign 2, Helicopter ETA 15 minutes, Over.

(etc.)

14.11 Transmitting Blind

- 14.11.1 This pro-word is used when an important message must be passed and it is suspected that the radio receiver may be unserviceable. Example, following no response after two attempts:

Team Callsign Control, Team Callsign Control, This Is Team Callsign 1, Team Callsign 1, Transmitting Blind, I am at Shenavall Bothy, I am at Shenavall Bothy, This Is Team Callsign 1, Out.

- 14.11.2 Because the station 'Transmitting Blind' may, unawares, interfere with other stations' transmissions, messages must be kept short.

14.12 Priority and Radio Silence

- 14.12.1 From time to time, calls may have to be made which have a higher priority than routine calls. Use the TWC if possible, but the ECC should be used if there is difficulty breaking in. The following pro-words should be used immediately there is a break in transmission. Stations outwith the interchange of messages, even if in a position to assist, must remain silent until the information has been passed.

- 14.12.2 The pro-words 'Priority, Priority, Priority' and 'Emergency, Emergency, Emergency' (for life threatening situations) may be used. By implication, unnecessary transmissions must cease.

Example:

Priority, Priority, Priority, Team Callsign Base, Team Callsign Base, This Is Team Callsign 7, We have located the casualty at Grid 744855, Request a stretcher and Entonox, Over.

14.12.3 When working with helicopters, the following aircraft urgency and emergency messages, i.e. **PanPan, PanPan, PanPan** (military- **Pan Pan Pan**) and **Mayday Mayday, Mayday**, respectively, may be heard. The callsign of the aircraft or vessel will be given and the following information may be included in the message: Status - either **Mayday** (emergency) or **Pan** (urgency); Aircraft or vessel callsign; What is happening; Intentions; Present location, heading, speed and flight level (as appropriate); Persons On Board (POB)

Your response is to listen and transcribe the message as accurately as possible. **Call 999** and pass on all the information, (preferable) or have base do so if no mobile phone or coverage is available. Inform your base/ICP of the details. Take action as necessary, depending on the situation

14.12.4 Radio silence can exceptionally be imposed by any station with an emergency, but will normally be initiated by Control. Example:

All Stations, All Stations Exempt Team Callsign 7 This Is Team Callsign Control. Silence, Silence, Silence on Channel Two Four Bravo, Out.

Note: Initially identifying the channel you are using is good procedure.

If there is a need to restrict radio transmissions to essential messages, the pro-word '**Minimise**' can be used. Again a channel should be specified.

14.12.5 To lift radio silence:

All Stations, All Stations, This Is Team Callsign Control, Silence Lifted, Silence Lifted on Channel Two Four Bravo, Out.

Important Note: The station that imposes Radio Silence *must* remember to lift it.

14.13 Transmission of letters and numbers

14.13.1 The words in the table below are to be used when individual letters are to be transmitted or words have to be spelled (use the pro-word '**I spell**'; see example in F.6).

A	Alpha	B	Bravo	C	Charlie	D	Delta	E	Echo
F	Foxtrot	G	Golf	H	Hotel	I	India	J	Juliet
K	Kilo	L	Lima	M	Mike	N	November	O	Oscar
P	Papa	Q	Quebec	T	Romeo	S	Sierra	T	Tango
U	Uniform	V	Victor	W	Whisky	X	X-ray	Y	Yankee
Z	Zulu								

These should be pronounced clearly, most with emphasis on the first syllable.

Exceptions: hoTEL, juliET, paPA, queBEC, noVEMber, siERRa.

14.13.2 All numbers must be transmitted by pronouncing each digit separately as indicated below (though also see below for exceptions). Grid references are given as individual digits. Precede

numbers with '**Figures**' or '**Grid**' if there could be doubt. Example, giving full grid reference in this case:

Team Callsign 1, Team Callsign 1, This Is Team Callsign 2, I am at Grid November Hotel zero zero four, six nine zero, Over.

14.13.3 Normally pronounced numbers are usually adequate though, if problems are encountered, the following may aid clarity over the radio.

Ø	zero	1	Wun	2	too	3	tree	4	fo-wer
5	fife	6	Six	7	seven	8	ate	9	niner

Note: surprisingly, 'two' and 'three' are often confused for each other. Emphasise them and be particularly careful with their pronunciation.

14.13.4 The following are specific forms for certain types of numbers.

14.13.4.1 Round hundreds and thousands, use '**hun dred**' and '**thousand**' respectively.

14.13.4.2 A number such as 5.7, say '**five , decimal seven**'. 'Dayseemal' can be used if conditions are poor or more emphasis is needed

14.13.4.3 Times should be given in the twenty-four hour clock in the form '**Time zero seven hundred**' or '**Time one nine three zero**'

14.14 Standard words and phrases

14.14.1 Commonly used procedural words (pro-words), with which all team members should be familiar, are listed below. Pro-words are easily understood, quickly become familiar and are easily recognized, even in poor reception conditions. Pro-words abbreviate what would otherwise be cumbersome phrases and sentences.

Table 4

Word/Phrase	Meaning
Acknowledge	Respond now, indicating that you have received and understood this message. (Response: Roger, Say Again, Wilco.) (14.2)
Affirm	Yes. Note: this is the standard nowadays, in place of 'Affirmative' which is still acceptable.
All After	Used with 'Say Again' to define part of message to be repeated. (14.7)
All Before	Used with 'Say Again' to define part of message to be repeated. (14.7)
All Between	Used with 'Say Again' to define part of message to be repeated. It is not recommended that this be used unless it relates to a written message. (14.7)
All . . . Stations	Callsign for all stations in the radio net. Can be restricted to, e.g. 'All

Team Callsign Stations'. (14.2)

Be Advised	This is a universal pro-word for imparting information either directly or from third parties. Less formal than 'Message'
Break	Used to separate different parts of a long message e.g. ' . . . Break. Roger So Far?, Over', <i>or</i> , having relayed a message, a station may want to add a further message of its own.
Change To . . .	Change channel to . . .
Changing To . . .	I intend to change channel to . . .
Channel . . .	I am using channel . . . (14.3)
Copied	I intercepted that message for me that was sent to you. This is not the same as 'Roger'.
Correct	You are correct or what you have transmitted is correct.
Correction	An error was made in my message so here is the correct version. (Note: include the text phrase before and after the incorrect part.)
Disregard This Transmission, Out	Ignore what I have just said. This should not be used for a message that has been completely transmitted and for which acknowledgement has been given (in this case, use 'Correction'.)
Emergency, Emergency, Emergency	I have a message of life threatening importance. (14.12)
Exempt . . .	The following message does not apply to the stations named.
Exercise, Exercise, Exercise	Used to indicate that the following message is exercise play and not a real situation.
Figures	Figures follow. Use if there is a chance of ambiguity but if a grid reference is to follow, use 'Grid'. (14.13)
From . . .	The originator of the message is . . . Only for relayed messages. (14.9)
Grid . . .	Grid reference follows. This may include the 100 km. grid letters. Note: If GPS is being used, it is important to read (14.13)
In Contact With . . .	I am in contact with callsign . . . and can relay for you. (14.10)
I Read Back	Repeating all, or the specified part, of this message back exactly as received so that you can check I have received it correctly. (14.8)

I Say Again	I repeat all, or the specified part, of my message for clarity or emphasis. (14.7)
I Spell	I shall spell the next word or words phonetically. (14.7 and 14.13)
Listen Out On . . .	Listen out on channel . . .
Long Message, Over Message	What follows is a long message. Are you ready to write it down? You may have to write down details from this transmission. This should not be needed when speaking to Base or Control. Avoid overuse for simple messages.
Message Passed	I have passed your message. Used when relaying an informational message. (14.9)
Minimise	Reduce transmissions (possibly on channel specified) to essential messages only.
Negative	No, incorrect, permission not granted, unable to comply.
No Duff	Used during training to indicate that what follows is not part of the training and not exercise play, but is a real situation,
No Play	As No Duff, above.
Nothing Heard	To be used when no reply has been heard from a called station. I have not received any reply to my transmission. Used after two failed attempts to make contact with another station. (F.2)
Out	This is the end of my transmission to which no answer is required or expected. (14.3)
Out To You	Indicates that I am finished with you, but about to transmit straightaway to another station. (Preferable to 'Break, Break' which means something else to aircraft!) (14.9)
Over	This is the end of my transmission and a reply is necessary. (14.3)
Pass Your Message	Pass your message. Note: replaces 'send' and 'go ahead'. (14.3)
Priority, Priority, Priority	I need to interrupt with a priority message. (14.12)
Read Back	Repeat all, or the specified part, of this message back to me exactly as received so that I can check you have received it correctly. (14.8)
Relay Through Me	Relay your message through me. This is an offer to relay a message. (14.10)

Relay To . . .	Relay this message to all addressees following this pro-word. (14.9)
Report . . .	Pass the requested information, e.g. 'Report your location' or 'Report your intentions'.
Request . . .	I would like to . . . e.g. 'Request I proceed to summit' (Response: 'Affirm' or 'Negative').
Roger	I have received and understand all of your last transmission.
Roger So Far?, Over	A query by the sender of a section of a long message, to be acknowledged by 'Roger, Over' before the message is continued.
Say Again Say Again . . .	Repeat all, or the specified part, of my message. (14.7)
Silence Lifted, Silence Lifted	Normal radio traffic may resume on this or the specified channel. (14.12) Note. Selonce Finis
Silence, Silence, Silence	All stations, except Control and unless 'exempt', are to cease transmissions immediately on this or a specified channel. Silence to be maintained until lifted by the station imposing radio silence or the ICP. (14.12)
Speak Slower	You are speaking too quickly so speak more slowly. May be requested so a message can be written.
Stand by	Can be used in place of 'Wait',.
Suggest . . .	It may be a good idea if you (or I) . . .
This Is . . .	The callsign of the transmitting station follows. "From" should never be used for this purpose. (14.3)
Time . . .	A time follows. (14.13)
Transmitting Blind	Used when an important message has to be passed and it is suspected that the radio receiver may be faulty. (14.11)
Unable or Unable . . .	I cannot comply with your request or instruction (followed by reason). This is sometimes preferable to 'Negative' which may sound rude or defiant
Unknown	A simple response to a query.
Unknown Station	The identity of the station that has contacted me is unknown. (14.2)
Verify . . .	I want you to confirm that what I say is what you said. (14.8)
Wait or Wait . . .	Wait a moment while I deal with something else or find an answer to

your request. If the wait is to be longer than 30 seconds, append a time in minutes, e.g. 'Wait 2'. (Preferable to 'Standby') (14.6)

Wilco

I understand your message and will comply with it. Usually followed with 'Out'.

Word After . . .

Used with 'Say Again' to define the word to be repeated. (14.7)

Word Before

Used with 'Say Again' to define the word to be repeated. (14.7)

Words Twice

I am going to say words or phrases twice or you are to reply giving words or phrases twice. Should be used when transmitting blind and may be used when communications between stations are difficult, e.g. To the request 'Say again, Words Twice', the response would be: This is ***Team Callsign 5***, I say again, Words Twice – The casualty is believed to be seriously injured. . . The casualty is believed to be seriously injured – having fallen 300 feet from the summit of Pen y Fan. . . having fallen 300 feet from the summit of Pen y Fan, Over.

ACRONYMS

AM	Amplitude Modulation
ARCC	Aeronautical Rescue Co-ordination Centre
CTCSS	Continuous Tone Controlled Squelch System
CW	Morse Code
ECC	Emergency Calling Channel
FM	Frequency Modulation
G2A	Ground to Air
Hz	Hertz
ICP	Incident Control Point
kHz	Kilo Hertz
MHz	Mega Hertz
MRT(s)	Mountain Rescue Team(s)
POB	Persons on Board
R/T	Radio Telephony
SAR	Search and Rescue
TETRA	Terrestrial Trunked Radio
TWC	Team Working Channel
UK	United Kingdom
VHF	Very High Frequency
VPN	Virtual Private Networks