

Avalanche Rescue Procedure

The avalanche rescue procedure encompasses a lot more than just using a transceiver and we should all remind ourselves of what is involved before we start going into the winter backcountry.

Organising the available resources and moving into an efficient rescue team, whilst maintaining the safety of the rescuers, are essential for a successful rescue. It is no mean feat to achieve this even in practice situations. Here I am going to focus on the use of the digital transceiver.

One thing that you should establish is the range of your transceiver as this varies widely depending on the model of your transceiver. Some more compact models with the smaller antenna can only manage 25m to 30m range whilst others up to 50m range. It is a good idea to place a transceiver on the ground and walk away from it until you lose the signal, so you know the limitations of your device. Then walk back to pick up the transmitter noting when you start to pick up the signal, which will be a shorter distance than when you lost the signal.

Rescue procedure

Remember time is of the essence as the victim is assumed to be suffocating in a tomb of snow. Creative thinking can be great, but this takes time, so here a more procedural approach is needed, hence the need for repetitive training so that we can automate the general procedures outlined below.

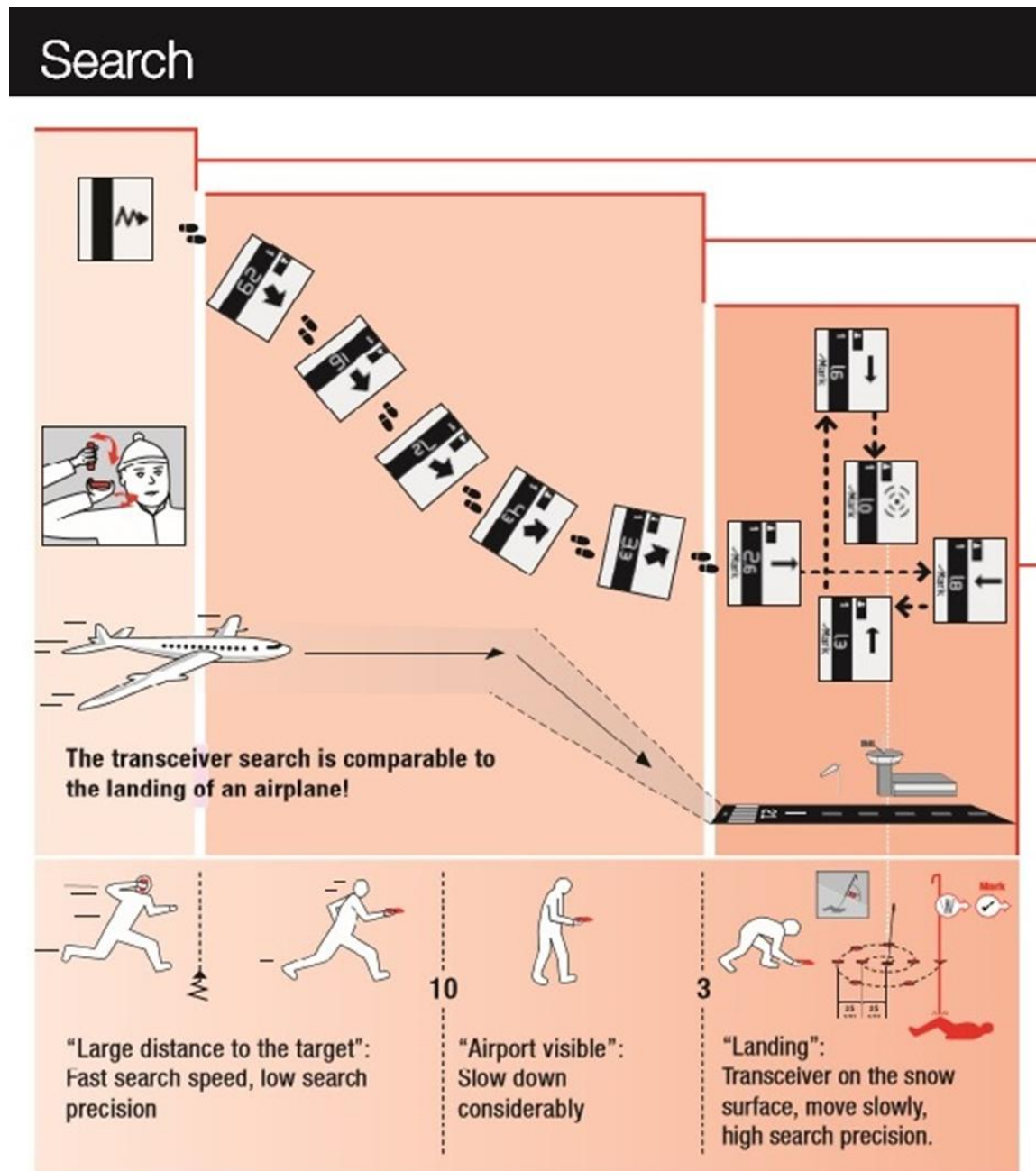
1. Stay calm as you will need to be focused. Move to a safe place (if necessary) and warn others of any immediate danger; be aware of the possibility of secondary avalanches. Watch carefully if you can see any victims going down and make a note of where they were last seen. They will be lying below this point, so you can safely rule out searching above this point. (if no point of last seen was established, you will need to search a greater area.
2. When it is safe you should start the search. Transceivers must be switched to search mode so that the only transceivers transmitting are from the buried victim(s). In search mode, most second and third generation transceivers will turn back to transmit mode after 4 or 8 minutes, (depending on how you have programmed them) in case of a secondary avalanche. Be aware of this. If you have a Mammut Pulse or the new Barryvox (S) then go into "Rescue Send" mode if you are not searching as this will reactivate transmission if there is no detected movement after 4 minutes and you will not interfere with the search.
3. Signal Search: The initial search for a signal from the buried transceiver. This is a very stressful part of the search and you should be moving as quickly as your transceiver can respond. If alone, adopt a zig zag search pattern leaving the distance of the range of your transceiver between the zig zags. If in doubt keep well within range. If you have more than one searcher, consider making a corridor search leaving the distance between the searchers equal to the range of the least sensitive transceiver. Keep looking for signs of burial (hands, gloves etc.), but stay on your course unless you are certain it is a partially buried victim. Also, rotate the transceiver slowly through 90° horizontally and 90° vertically and listen for the beep as the transceiver will pick up the analogue (audible) signal first.

Interference problems in the Signal search phase

Interference from electromagnetic transmitting objects (power lines, lift installations, turned on phones, radios, gps, gps watch, heated gloves, snow canons in operation, camera, etc.) can be a problem with digital transceivers in the signal search phase. These cause the digital transceivers to give a false reading (ghost reading) which isn't persistent and can cause confusion. If you have a digital transceiver with true analogue functionality such as the Mammut Barryvox S or Pulse (in advanced mode) then you should hear the analogue beeps as well as a digital distance reading. If there is known interference around the avalanche area you should use a narrower search band in the signal search phase (e.g. 20m rather than 40m) so that you don't miss the signal.

4. Coarse Search. You have found a robust signal. There is an analogy to landing a plane now... Once you have a signal you can quickly run following the arrow and ensuring a decreasing distance indicator. Your transceiver will be sending you along the curved flux lines from the transmitting transceiver so don't worry if you are not going in a straight line. The distance shown on your dial is the distance along the flux line and not a direct line distance. Hold the transceiver horizontally. At 10m slow down or you may overshoot the victim. The transmitting pulses are at about 1 second intervals so you should move at a pace whereby the transceiver has time to process these pulses. Here I put both hands on the transceiver and hold it firmly and squarely in front of me at chest height. I move at 1 pace per second from the 10m point so that I don't overstep the rhythm of the transceiver and go past the buried transmitter. At 5m take a split second and stop as we need to line up the "plane" (the arrow on the transceiver) to the runway as this will save time later as we shall fly directly over the victim. This means that we will not have to deviate far to the side of the approach path to locate the transmitter in the fine search phase.
5. Fine Search. At 3m we go into the fine search phase so lower the transceiver so that it is just flying above the snow keeping at the same altitude. The closer we are to the ground the greater the rate of change of the minimum distance. Keep your device in the same orientation throughout, don't rotate it when you move it sideways as this will cause confusion.
6. Within 3m of the victim, really slow down as you need to work with the timings from the one second interval pulses from the buried transceiver. The arrow is now redundant and you should focus on the distance indicator. Keep on the approach line and use this as an axis. Once you find the minimum distance on the approach axis (X) move 90° to form a y axis and see if you can decrease the distance (keeping your transceiver in the same orientation). Keep moving in the grid on the x and y axis until you have found the true minimum.

Diagram illustrating the stages of transceiver avalanche rescue...



How to rule out a false minimum distance with analogue and two aerial transceivers, formed by the transceiver being 90° misaligned. I.e. you are searching horizontally but the victim’s transceiver is lying vertically in the snow.

Continue along your approach path until you reach 3m (fine search) If you suspect that the transmitting transceiver is lying vertically within the snow, turn your search transceiver from the normal horizontal orientation position to a vertically aligned position. It is good to do this in any case to confirm the true minimum distance, unless you have a 3 aerial device which automatically compensates for this problem.

It can be useful to reinforce where the minimum distance is by drawing a box 2m or 3m distance around it. (If the victim is 2m down, that will be the minimum recording) The intersection of the diagonals from the corners of the square will also point to the minimum.

7. Probing. Once you have found the minimum get your probe out and probe at 90° to the slope (not vertically, unless the ground is horizontal) to see if you can locate the device (or person if not training). If you don't get a strike first time, then probe in a spiral or grid at 25cm intervals. When you locate the victim, keep the probe in as a marker and this is also of psychological benefit for the victim. Here the searcher may "mark" the victim's transceiver (to eliminate it and if the transceiver has this function) and move to search for the next victim if resources allow.
8. Digging. If you are on a slope, move down 1.5 - 2 x the distance of the burial and dig horizontally into the slope. This is more efficient and safer than digging directly on top of the victim, which you will have to do if it is flat terrain. If there are multiple diggers, employ an inverted V formation keeping 2 shovel lengths apart and rotate to keep the digger at the front fresh.
9. First Aid. The priority is to get to the head of the casualty and clear their airway, then administer first aid (Airway, Breathing, Circulation, Deformity, Exposure). If needed, you could use the hole created during the rescue as a shelter to keep the casualty protected. Any burial victim should go to hospital as soon as possible as inhaled snow can cause irritation in the lungs which can turn to pulmonary oedema with fatal consequences.
10. Emergency Services. When to call for help is always a balance between the race for self-rescue to expose the victim's airway which is always the priority and getting the casualty to a hospital as soon as possible. As soon as you have a surplus person, then that person should alert the emergency services (phone or radio) whilst the others perform the search. This will depend on the number of casualties and the number of rescuers. Keep handy the emergency numbers for the area in which you are skiing – 112 for Europe 144 for Switzerland.

Avalanche Rescue Procedure STAY CALM

1. Go to safe place. Look up mountain for further danger.
2. Watch the victim/s and remember point last seen.
3. Wait until it is safe to start the rescue.
4. All transceivers to RECEIVE position, only victims transmitting
5. Signal Search. Z or | | (40m). Mark point last seen & first signal.
6. Coarse Search. Transceiver horizontal. Fast to 10m, steady (1 step/sec) to 5m- align, 3m "land the aeroplane".
7. Fine Search, + (1 person) others get probes and shovels ready.
8. Probe: 25cms apart spiral until strike. Mark with probe.
9. Dig out victim: 1 ½ x burial depth below probe if on a slope, Dig in a "Λ"
10. Clear airway: Check breathing (ABC- minimal first aid and turn off their transceiver)
11. Search for next victim as soon as possible (on probe strike if there are enough resources to recover found victim).
12. Emergency phone numbers: Swiss 144, EU 112
ISM. www.alpin-ism.com

Training with the Transceiver

Getting to know the limitations of the transceiver is essential as well as trying to identify ways in which you can improve your own performance. I always practice before the start of my ski season to improve my confidence and performance. If there is no snow you can improvise using leaves (or similar) to hide your transmitter. Always protect the transceiver you are "burying" by placing it into a waterproof padded container (tip: Tupperware boxes are great).

In many ski resorts now, you can find transceiver training parks. These excellent facilities are free to use and have transceivers already buried which can be activated by a control box. You can choose from different programmes and time yourself. There is a plate above the transmitter and when the probe hits this plate it turns the transceiver off. Start your training with an easy single transceiver search with the transceiver in view so that you can build confidence and see how the transceiver reacts to the transmitter. You should aim to find a single transceiver in less than 2 minutes from first finding the signal. Then move on to hidden and multiple burials.

This is also a good way to familiarise yourself with your transceiver and how it reacts in the 3 search phases.

1. Signal search phase.

What is the range of your transceiver? How does the transition going from no signal to obtaining a strong signal go? This can be a delicate transition if your direction of travel is at a tangent to the path to the transmitter. Try moving in and out of this point to get to know how your transceiver deals with this transition.

2. Coarse Search phase. (Landing the plane).

How fast can you move and maintain focus on the distance reading? If you move very fast, you will be closer than the transceiver indicates, and you may overshoot the buried transceiver.

Sometimes the 3rd generation transceivers say, "stand still" and seem to stall which is stressful and time consuming. This can happen in multi-burial scenarios and the device needs time to process the different signals. This is where a well-trained rescuer using an analogue device has the advantage. Unfortunately, you have no choice but to stand still and wait.

3. Fine search Phase.

Concentrate on staying on your approach line (x) axis and y axis. Slow down! Move in time with the pulses and move smoothly, be patient and steady. Try marking out a box on the 1 or 2m distance so that you can reinforce the minimum which should be in the centre of the box. Do not rotate your transceiver. If you have a 2-aerial transceiver, be aware of the false minimum issue - practice with the hidden transceiver vertical and then horizontal. See how the distances changes with the orientation.

In Conclusion

Remember practice make perfect! I am sure you would want your winter backcountry companions to be perfect in making a rescue, so shouldn't you be to.

We can see how the transceiver and the techniques outlined above can increase your chances of survival but these are not an excuse to push the boundaries of risk management, say to ski a marginal slope. Avalanche prevention is key as many avalanche victims don't survive the fall in the avalanche. A metre cube of snow weighs about 700kg so this can give you an idea of the immense forces that can be generated within an avalanche. Being avalanched is not an option.

If you would like more help in avalanche awareness training, then please have a look at the International School of Mountaineering (ISM) courses below.

All these courses conform to the Swiss Mountain Training standards and are certified. This is an organisation supported by the Swiss Mountain Guides (SMGA, IFMGA), National Swiss Avalanche Service (SLF) and the Swiss health and safety organisation (SUVA).

1. ISM Ski Touring Skills Course (<http://www.alpin-ism.com/courses/ski-touring-and-off-piste/ski-touring-skills>) This 5 day course is a general ski touring course looking at the basics skills for ski touring including avalanche awareness and self-rescue for an avalanche accident to Swiss Mountain Training level 1.
2. ISM Advanced Ski Touring Skills Course (<https://www.alpin-ism.com/courses/ski-touring-and-off-piste/advanced-ski-touring-skills>) This is a more advanced 5 day ski touring course for ski tourers wanting to operate in peer to peer groups (i.e. unguided). This course covers

avalanche awareness and self-rescue for an avalanche accident to Swiss Mountain Training level 2. It also focuses on group management and leadership styles to accomplish a well-functioning team regarding group safety.

References

Louis Piquet and Mammut Documentation

Terry Ralphs, Ski and Mountain Guide.

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