MountainSkills ADVICE

TRAINING DAYS

Avalanche Processes and Leadership

Sophie Nicholson joins up with the Avalanche Geeks for some advanced avalanche training in Tignes...

WORDS & PICTURES SOPHIE NICHOLSON

Five years ago I moved to the French Alps and a journey of enquiry began. One of the very first things I did after arriving in the mountains was to sign up for an AIARE (American Institute for Avalanche Research & Education) Level 1 avalanche course in Chamonix. More than just an 'avalanche awareness' course, the Level 1 appealed to me as it was designed to provide an existing recreational backcountry skier such as myself with the basic skills to enable effective decision-making when travelling in avalanche terrain.

Over the course of three days we were introduced to a variety of hazard management tools and looked in detail at human factors, 'red flag' observations, safe travel techniques, terrain recognition, basic companion rescue and more. As backcountry novices, the Level 1 introduced the fundamentals and taught us some invaluable backcountry how to's, such as how to recognise avalanche danger, how to mitigate the risk and how to react should the proverbial powder hit the fan.

Fast forward five years to December 2015 and I was ready to go back to avalanche school once again. Having grasped the concept of the 'hows', spent a handful of winters exploring on ski and consolidating skills learned during the Level 1 course, I found myself wanting to go deeper into the subject, and the snowpack in particular. For an avalanche to occur one of the following three factors must be present – snowpack, terrain and people – and I felt my understanding of the former was minimal at best. I wanted to explore beneath the surface, to learn how to analyse the crystals and layers within the snowpack and interpret them accordingly. Essentially I was ready to get my snow geek on so, I headed to Tignes to attend the AAA Level 2: Avalanche Processes and Leadership course being run by the appropriately-named Avalanche Geeks.

MEET THE TEAM

The Avalanche Geeks are Bruce Goodlad – an Alps-based Scottish IFMGA mountain guide and the Technical Director of the British Mountain Guides (BMG) – and Mike Austin, a Professional Member of the American Avalanche Association (AAA) and fully-certified avalanche forecaster. The AAA itself is made up of dedicated professionals engaged in the study, forecasting, control and mitigation of avalanches such as group professional avalanche forecasters, qualified researchers, educators, guides, snow safety officers, ski patrollers, and technicians etc. Together they have developed a syllabus for avalanche education and this is the fourth year that the Avalanche Geeks have been delivering their courses in the UK and Europe.

The three-and-a-half day Level 2 course I had signed up to promised to go deeper into many of the topics covered in the Level 1 course, including advanced rescue techniques such as multiple burial practice scenarios, tour planning, group management, communication and travel protocols. I was keen to revisit these in more detail five years on but I was particularly drawn to the AAA Level 2 because of the geeky stuff – the parts of the course that would focus on assessing snow instability, understanding the metamorphism process within the snowpack, forecasting practice and standard recording techniques. To be ›


A short bootpack in the Tignes backcountry

Pre-tour planning and information gathering


Colourful crew digging pits in the sunshine


Happy snow students


A new world beneath the surface

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Heading to the summit of the Dome de Pramecou on Day 3


Getting the snow geek on...


Taking a closer look at the evidence


Putting it all together out in the field


Taking 'one for the team' in the avalanche rescue scenario on Day 2

in with the slightest chance of managing the avalanche hazard you have to understand both the big picture and the microcosm in equal measure. The ability to evaluate the factors critical to assessing snow stability demands constant questioning and a level of knowledge I was keen to begin to acquire.

UP TO SPEED

The first evening and following morning were spent in the classroom revisiting topics covered in the Level 1, going through our pre-course exam that the Geeks had sent us several weeks prior to arriving in Tignes, and discussing the various sources of information that are available to help you plan a successful backcountry trip. Online weather forecasts and local avalanche bulletins are the obvious traditional reference points but with the advent of social media we now also have the ability to access up-to-the-minute information from folks on the ground and all from the palm of our hands. If you're new to an area and unfamiliar with the evolution of the snowpack then it is well worth following the social media feeds of local guiding operations and reputable backcountry skiers before heading out of bounds.

Other reference points of note discussed included Google Earth which is widely used by many mountain guides and high-profile ski mountaineers as it offers them a pretty much bird's eye view of their chosen terrain before leaving the house. Cliffs, rocky areas, trees, accessibility issues and other potential pertinent information can all be observed and considered ahead of time, enabling any backcountry enthusiast to study terrain and plan a suitable ski tour.

Lesson 1: If you have to spend hours indoors pratting around on the internet, at least make sure you're looking at something useful!


Bruce inspecting the snowpack


A handful of snow gives vital info

"If you're truly serious about becoming a snow geek then you're going to need to buy yourself an inclinometer to measure slope angles."

We also spent a considerable amount of time looking at some compelling case studies that provided us with some serious food for thought. Many of the avalanche scenarios we analysed involved experienced backcountry enthusiasts who appeared to do more things right than they did wrong – yet their trips still ended in tragedy.

One example in particular involved an especially knowledgeable and experienced group who consulted and considered both the weather and avalanche conditions, dug snow pits, selected terrain appropriate for the conditions, skied conservatively and sensibly but still ended up triggering an avalanche that buried and killed one member of the group and severely injured another. The film made for sobering viewing, but crucially it highlighted how very often when an avalanche occurs it is not the result of one glaring mistake but rather the culmination of lots of little ones.

If you huck a cliff on a 40 degree windloaded slope on a Level 4 day, you're asking for trouble, but surely if you're skiing one at a time on low-angled slopes in the trees you should be okay? Technically yes, but all it takes is for one of the group to ski just a little bit beyond the agreed defined zone in the pursuit of fresh tracks, to start their next line just a smidge higher than the last, to just push the rules a tiny bit to the left or right and before you know it you're in an avalanche.

Lesson 2: Small risks can create disproportional damage; powder is an enormously potent drug so you simply have to practise rigorous self control if you want to stay alive in the backcountry.

HIT THE BACK COUNTRY

After a couple of pretty intense hours spent indoors, it was time to head out into the sunshine of the Tignes backcountry – our outdoor classroom for the course. We gathered at the base of the lifts and Bruce carried out a transceiver check to make sure that everyone's device was fully functioning.

Lesson 3: If your transceiver has had a meltdown, it's better to find out in the carpark where you can do something about it rather than up at 3,000m where a set of Duracell batteries can be pretty hard to come by. It's also worth changing the batteries in your transceiver when they reach between 50-60% of capacity charge; any lower than this and the signal strength is dramatically reduced, making it more difficult for you to locate your buried mate and vice versa.

With our transceivers all confirmed as fully operational, we hopped on the lift and made use of the ride to orientate ourselves and make note of what was going on around us.

Lesson 4: Riding ski lifts can be pretty dull at the best of time, but if you're a backcountry skier then it offers you the perfect opportunity to observe invaluable information such as recent and/or past avalanche activity, the characteristics of the snow, and solar and wind effects. Taking note of the stability and behaviour of the snowpack on slopes that closely resemble the ones you intend to ski will go a long way to helping you make good decisions in the backcountry.

The terrain in the Tarentaise valley is simply huge, offering seemingly endless potential for ski touring adventures but our goal for the afternoon was exploration of a different kind. We headed away from the ski area and after a few surprisingly pleasant powder turns, we reached our base for the afternoon just below the Col du Palet. Skis off, shovels out, down jackets on – this was the moment I had been waiting for. It was time to dig some snow pits.

Lesson 5: Digging a snow pit, analysing the layers and recording the results can be pretty time consuming when you're starting out on your snow science career, so before you start it pays to make sure you're in the right spot. First of all you want to choose a location that is representative of the slope you're going to be skiing, as the whole point of digging a pit in the first place is to get an idea of what is going under the surface on a slope that you are hoping to ski. Make sure you consider the aspect, elevation and gradient accordingly. Be sure not to dig one in an area where you could end up triggering or getting caught in a slide as the irony of that may see you picking up a Darwin Award, designed to honor those special individuals who eliminate themselves in an extraordinarily idiotic manner. To maximise the potential of your pit to produce accurate results, make sure you avoid compression zones and stay away from ridge lines, thick trees and places where people have compacted the snow. Basically open areas in the middle of a slope with no wind-affected snow are ideal. If appropriate, dig the pit in the sunshine as it can get pretty cold standing around but if that's not an option then just put on all your clothes, man up and get involved with the

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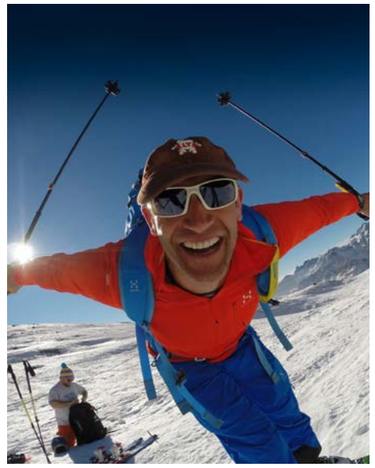

Multiple burial rescue practice

"A high quality shear (Q1) is a huge red flag – meaning the fracture breaks on a clean and smooth plane..."

shovelling. You'll be amazed how quickly you warm up when you've got 1.5m² of snow to shift.

If you're truly serious about becoming a snow geek then you're going to need to buy yourself an inclinometer to measure slope angles, a snow saw to isolate snow columns for stability tests, a thermometer to measure temperature gradient in the snow pack, a magnifying loupe and crystal card for snow crystal analysis, and a field book to record your findings using the industry standard methods and terminology known as SWAG (snow, weather and avalanche observation and recording guidelines). Oh, and a pencil. The Level 2 is an advanced avalanche course designed for either experienced recreational skiers looking to lead teams in the backcountry or as an introduction for professionals such as ski guides and ski patrollers. As a result, it is assumes you are pretty committed to the cause and ready to a) part with some cash for some big boys' toys and b) commit to learning a whole new language in order to communicate effectively with your fellow snow geeks.

ANALYSING THE PACK

Having got a bit of a sweat on digging our snow pit, we smoothed the snowpit wall with our shiny new snow saws in preparation for the stability tests. Before that, however, it was time to do something I've never done before – measure the temperature gradient in the snowpack from surface to the base of the pit (in this case we were looking at a relatively shallow early season snowpack so our snowpit went right to the ground). Basically the red flag you're looking out for is a large temperature gradient of more than 1 degrees centigrade per 10cm in the snowpack. If this is happening then metamorphosis will take place within the snowpack creating the backcountry skier's nemesis: sugary facets. Facets are basically the brussel sprouts of the snow world, the things we don't want – weak crystals that don't bond together and the junk that is responsible for the vast majority of avalanche accidents. Large temperature gradients can arise in periods of cold, clear weather when the snow surface becomes very cold and/or when the snowpack is shallow. In either case it's a pretty important indicator of potential instability but the good news it is reversible. When the snowpack gets deeper and/or the air temperature warms up a notch, the plankton junk facets will win back our favour as they metamorphose back into rounded, well-bonded grains.

Having assessed the temperature gradient every 10cm throughout the pit, noted the structure of any potential weak layers, analysed the size and variety of grain types (facets, rounds ice etc) and recorded all of this in our field book, we then got ready to carry out our stability test of choice. Having learned how to perform both a standard Compression Test and a Rutschblock Test in my Level 1, I elected to perform an Extended Column Test (ECT) – a relatively new compression test developed to directly assess fracture propagation.

The ECT is done by isolating a vertical snow column 90cm x 30cm across the slope (**Lesson 6:** Buy a snow saw that fits on the end of a ski pole so that you can easily cut the back of the column) and then carrying out a standard compression test on that column – 10 taps on the shovel from the wrist, 10 from the elbow and 10 from the shoulder. The tester records the number of taps required to initiate a fracture and whether or not the fracture propagates across the entire column. If this does occur this means the weak layer may be capable of propagating a crack across an entire slope and producing an avalanche.

In SWAG language, an ECTP5 would mean that the fracture initiated on the fifth tap and propagated across the entire column, an ECTN8 is when a fracture initiates on the eighth tap but does not propagate across the entire column whilst an ECTX means no fracture and no propagation. Still with me? Good geek.

This was the first time I've carried out an ECT and could see the advantages. Interpreting the results in terms of stability is reasonably straightforward – an ECTP5 for example is pretty big eyebrow raising stuff whilst an ECTX on the other hand indicates things are pretty stable under our skis. If you do happen to record an ECTX however, don't go hucking cliffs just yet as no slope or test is ever absolute. You might want to carry out another ECT stability test in a different location.

Having observed the strength and structure of the snow within your pit, it is imperative that you also assess the energy stored in the snowpack and this is done by recording the quality of any shear produced on a scale of 1-3. A high quality shear (Q1) is a huge red flag – meaning the fracture breaks on a clean and smooth plane, like its spring loaded. Q2 is smooth but more stubborn while Q3 is rough and slow. If your stability test appears to indicate relatively stable conditions but your shear quality is rated as a Q1, then you better look out as this indicates that the snowpack is packing more energy than the Duracell bunny. Translated, if it goes, it's going fast and potentially pretty bloody large.

Getting down low for a pinpoint search

With our snow pit analysis complete we packed away our kit and prepared to head home in time for another classroom session and a cheeky beer.

Lesson 7: Fill in your snow pit when you've finished your geekery. Leaving a big hole in the snow for an unsuspecting skier to fall into will likely anger the snow gods and any potential karma is likely to take the form of a lifetime of backcountry sun crust descents.

MULTIPLE BURIALS

Day 2 saw us head into the field to practise multiple burial scenarios, group rescue leadership and carry out advanced beacon practice. Back in the classroom, we looked at a variety of topics in more detail including human factors. Particular attention was brought to risk acceptance and how to mitigate the potentially complex scenario of a backcountry group with different goals, experience and level of risk acceptance. Of all the human factors and group dynamics we discussed, I find the 'expert halo' the most fascinating. Time and time again we read about situations where people have been persuaded – or persuaded themselves – into potentially dangerous situations, often against their better judgement, because the 'leader' of their group was perceived to be experienced and therefore 'if they think it's safe, it must be ok right?'

Lesson 8: If you have to follow someone, do so based on their actual qualifications rather than their personality and/or perceived experience. Ideally, get qualified yourself so that you can make a sound and balanced contribution to the decision-making process but – if nothing else – trust your instincts and ski with people who respect your opinion.

On Day 3 it was time to pull it all together and carry out a ski tour. Our goal was the Dome de Pramecou – a 3,081m peak situated between Grande Motte and Tignes itself. We spent the evening consulting the weather and avalanche forecasts, identifying potential hazards and back-up plans, analysing the gradient and aspect of the slopes we would be travelling through and estimating the time involved.

Lesson 9: It can be tricky to assess slope angle using contours on a map alone but the handy little credit-card sized Navigators Slope Angle tool from Shaven Raspberry can help you determine which slopes are prone to avalanche before you commit. It works on all 1:50,000 and 1:25,000 scale maps, is easy to use and costs just £1.99 – no brainer really.

The tour itself was spectacular, requiring us to negotiate a variety of terrain across different aspects. We took it in turns to lead the group, paying particular attention to our group management and communication skills, and taking our time on the descent to plan pitches that would maximise the potential for powder turns and minimise the scraping of skis along the ever-present rocks constantly lurking in the early season, relatively shallow snowpack.

Throughout the day we constantly carried out simple snow stability tests as we worked our way around the mountain.

Lesson 10: You can get a pretty good picture of what's going on beneath your skis by simply pushing the handle end of your ski pole into the snow and feeling the unseen layers below. You can do this hundreds of times a day and it takes just 1-5 seconds. Another example of a simple snow stability test is the hand shear test – simply isolate a small square of snow using your gloves and pull on it. In just 15 seconds you'll have a pretty good idea of how well the surface snow is bonded to the layer below.

The sun was beginning to set as we skied back into resort, our limbs and minds buzzing from three and a half days of intense snow-related activity. It often takes time to process exposure to new and complicated theories and practices but I knew immediately the AAA Level 2 came to an end that the course had given me what I came for. When it comes to avalanches there are no 'definites', so it wasn't answers I was looking for in Tignes, but rather the ability to put my backcountry questions into context. To know why it is necessary to be continually asking questions of your group and the environment you are travelling through, to be able to interpret the results of a snow stability test or the behaviour of your team in order to lead you to the next question, and to accept that conditions in the backcountry are ever-changing and you will never have all the answers.

More than anything else, the AAA Level 2 has taught me how to continue to adventure safely in the backcountry and why it's so vital I keep enquiring at every step along the trail. ■ **T&M**

Recording the findings in official SWAG language

COURSE DETAILS

Course name: Advanced Avalanche Education Level 2

Venue: Tignes, France

Duration: 3.5 days

Cost: £360

More info: www.avalanchegeeks.com