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Incidents caused by avalanches: site inspections to recover evidence in reference to legal proceedings.

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For every fatal incident caused by an avalanche one must establish if there exists any possibility of a significant violation at a criminal level. Since incidents caused by avalanches constitute relatively rare events their explanation requires the application of specific knowledge. In the majority of cases the bodies which are in charge of the investigations are well advised if they utilise the assistance of an independent expert that aims to carry out a thorough site inspection in order to recover all available evidence. Consequently it is particularly crucial that the site inspection is carried out quickly before any evidence is destroyed or removed, namely within 1-2 days following the incident. Ideally this site inspection should be carried out personally by the expert that has been commissioned, and to whom the writing of the expert report is normally later assigned.

1. Introduction.

Avalanches are extraordinary phenomena and, consequently, the fatal incidents that they cause also constitute events which are equally rare. For this reason, approximately 25 people die every year in Switzerland: nearly 90% of the victims of avalanches are people who practise sports in their free time and that, in the majority of cases (90%), are also responsible for having caused the release of the avalanche which subsequently proved to be fatal for them. Incidents in ski resorts, on transportation routes or even in residential areas are extremely rare; this shows that the temporary measures (for example, structures for dispersion or deviation) as well as the permanent structures (anti-avalanche barriers) play an effective role in the prevention of avalanche damage and considerably reduce the risks involved. Therefore in the majority of cases an individual is unexpectedly surprised by an avalanche.

The above-mentioned figures are similar in most parts of Alpine areas: according to statistics drawn up by IKAR, the releases of avalanches in the Alpine district taken as a whole cause the death of more than 100 people every year. Prevention, information, rescue teams and warnings of the risk of avalanches are all factors which considerably contribute to ensure that the number of incidents caused by avalanches does not increase, on the contrary they are even reduced in some cases despite the intensive exploitation (above all tourist-related) of the above-mentioned Alpine areas.

Even though incidents caused by avalanches are rare occurrences, the number of deaths in the event of an avalanche is meticulously reported by the media: in the presence of victims due to avalanches, maybe many in the same weekend, the echo which reverberates throughout the various means of the mass media is decidedly higher than the coverage applied for the same amount of victims due to road traffic accidents. This can generally be explained away as the consequence of a strong

aversion to this subject matter. But when a judicial case derives from the event then their focus of attention is even greater.

2. Avalanche predictability and forecasting.

Avalanches represent one of the most major natural dangers in the Alpine district: they are classified as movements of snowy masses and they are ranked amongst natural dangers which are conditioned by the current weather conditions. So far avalanches constitute the only natural danger (apart from purely meteorological phenomena such as hurricanes and substantial rainfalls) for which there exists an active early-warning system: an avalanche bulletin has been in existence in Switzerland since 1945. Thanks to this bulletin the warning of avalanche danger has now reached an extremely high level of quality.

Early-warning systems for avalanches are currently very reliable and warn the residents, the tourists and those who are travelling along the transportation routes in that area of the potential danger. A moderate level of danger for example indicates that in a well-defined area there exists a slight possibility that skiers may cause an avalanche. However neither the avalanche bulletin nor any other report regarding the meteorological situation is capable of providing an exact answer to the question which is raised regarding the location or the exact moment in which the detachment will occur or the path which the avalanche will take, and not even the foremost experts in the sector are currently (yet?) capable of answering these questions. The point is that avalanches are generally rare phenomena which occur in well-defined localised circumstances: these specific circumstances mainly depend on the weather conditions. Nevertheless the weather factor plays a limited role and consequently can cause extremely different results from one place to another without forgetting that these local "moods" of nature do not take into consideration the best weather forecasts. Furthermore it is not only the weather in that precise moment which plays a decisive role in these events but rather the whole climatic development of the winter which has been memorised in the structure of the snowpack.

Along with this enormously wide variety of factors in play we must not forget that there also exists a constant factor: the land. Avalanches always detach in the same points despite that fact that the preparatory conditions are different. Therefore it is sufficient to remember this feature to comprehend the general requirement and opportunity to erect protective structures against avalanches. In that case it is possible to foresee principally the large avalanches, since it is obviously improbable that an avalanche of this type detaches and slides in inopportune moments outside an already created path. However one can not exclude unexpected movements and it seems that it is just as rare to predict the exact moment of the detachment, as it is to calculate the mass of snow that slides down the avalanche path.

With regard to the avalanches caused by skiers, the situation is slightly more complicated in that they cross very different areas: consequently, even the location from which the avalanche detaches itself is more often fruit of causality, which therefore makes any movement virtually unpredictable.

Despite the current commitment of all the best technicians available it is still not possible to predict with precision when and where an avalanche will release.

3. Site inspections to recover evidence in the event of an incident caused by an avalanche.

In the event of an incident caused by an avalanche the following points need to be clarified: what has been the extent of the avalanche and how should it be classified; did the mass of snow have exceptional characteristics; in the past have other avalanches released in the same area where the incident occurred; does the slope of the mountainside involved in the incident present particularities relating to steepness, exposure etc.; which layer of the snowpack fractured and caused the avalanche; where exactly were the people involved immediately before the avalanche released; did the avalanche spontaneously release or was the fracture caused by one of the people involved; from where did the avalanche release; how stable was the snowpack in the immediate area of the incident and the surrounding areas before the incident occurred; have there since been further slides in the area of the incident; were any pointers registered which may have led one to presuppose a raised level of danger in the period leading up to the incident; does the level of danger in the bulletin regarding the avalanche situation correspond with the effective level of danger in the area of the incident; and finally was the choice of route, the slope and the general behaviour of the people involved in the situation appropriate.

The above-mentioned questions clearly show that, on one hand, only an expert is capable of providing adequate and conclusive answers on this subject and, on the other hand, it is absolutely essential to carry out a thorough site inspection of the location of the incident as soon as possible. Ideally this site inspection should therefore be carried out by an assessor no more than 1-2 days after the incident and consequently requires an excellent working relationship between the police, the investigating authorities and the experts involved. In Switzerland, the police and the investigating authorities notify the Swiss Federal Institute for Snow and Avalanche Research (SLF) in Davos about the occurrence within a few hours of the avalanche-induced incident, and assign them with the commission of carrying out the site inspection to recover evidence. When the commission is initially assigned it is not always clear if the expert is required to write a report: this necessity only becomes apparent after an initial examination of the facts or based on the results of the site inspection of the incident. The speed with which the intervention is organised and managed however guarantees that the appropriate foundations are laid for writing any report which may be required. In order for the site inspection to be productive and useful it is nevertheless necessary for the expert to already have an idea of what happened before carrying out his inspection in situ so that he may be able to collect evidence and indications in a targeted manner.

4. Legal Evaluation

In order to be able to provide an adequate response to the majority of the previously posed questions, the expert must first of all be an expert on avalanches and, at the same time he must also prove to be experienced and familiar with the procedure. Since it does not occur very often that one person possess all these characteristics it may be a good idea to divide the questions into two groups, namely the technical queries relating to the avalanche to one expert and those relating to organisation and managing the site inspection to the other so that these two different experts are able to find answers to these questions. Close collaboration between these two experts is crucial otherwise there exists a risk that convincing and conclusive results may not be reached.

The Swiss Federal Institute for Snow and Avalanche Research (SLF) in Davos has an exhaustive know-how with regard to processing legal evaluations and works with

many experts who specialise in different areas. Consequently, it can guarantee that the expert evaluations drawn up on behalf of the SLF by one of the experts assigned by the investigating authorities do not represent individual opinions and that they are extensively backed up the internal quality control procedures which are applied. As the SLF draws up evaluations on a regular basis it follows that they can guarantee that single cases are not treated exclusively on an individual level but indeed on the basis of a considerable wealth of experience; they are subjected to cross-referencing which facilitates and specifically supports the production of a judgement by the expert.

The incidents caused by avalanches which require a written report by an expert are normally complex cases therefore the diverse issues which influenced the risk factor must be compared, as they are during the assessment of the danger of avalanches. Occasionally one may reach different valuations before the incident, but as everyone knows we have more knowledge after the incident itself. In the same way one can not exclude the possibility of an erroneous decision by the commissioned expert even though he has carefully verified all the facts. It therefore follows the necessity for a differentiated examination in the form of an independent evaluation. To this end it may be useful to consider the positive and negative pointers in referring to the recognisability of danger, whilst obviously still practising caution so that the evaluation remains convincing and conclusive.

Furthermore it is also very important to maintain a definite personal distinction between the work of the expert and an avalanche danger warning because conflicts may be otherwise created. As has already been indicated verification of the report on the situation bears considerable importance.

5. Conclusion

In the event of fatal incidents caused by avalanches for which one must presume criminal consequences it is essential that there exists close collaboration between the investigating authorities and the expert who has been commissioned: especially in the initial phase immediately after the rescue operations have terminated. An expert needs to be commissioned in order for a meticulous site inspection of the place of the incident to be carried out so that all available evidence may be recovered, even if the chain of events has not been completely ascertained. This will ensure that one may guarantee the existence of the best possible foundations so that a legal evaluation may be carried out in the interest of all those involved in the incident.

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