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*Sub-theme 53: Resilient Organizing: Managing in Extreme Contexts and Situations of  
Crisis*

**Enacting resilience in extreme action teams:  
The case of French mountain rescue organizing**

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Since the mid-2000s, the 9/11 attack in 2001 and hurricane Katrina in 2005 put the concept of resilience on the forefront (Bergström et al., 2015). It has been introduced in organizational theory by Meyer (1982). He studied how nineteen hospitals adapted to a sudden strike of physicians that lasted one month. Then, this concept has been subsequently mobilized in High Reliability Organizations (Weick et al., 1999), and large-scale accidents literatures: natural disasters, economic crises or terrorist attacks (Bhamra et al., 2011; Linnenluecke, 2015; Van der Vegt et al., 2015). Sutcliffe and Vogus (2003, p. 96) define resilience as “*characteristic or capacity of an individuals or organization, or more specifically the (1) ability to absorb strain and preserve (or improve) functioning despite the presence of adversity (both internal adversity – such as rapid change, lousy leadership, performance and production pressures – and external adversity – such as increasing competition and demands from stakeholders), or (2) an ability to recover or bounce back from untoward events*”. These events can be exogenous to the entity or internal to the organization: errors, escalating causes that create discrepancies that may result in catastrophic accidents (Amalberti, 2016).

So far, resilience has mainly been studied at the individual and organizational levels (Powley, 2009; Sutcliffe & Vogus, 2003), while team resilience is little studied; which seems surprising now because teamwork is the norm in many organizations (Hu & Liden, 2015; Marks et al., 2001; Van der Beek & Schraagen, 2015). We define team as “*two or more individuals, who have specific roles, perform interdependent tasks, that are adaptable, and share a common goal*” (Baker et al., 2006, p. 1578). Some are considered atypical (Jacobsson & Hällgren, 2016) as they work in so-called “extreme” contexts. They appear to be relevant for the study of resilience since this capacity is crucial for both their functioning and integrity. They operate in social or natural environments where exposure to danger and time pressure are high, and consequences of errors are potentially lethal (Amalberti, 2016; Hannah et al.,

2009). These action teams are made up of professionals whose expertise is heterogeneous (Carlile, 2004; Nicolini et al., 2012). They are required to achieve common objectives of strategic and/or vital importance (Melkonian & Picq, 2010). They can be encountered in hospitals (De Bovis-Vlahovic et al., 2014; Faraj & Xiao, 2006; Klein et al., 2006), in rescue organizations: firefighters, police, special forces and commandos (Bechky & Okhuysen, 2011; Schakel et al., 2016; Weick, 1993). Despite this literature does not address team resilience explicitly; it appears in the background of practices that ensure - or not - the achievement of objectives or mission.

Resilience is crucial for this kind of team, especially when members are themselves threatened. Indeed, if all have to deal with vital issues (deaths of patients or victims), the life of their members is not necessarily at stake. The expertise of emergency physicians is essential for the patient; however, the former are unlikely to die. Nevertheless, for fast-response (emergency, fire, police) action teams, resilience means that the success of the mission depends on the ability of the team and its members to preserve their integrity. Therefore, teams are submitted to a double imperative. On the one hand, it must achieve the common objective assigned while facing time pressure, which is assessed in terms of efficiency. On the other hand, it must be resilient to deal with any unexpected event that, should it occur, could directly or indirectly threaten the team itself and therefore jeopardize the mission.

The exploration of this double constraint leads us to formulate our research question as follows: **how do extreme action teams handle simultaneously the commitment to complete mission and the enactment of resilience under time pressure?**

To answer this question, we are currently conducting an exploratory qualitative study with ethnographic approach (Bechky & Okhuysen, 2011; Rouleau et al., 2014; Van Maanen, 1988, 2011). We chose a “practice-based” perspective (Gherardi, 2012; Jarzabkowski et al.,

2012; Nicolini, 2012) that helps understanding how and under which conditions team resilience is activated. The research of the first author started in July 2016 in French organization of mountain rescue, precisely that of the “Peloton de Gendarmerie de Haute Montagne” (PGHM) in Chamonix. This unit has the largest force in France (45 rescuers) and the busiest (about 1,000 rescue missions a year). It is very often in the spotlight of the media because it is the national reference for rescue practices.

The research examines how team resilience is activated during interventions and what are the basis it is built on. The rescue which we studied constitutes an archetypal one. It is a representative case of rescue missions of the same kind. At this stage of the research, our results show two spatio-temporal dimensions of resilience: a resilience that unfolds during the critical phases of the intervention, that we label “on the spot” resilience. It is articulated around practices we observed during our immersion with the action team. They are the most obvious and even spectacular, they rest on more latent capacities (Powley, 2009), that are built partly outside the interventions. They constitute what we call a structural or “chronic” resilience of the team and, beyond that, of the unity itself. This resilience underlies and empowers resilience “on the spot”. In contrast to the literature on extreme action teams, our research shows that resilience practices do not all coincide with the principles of systematic learning processes (Bechky & Okhuysen, 2011; Melkonian & Picq, 2010). This paradoxical result will steer us to question the identity of rescuer profession as well as the coordination of expertise within the teams.

This paper is divided into four parts. First, we analyze both the literature mobilized on extreme action teams’ resilience and that on coordination practices as modalities to apprehend resilience processes. Second, we detail the methodology and the case study. Third, we present our first results. Finally, we discuss them and highlight the theoretical and managerial implications, before concluding the article.

## 1. Literature review

### 1.1. From organizational to team resilience

Resilience has been the main focus of organizational literature (Linnenluecke, 2015; Sutcliffe & Vogus, 2003; Wildavsky, 1988): it is defined as an ability to face dangers that have become manifest, learn from them and bounce back. According to Powley (2009), resilience is as a latent “slack”, built over time and based on social and emotional ties (Gittel, 2006). A temporal dynamic of resilience can be perceived. All authors do not necessarily agree on a common conceptualization: it can be conceived as a capacity prior to an event (Weick & Sutcliffe, 2007) but also as the set of conditions and actions related to the preceding and following phases of an adverse event. There would be “*precursor resilience about monitoring and keeping operations within a bandwidth of conditions, [...] a restoration resilience which consists of rapid actions to resume operations after temporary disruption [...] and a recovery resilience which is about putting damaged systems back together to establish a “new normal” at least as reliable and robust as before, if not improved*» (Pettersen & Schulman, 2016, p. 2).

Weick and Sutcliffe’s conception of resilience is different in work about mindfulness, which has been amended from first edition in 2001 to second one in 2007. In the latter, resilience refers to the three principles of anticipation (of unexpected events) “preoccupation with failure, reluctance to simplify, and sensitivity to operations”, while the two others “commitment to resilience<sup>1</sup> and deference to expertise” are gathered as containment principles. If one must “expect the unexpected” (Weick & Sutcliffe, 2007, p. 44), resilience would be a “mindful process” – and a precondition – of organizational reliability in HROs: “*it is this precursor resilience that is the form to be found in high reliability organizations*”

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<sup>1</sup> Here resilience is to be understood as defined by Wildavsky (1988, p. 66): a “*capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back*”.

(Pettersen & Schulman, 2016, p. 4). Thus, resilience is invisible until an event reveals it (Meyer, 1982). Despite the differences in conceptions, a consensus emerges from the previous work: it is necessary to consider the elaboration of resilience in its “temporal thickness” (Hollnagel et al., 2009, p. 227).

As for the teams, Alliger et al. (2015) do not directly refer to “times” of resilience, but refer to “behavioral strategies” that resilient team demonstrate according to the moments (before a challenge, during a challenge and after a stressful event): “*We have observed that resilient teams demonstrate three behavioral strategies for dealing with pressures, stressors, and difficult circumstances: they (a) minimize, (b) manage, and (c) mend*” (Alliger et al., 2015, p. 178). Before, teams seek to minimize or even avoid impact of adverse events through anticipating and planning, preparing for the challenge, identifying early warning signs, preparing standard operating procedures to be preserved or plans for continuity to manage the problem. If the situation cannot be avoided, teams need to quickly and accurately assess the challenge they face, maintain team cohesion by addressing what might put them at risk, maintain appropriate processes and seek support from individuals who have the relevant experience and expertise within or outside of the team. After the situation, they conduct a post-event assessment of each team member, organize collective debriefings, address the friction points that emerged during the challenge, and finally, members express mutual appreciation. In other studies, horizontal (between team members) and vertical communication (between team members and the manager) also appear to be a fundamental practice of team resilience (Amaral et al. 2014; Vidal & Roberts, 2014), whether it is direct or that it uses artefacts (workbooks, data forms or debriefings, patient records, checklist) (De Bovis-Vlahovic et al., 2014; Edson, 2012; Van der Beek & Schraagen, 2015). These works also highlight that structural mechanisms such as routines, procedures, continuity plans, and training, reinforce team resilience.

Finally, resilience might be linked to sudden and time-limited challenges, sometimes it might be related to more long-lasting situations: “*chronic challenges are difficult circumstances of an ongoing or long-lasting nature. [In contrast,] acute challenges have a sudden or rapid onset; they are short-lived but typically more intense*” (Alliger et al., 2015, pp. 177-178). In the first case, team performance and cohesion are threatened; in the second, non-resilient teams turn to more individualistic behaviors, which disrupts coordination processes. How and by which modalities resilience is developed in contexts different from HROs remains to be explored (Hollnagel, 2011).

## **1.2. Extreme action teams and coordination practices for resilience**

Bell et al. (2016, p. 2) offer a definition of extreme action teams that encompasses various elements: “*teams that complete their tasks in performance environments with one or more contextual features that are atypical in level (e.g., extreme time pressure) or kind (e.g., confinement, danger) and for which ineffective performance has serious consequences (e.g., compromised health or well-being of the teams or the team’s clients)*”. The “atypical” nature of these teams refers to high tempo and environments in which they are immersed as well as life-threatening consequences of errors. According to Klein et al. (2006, p. 592), extreme action teams bring together members who cooperate “*to perform urgent, highly consequential tasks while simultaneously coping with frequent changes in team composition and training and developing novice team members whose services may be required at any time*”.

The missions, the nature of the teams and the contexts they operate in are different: crisis management teams (Pearson & Clair, 1998; Williams et al., 2017), action teams and fast-response teams (Devine, 2002; Faraj & Xiao, 2006; Jacobsson & Hällgren, 2016; Klein et al., 2006; Lundberg & Rankin, 2014; Majchrzak et al., 2007; Sundstrom et al., 1990). Beyond semantic variety, several dimensions characterize these teams: a) the lethal consequences of an inappropriate action, b) the composition (heterogeneous size and expertise, [Carlile,



2004]), c ) the socio-cognitive processes of “agreement” to coordinate and d) the intensity of training and exercises within and between specialties (Bechky & Okhuysen, 2011; Godé & Lebraty, 2015; Melkonian & Picq, 2010).

Main part of this literature is developed on a “practice-based” perspective (Nicolini, 2012), that studies (coordination) practices as specific activities that professionals perform in their work (Bruns, 2013). To become “practices”, these activities must be recognized by the professionals themselves and by those who are outside (Gherardi, 2012). While the notion of practice varies widely among authors (Rouleau, 2013), many agree on that they emerge from arrangements between humans and non-humans (materials, artefacts, technologies). They are socio-material and/or discursive (Gherardi, 2012) and must be studied in context and in the course of action (Hernes, 2007), which is the case for all the research presented above.

Authors using this perspective show how crucial it is to open the black box of coordination (Bouty et al., 2012) to understand how teams produce appropriate (or not) decisions in extreme contexts (Faraj & Xiao 2006; Majchrzak et al., 2007; Schakel et al., 2016). According to Faraj and Xiao (2006), coordination allows trauma center teams to produce “effective work outcomes” by managing uncertainties produced by sudden change in workload within the framework of what they call “habitual trajectories”, and those linked to “problematic trajectories”. The authors define a “habitual trajectory” as “*sequence of actions and interactions that moves the patient steadily toward successful treatment as per expectation*” (p. 1164). They refer to “problematic trajectory” as “*deviation onto a path hazardous to the patient, is often driven by a novel event, an unexpected realization, or disconcerting information that challenges participants’ mental models*” (p. 1164). Schakel et al. (2016) point out that a shift from “habitual” to “problematic” trajectory may require adjustments in the face of rapid change, which may extend to a change in practice. In the context of a “habitual” trajectory, coordination relies on protocols (procedures and supports,

formalized and materialized, sequences of treatment of a patient) (Faraj & Xiao, 2006) and operational procedures (Shakel et al., 2016). Coordination is also enabled by the organizational structure and the institutionalized communities of practice team members belong to (Klein et al., 2006). When the trajectory becomes “problematic”, it is necessary to turn to “dialogic” coordination practices allowing improvisation (Miner et al., 2001), that might break predefined operating modes if necessary. Similarly, relational interactions embedded in this “dialogic” coordination allow teams to produce shared meanings (about the patient’s condition). Thus, communication plays a key role in real time adjusting processes according to the evolution of a situation considered critical. In contrast, Schakel et al. (2016) show how a break in communication can be detrimental to the success of the mission. Indeed, in the face of an unexpected event, a gunshot killing a criminal under close surveillance by the police, the ambiguity of the messages communicated by radio, the technical limitations of the devices and the lack of familiarity between members of the surveillance team created a break in common understanding the situation and its evolution. Team members were unable to readjust their action by changing practice. Ultimately, this resulted in the impossibility of arresting the shooter and the failure of the initial operation to apprehend the criminal who was killed in the eyes of the police. Our present work falls within the framework of the “habitual trajectories”, where coordination practices tend to avoid deviation towards a “problematic trajectory”.

The research of Bechky and Okhuysen (2011) shows that a common understanding of mutual actions is an essential condition to carry out a mission in a resilient way. Material resources can be effectively mobilized only when team members have a convergent understanding of the current situation, of each team member prerogatives, of assigned tasks and of the entire process to be managed. Those requirements are built during daily work, multidisciplinary trainings, as well as during preparation phases of interventions and in post-

mission debriefing sessions (Melkonian & Picq, 2010; Schakel et al., 2016). Additionally, in aerobic teams (Godé & Lebraty, 2015), real-time “*à chaud*” feedback supplement more conventional systematic debriefings to ensure team resilience.

Although dealing with project teams under temporal pressure, the study carried out by Majchrzak et al. (2012) deserves to be evoked. It disputes the widely-admitted view that it is necessary to share “mental models” and make them understandable by others to act in common. Indeed, most of studies rely on the assumption that working together towards a common goal requires “deep” knowledge about the knowledge of others. The acquisition of such knowledge is long and difficult because it requires “traversing” disparate and distant local expertise (Carlile, 2004). The authors uncover additional practices that “transcend” more than they “traverse” the various expertise. These are less time-consuming and they facilitate joint decision-making. Based on discursive practices, the voicing fragments, cocreating the scaffold, dialoguing around the scaffold, moving the scaffold aside, and sustaining engagement (Majchrzak et al., 2012) direct team members’ attention to the collective search for solutions to eventual problems identified in the project, rather than towards their mutual differences. This focus avoids conflicts between members and maintains team cohesion and commitment. Thus, these practices make it possible to “transcend” knowledge in the sense that they minimize differences and distinctions between specialities by avoiding confronting them. This aspect, little seen elsewhere, deserves to be apprehended in our own research because the intervention teams are made up of experts of very different fields (air forces, rescuers and doctors).

In conclusion, while team resilience is not addressed explicitly in these research, it is addressed indirectly through the examination of coordination practices between heterogeneous expertises evolving in extreme contexts. The twofold dimension of effectiveness (carrying out the mission) and resilience (preserving the safety of team

members) is particularly crucial for action teams immersed in environments that threaten their integrity and, by cascade, the organization in which they carry out their missions.

## **2. Methodology**

### **2.1. Research setting: the case of the “PGHM” in Chamonix and its context**

We opted for a unique case study within the “Peloton de Gendarmerie de Haute Montagne” (PGHM) in Chamonix. According to prescriptions of Yin (2008), this unique case is justified because it is “representative” (or typical) of other organizations belonging to the same sector (mountain rescue units). Then, the rescue example we studied is characteristic of the majority of interventions carried out on a daily basis.

The PGHM of Chamonix was founded in 1958, following the drama of Jean Vincendon and François Henry, two young Belgian climbers who died during in Christmas 1956, victims of bad weather and disorganization of the various actors that handled mountain rescue at that time. The following two years built what officially became a specialized rescue unit. It was made official by the “Mountain Law” and the circular of August 21, 1958 (Agresti, 2012). Hence, the Chamonix unit is historically the first of the 20 units settled in France. It has the largest number of rescuers (45) and the largest volume of activity (about 1000 rescues a year), which can be explained both by the history and characteristics of the Mont-Blanc, where mountains are geographically concentrated over a small area.

In France as elsewhere, the number of mountain rescue missions is proportional to the number of visits to the sites, summer and winter months concentrate most of the interventions. Chamonix experiences tourist seasonal peaks that multiply its population by ten during the high season, growing from nearly 9,000 inhabitants to nearly 80,000. As a consequence, rescue missions increase significantly. During the summer, interventions can rise up to fifteen per day. When severe accidents occur, such as an avalanche in summer 2012 on one of the routes leading to the summit of the Mont-Blanc, the PGHM draws the attention

of the media, which are particularly fond of information to broadcast.

Mountain rescue is legally bound to an obligation of means and not of result. Thus, the reception of an alert does not necessarily lead to an on-site intervention. In France, unlike the Alpine neighbouring countries (Italy and Switzerland), mountain rescue is free. When an on-site intervention is triggered, victims are not charged, flight costs are estimated at EUR 3,800 per hour, including personnel and fuel. Despite the feminization of the workforce, the units remain almost exclusively male. One woman is a rescuer within the PGHM of Chamonix. At the national level, only two female carry out rescue missions. A third one, who is officer, is currently commanding the PGHM of Alpes-Maritimes since September 1, 2017.

The activity of the Chamonix unit is divided between two places of different and complementary functions. The first is the PGHM, located in the city center: it is the headquarter of the organization and adjoins the premises of the “*Centre National d’Instruction au Ski et à l’Alpinisme de la Gendarmerie*” (CNISAG - – national instruction centre for ski and mountaineering dedicated to the “*gendarmerie*”), which centralizes all formations of French rescuers in the Gendarmerie. All phone calls, including alerts, are received at the PGHM call center. Some additional rooms allow rescuers to isolate themselves to carry out investigations and hearings related to the rescue mission. The PGHM is also the staff’s “living place”. Indeed, rescuers’ personal mountain equipment is stored there. They gather there every morning (“morning coffee”) and every after work (“afterwork beer”) in the break room. The PGHM is located four kilometers, and less than fifteen minutes by car, from the DZ des Bois. DZ is the diminutive of the Dropping Zone that is the heliport from which the rescue teams leave for intervention. On the ground floor, it hosts a medical practice. Opposite to this room, the emergency equipment is stored. The first floor houses the operational room of rescuers who are “*premiers à marcher*”<sup>2</sup> (on-duty rescuers) and a saloon

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<sup>2</sup> “*Premiers à marcher*” is a military designation for on duty rescuers who are the first to be mobilized if an on-

where team members, pilots and flight engineers can settle down while waiting to be mobilized on an intervention. This room also serves as a dining room for lunch. The hangar of the DZ allows to shelter two helicopters. At the other end of the building are the premises of the Gendarmerie Air Section.

The rescue process involves three groups of actors from different organizations whose expertise are complementary. (1) Rescuers are the cornerstone of the process. Alert reception, decision to trigger an on-site rescue (or not), and smooth handling of the process are PGHM headquarter's responsibility. They ensure a permanent watch, twenty-four hours a day, every days of the year. Rescuers often hold the diploma of a high mountain guide or the aspirant guide issued at the national level. They are also qualified as Judicial Police Officers ("*Officiers de Police Judiciaire*" - OPJ): they investigate the circumstances of accidents and/or the search for liability when a professional is involved in the accident. They shall also draw up the minutes of each of their speeches. (2) The doctors of the "Hôpitaux du Mont-Blanc" (local public hospital) are specialist emergency physicians specially qualified for mountain interventions. The eight of them in total are on duty for twenty-four hours each week. A room on the first floor of the DZ allows them to sleep there. (3) In addition to the flight crew (pilot and flight engineer), the two EC 145 helicopters allow to convey two rescuers and an emergency physician on site. Like other actors, they can be mobilized on a permanent basis. Depending on the nature of the intervention, the doctor may not board and stay at the DZ. This is particularly the case for benign situations such as altitude sickness that is cured when going downhill. We call these teams are "recurring" temporary teams because their composition varies every day according to a schedule that establishes role turns, which leads staff to work together on a regular basis.

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*site intervention is triggered.*

## 2.2. Data collection

In order to understand how efficiency and resilience are combined within extreme action teams, we opted for a “thick” description that details in-depth (Geertz, 1973) what the actors are experiencing. As the first researcher was most often immersed in context with them, an ethnographic approach seemed particularly appropriate (Sanday, 1979; Rouleau et al., 2014; Van Maanen, 1988). The second author carried out an exploratory search with the same unit between July 2011 and April 2012<sup>3</sup>, thus supplementing with secondary data the observations in progress. Finally, since the third author has a more external posture, this combination increases the internal validity of the research by balancing the positions of “insiders” and “outsiders” (Bartunek & Louis, 1996). The first author began collecting the primary data in July 2016 and is ongoing her investigations. In accordance with the rules of ethnography, we favoured direct observation as the main source of data, the first researcher having the status of “observer who participates” (Junker, 1960).

52 alerts were directly observed during the summer of 2016, 48 of which triggered on-site interventions. The first author spent 14 days in the unit (between 8 and 12 hours of observation a day), i.e. 6 days at the call center and 8 days at the DZ. In 2017, 13 days of observation during flights in training sessions of helicopter pilots were carried out in the air force of Gendarmerie in Briançon (Hautes Alpes). Fieldnotes were recorded in a logbook (Sanday, 1979; Van Maanen, 1988). An observation report was also drafted, presented and validated by two mountain rescue actors.

In addition, 14 semi-directive interviews from 45 minutes to 2 hours were conducted among the members of rescue teams. Each interview, after having been recorded and transcribed in full, was synthesized in a sheet. In addition, informal conversations that constitute valuable “naturally occurring data” (Silverman, 2013; Van Maanen, 1979; Van

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<sup>3</sup> Projet BlancANR LEDEPAGOD (2011-2015).

Maanen & de Rond, 2017) have also been collected.

Finally, the data collected since 2016 have been supplemented by secondary data from the second author. They consist of observation notes recorded during two professional training followed by rescuers at CNISAG. Meeting reports and working documents shared with the team of trainers are confidential, but they have provided an opportunity to learn about the operating rules of the rescue teams. Video documentaries, official texts and materials for mountain professionals were also collected, mainly from the library of the “*Ecole Nationale de Ski et d’Alpinisme*” (ENSA - National School of Skiing and Mountaineering) in Chamonix. It is a school that trains high mountain guides. Table 1 below summarizes the data collected.

**Table 1. Synthesis of collected data**

Phase of collection	Observations	Recorded interviews	Other recordings	Documents (number)	Videos (number)
<b>Before observation period</b>	Observations of author n°2 of two training sessions in CNISAG + operating mode of the PGHM (july 2011-april 2012) 95 pages of observation fieldnotes + audio recordings			Circular from the Ministry concerning mountain rescue organization at national level (1) Documents concerning trainings in CNISAG Book/Chronicle about mountain rescue (1)	Activity report about winter season 2014-2015 of the PGHM in Chamonix (1) Documentaries about mountain rescue (6)
<b>Observation in the PGHM call center in Chamonix</b>	From alert reception to actual rescue trigger (6 days) >60 hours	5 interviews with rescuers: 2 “ <i>plantons</i> ”/rescuer 3 “chefs de cellule”/“caravan leader” head of rescue team		Hand copy of 7 RETEX (written experience feedbacks)	



<b>Observation in the Dropping Zone in Chamonix</b>	From rescue triggering to final feedback (8 days) > 90 hours	2 interviews in Air Forces of Gendarmerie : 1 pilot et 1 flight engineer 7 interviews with rescuers : 2 Officers who lead the PGHM 4 “chefs de cellule”/”caravan leader” head of rescue team 1 dog handler	2 recordings concerning the preparation and use of rescue equipment		
<b>Observation during flights in training sessions in Briançon</b>	13 days observation -14 flights of an average 45 minutes > 10 hours of flight				
<b>After observation period</b>		1 physician		Ongoing data collection	Ongoing data collection

In accordance with the recommendations of a qualitative ethnographic approach (Sanday, 1979; Van Maanen & de Rond, 2017), the analysis of the data was based on documents, observations, informal conversations, and interviews from the field. It is currently under construction; the items below specify our choices.

The analysis and coding of the extensive data is currently under construction given the relatively short time between the collection period and the sending of this communication. We choose to present the coordination practices we have identified around two categories: (1) “on the spot” resilience and (2) chronic resilience. The category of “on the spot” resilience encompasses the practices directly observable in the realization of the rescue process which enables keeping the mission in its “habitual” trajectory. It is supported by our observations, informal conversations and interviews. The category of chronic resilience brings together the less observable practices that develop partly outside the time of the intervention: they make possible the observable resilience and build knowledge and expert competences on which the latter is actualized.

### 3. First results

The results presented below are first-order results. “*Mrs. Anderson rescue: injured head in one route*” (cf. Box below) tells the story of the process that leads to: a) trigger an on-site

intervention; (b) take care of the victim. This process corresponds to the “habitual” trajectory of uncomplicated rescue (e.g., deaths) and without significant media consequences.

### **Mrs Anderson rescue: injured head in one route**

An alert is received at the PGHM call center [called Cordial]. The “*planton*” picks up the phone. A mountaineer, Mrs. Anderson, has just fallen in a well-known route in the Mont-Blanc. Her climbing companion mentions on the phone that she is “dizzy” and that at her head is bleeding. A conference-call is immediately arranged with the “*chef de cellule*”, the “*planton*”’s direct supervisor, and the emergency physician located at the Dropping Zone. The doctor advocates intervention. The weather is good. The rescue is triggered.

The rescuers of the PGHM warn those who are on-duty and located at the DZ. The “caravan leader”, who will lead the operation, calls *Choucas* [code name of the helicopter and its crew] on the radio to “signal” an on-site intervention has just been triggered. “OK!” answers the pilot. The material and rescue equipment have been picked up, the two rescuers, the physician, the pilot and the flight engineer meet on the tarmac and board. The rescue might be “technical”: it might require sling operations, and manoeuvres can be harmful for both the victim and the interveners themselves.

The “caravan leader” indicates to the pilot the location of the accident as established by the call. It is a place that team members know well because they regularly mountaineer and intervene there. During the approach flight, the whole team discusses: maybe it is possible to find a place to land next to the victim rather than slinging? The helicopter makes a first sighting flight. The pilot and the flight engineer define a landing area next to the victim. The two rescuers and the doctor disembark. The helicopter leaves to fly away from the rescue operation.

There is nothing serious. The wounds are superficial. The physician requires the rescuers to put a wreck and to install the victim on a stretcher. During the whole operation, the rescuers stay in contact with the helicopter thanks to the radio. Once the victim is “packed”, the “caravan leader” informs the flight engineer that the helicopter can return to pick up everyone. The pilot decides to recover the physician and Mrs. Anderson at first: they will be transported to the hospital in Sallanches, located eight minutes away from the accident site. On his way back, he recovers the two rescuers who remained there.

During the flight back to the DZ, all team members evaluate the operation: the situation was less serious than they had imagined, the medicalization went well and the case was treated quickly. They are fully satisfied. An hour passed between the initial call and the return to the DZ.

Resilience is assessed in terms of two spatio-temporal dimensions: an obvious one, which is actualized during the intervention phase itself, that we label the resilience “on the spot” (3.1) and that constituted of practices developing in the long term, by the accumulation of previous experiences and rules of the institution that we call “chronic” resilience (3.2.).

#### **3.1. Practices of resilience “on the spot”: a short temporality, a visible process**

Analytically, the time of the rescue dedicated to Mrs. Anderson can be organized in two sequences which are articulated around a “breakpoint” defined by the moment when the decision to intervene is taken.

The first sequence uncovers deliberative practices among the actors whose prerogatives

are to answer the following two questions: “*is the rescue operation justified?*” and “*is it technically feasible?*”. The second is initiated by the actual triggering of the on-site intervention. It ends when the helicopter and all members of the rescue team return to the DZ.

#### **a. Justification and feasibility**

The “*planton*” rescuer located in the PGHM call center receives the call from Mrs. Anderson’s companion. By questioning the mountaineers, he quickly assesses the victim’s health condition as well as their location in the massif using the topographical map displayed against the wall. This oral evaluation will then be transcribed manually on an “intervention sheet”.

“Concerning the level of pain, do you feel pain? On a scale of 1 to 10? [...] We are going to confer with the doctor, wait patiently [...] Where are you? [...] Normal route of XXX, 100 meters above the collar? [...] What colours are you dressed?” (“*planton*”)<sup>4</sup>.

The “*planton*” puts the phone on the loudspeaker and contacts the emergency physician based at the DZ. He advocates intervention: he finds it “justified”. Mrs. Anderson is “dizzy”. It can be a cranial trauma; he would have to embark too. The doctor only has an advisory role, but the rescuers follow him. Accountability falls under the prerogatives of rescuers and, especially of the “*chef de cellule*”. The morning weather report says “great sun and no wind”. The rescuers consider the intervention “feasible” given the absence of particular “constraints”.

“When you see a weather like that, it is obvious” (helicopter pilot 1).

In many cases, it is not:

Conversely:

“If an intervention is not triggered, it is not done because of the weather. So, if it is not done, it is because of the weather, the helicopter does not take off [...]. Flying in the clouds is forbidden! [...] You see here, if you fly in the clouds, you will hit the mountain. So, we forbid ourselves to go there. Really!” (Rescuer 3).

To determine the feasibility of the intervention, rescuers and physicians, supported by a perfect weather, weight the victim's condition with the "constraints" that could make the

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<sup>4</sup> All *verbatim*s are translated from interviews in french.

intervention dangerous. For Mrs. Anderson's rescue, there is no obstruction: no cloud, no rain, no wind or snowfall and the call arrives in the daytime. In other situations, the flight capabilities of the EC145 [*Choucas*] helicopter may be limited or non-existent. In the case of a terrestrial rescue (scarcer), when the snowpack presents great risks to the rescuers themselves, rescue may not be undertaken. The "*chef de cellule*" and the "*planton*" therefore systematically evaluate the level of "risk-taking" in case an on-site intervention is triggered. If the risk is considered significant, and if they doubt about the helicopter's flight capabilities, the rescuers ask help from the crew (pilot and flight engineer) to assess the weight of the various constraints. If necessary, the latter are entitled to veto their participation.

These two deliberative processes (justification and feasibility) thus construct a decision conventionally summarized by "go/no go": in the case of Mrs. Anderson, the initiation of the rescue. Justification and feasibility therefore make it possible to deliberate on the appropriateness of the commitment of human and material resources for an intervention on site. The PGHM, the telephone calls, the topographical map, the intended crew, the doctor and the two rescuers made a decision to intervene in about five minutes.

#### **b. The actual intervention**

Once the rescue intervention is officially triggered, there are various stages, from the embarkation to the repatriation of Mrs. Anderson and the return of the team to the DZ.

##### **→ Embarking**

Once decision to intervene is taken, the rescuers located at the PGHM in the city center, inform those on duty - the "*premiers à marcher*" - waiting at the DZ, four kilometers away. Notification is made by radio or telephone. The call is received in the Operational Room on the first floor of the DZ. The "*premiers à marcher*" inform the crew of the EC145 at the other end of the DZ: then, they go downstairs with the doctor to take the appropriate emergency equipment. Once on the tarmac, the whole crew briefs about the realization of the

intervention: estimated GPS coordinates, type of terrain (here a cliff).

The two rescuers, the doctor and the pilot board and buckle up. While the pilot starts up the “machine”, the flight engineer stays outside and checks for any technical problem. Once the verification is complete, he climbs aboard and hooks up his lanyard. He makes sure all passengers are seated and that their belt is fastened. He gives the green light to the pilot for the take-off according to the classic codes: “*Security cabin, OK! It’s free at the back, it’s free on the left, you can go!*”. The pilot then becomes sole master on board.

→ **Establishing intervention strategy: from plan to actual situation**

Once the team is on its way, all passengers are equipped with headphones. A first discussion begins to define more precisely the *modus operandi* of the intervention. During the approach, they negotiate together on the concrete modalities to be implemented: there are often discrepancies between the estimate conditions envisioned during the phone call and the "reality on the ground" they will encounter. Topography and precise situation of the victim will determine both the possible manoeuvres (use of the sling or not) and the appropriate equipment to use:

“It depends on how the victim is. [...] Because sometimes, we will not be able to land directly. So, we're going to be winched on it, because the helicopter cannot land when it's on steep slopes. For example, we did it this morning ... Or the Drus, anyway, we will necessarily be air-lifted. We have no choice there” (rescuer 1).

“In these situations, very often the actual situation, or precise one, does not stick perfectly to the alert we were given. So, we have a general idea, it is to extract the victim, at first, but ... we keep in mind that the decision-making scheme can change at any time. And especially when you arrive in the area, take time to look carefully at what is happening, to know if you stick to the plan or if you change. Especially take time to look at who is where, how it is attached, everything there is, the environment around, if there is a risk of falling stones” (rescuer 2).

This discussion about an eventual change of plan is a concertation between the three specialities involved, [pilot + flight engineer], rescuers and physician.

“It's still a discussion, there it is. But if the victim is safe, we do not hesitate to reassess the situation, recalibrate things so that everything is clear in the minds of the crew and the rescuers. That's important.” (rescuer 5).

→ **Position the machine and disembark: delicate manoeuvres, critical communications**

Once the intervention strategy is clarified, silence is made: only the pilot and the flight engineer communicate with each other to define the positioning of the helicopter and allow landing manoeuvres. The “MRAD” (*“Méthode de Raisonnement d’Approche et de Décollage”* - Approach and Take-Off Method), a standard operating procedure to fly in mountain settings, requires several overflights to determine where the helicopter will land or hover. Once the point is decided, the manoeuvres for positioning begin. When the machine is close to the landing point, the pilot no longer sees what is happening below the helicopter because of its shape. Then, he then totally relies on the flight engineer who becomes “the eyes of the pilot”, according to the consecrated expression.

The exchanges between the flight engineer, the rescuers and the doctor are non-verbal using codes learned in training and repeated during exercise sessions and missions. An example of non-verbal language during landing is given in Figure 1 below.

**Figure 1. Example non-verbal code when disembarking**



The dialogue between the pilot and the flight engineer is continuous and it does not interrupt until the disembarking of the rescuers and the physician:

**Positioning**

“Pilot (helicopter 1): Objective lost [...]. I go up a little, I go back on the right and we go.

Engineer (helicopter 1): Do you make an overflight or do we go directly?

Pilot: We're going. I have a good point of reference. The speed is OK.

Engineer: OK, stay in the axis, 30 meters you are good in the axis, 20 meters, always in the axis, forward 10, good in the axis, forward 5 meters, 4 ... 3 ... 2 ... 1, top front!”.

#### **Disembarking**

“Engineer: "May I open the door?

Pilot: Allowed

Engineer: Go, it's open, I'm on skate. It blows a little bit. It's free to land, it's good at the back. We are on the floor on the left hand-side but not on the right hand-side. The first [rescuer] disembarked. The second is at the door. The second arrives. Leave whenever you want.”

#### **→ Taking care of the victim: the “packing”**

While the rescuers and the physician are on the ground, *Choucas* flies away to avoid additional nuisance with annoying sound during the care of the victim. Physician and rescuers have clearly distributed roles. Rescuers carry out “first-aid gestures”; the doctor handles “medical gestures” and “pre-hospital care”. For Mrs. Anderson, the medical gestures are limited: injection of painkiller and bandage. Rescuers settle the neck collar and settle her in the stretcher.

#### **→ Picking up the victim and flying back to the DZ**

During the takeover, the crew remained in radio communication with the rescuers on the ground. The link is either direct or via the *Cordial* call center: the different players distributed geographically follow in real time the evolution of the care.

“Rescuer 2 on site: "Cordial, from Francis

“*Planton*”: Yes, Francis from Cordial!

Francis to Cordial: The “packing” is in progress with the doc[...]. We will be ready in five minutes

Pilot helicopter 1: OK *Choucas*! Roger.

[Eight minutes later]

Pilot to Cordial: *Cordial*, from *Choucas*, we've just taken off from Sallanches to pick up the two rescuers and fly back to the DZ.

“*Planton*”: *Cordial*, Roger. They have just called us, they are ready.”

When doctor and rescuers on site are ready to leave with the victim, the rescuer requests the helicopter to return to pick them up. The re-embarkation manoeuvres start. As per disembarkation, communication between rescuers and flight engineer remains non-verbal, using the same codes. Similarly, the exchanges between the pilot and the flight engineer are continuous, the second describing in real time what is taking place between the ground and

the moment when all the passengers are in the machine.

“Engineer: Is that good for you? May I open the door?”

Pilot: Authorized

Engineer: I'm on the skate. OK, that's all right. It's free in front. We are on the left but not on the right. I signal them to climb ... The first rises. The second is on the skate, he goes up, he's in the cabin, he's in it, and he's going to be buckled up, whenever you want.”

→ **“A *chaud*” debriefing**

Mrs. Anderson is left at the hospital, all the members of the team are installed in the helicopter which returns to the DZ. The stress and “pressure” of the intervention fall down. Team member share their impressions about what has just ended. Everything went well; the rescue was not so “technical” [to be translated as “delicate”] as envisaged at the time of the appeal. The manoeuvres (of ropes and specific equipment) were easy for the rescuers and the doctor. They are all high mountain guides and the doctor is in its fiftieth intervention. The “mountain setting”, they all know it well!

The assistance was made without any particular difficulty. The discussion in the machine is sufficient.

“Debriefing, we do it in the machine, very quickly.” (Rescuer 1).

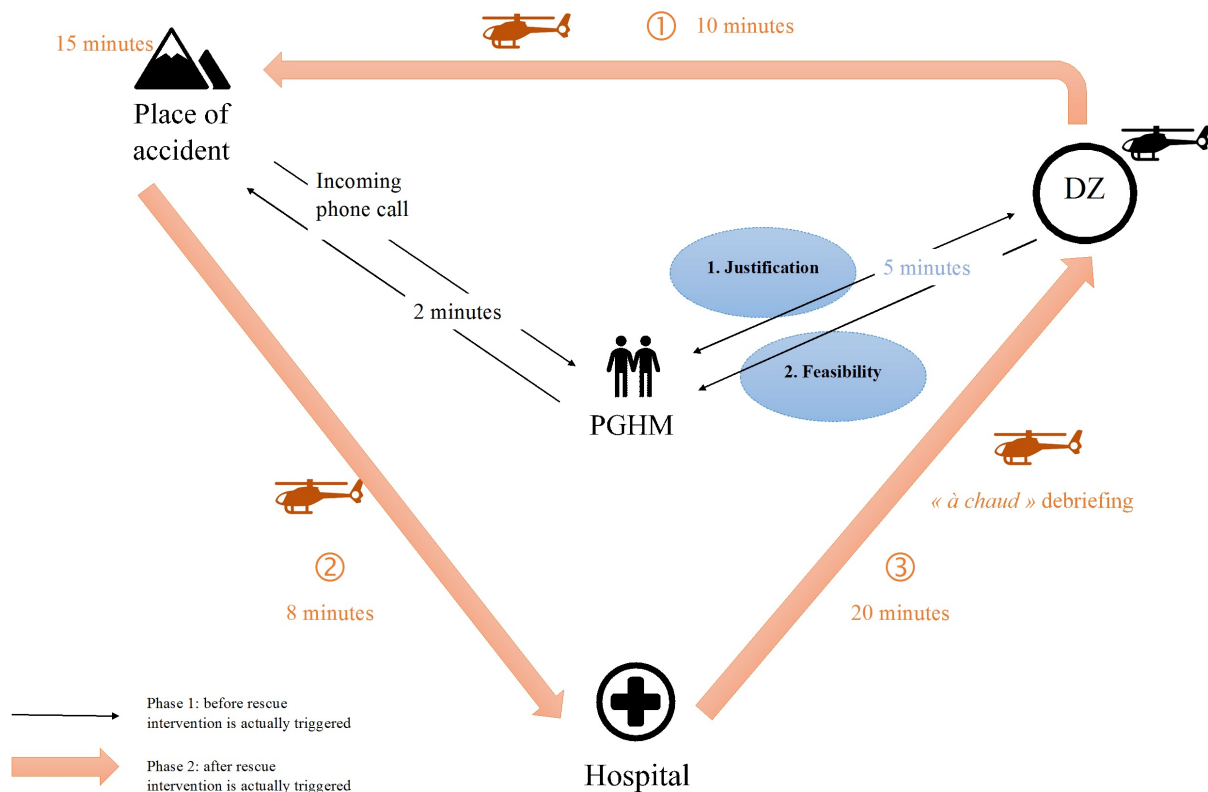
“Debriefings? All the time! We debrief very quickly if there are small things to say. If you do not see us debriefing once on the tarmac, it is because everything went well. It does not require further debriefing.” (Rescuer 2).

Back at the PGHM at the end of the day, and before everyone gets back home, all gather around the “afterwork beer” to discuss the events of the day and speculate about the volume of activity of the day after.

Figure 2 below shows the operation as a whole from a spatial and temporal point of view (time spent on each identified practice).



**Figure 2. Rescue process**



### 3.2. Practices of chronic resilience: a long temporality, less visible practices

Practices observed during operations are the most obvious part of resilience, the one we called resilience “on the spot” because it is updated in the situation and in the course of action. It is based on less visible but equally crucial practices, which form a chronic resilience, in that it is prior to the first, that it supports it and that it is enriched through accumulation of the rescue experiences.

#### a. Rescuer: a threefold profession with three expertise

The rescuers combine three different qualifications in their one profession: high mountain guide (or aspiring guide), rescuer and military man holding the status of judicial police officer.

→ **Training facet: high mountain guide**

Rescuers are mountain experts even if they do not practice this profession. Many will when they leave the Gendarmerie. This expertise is endorsed by the diploma of the State certificate of high mountain guide: “the mountain guide [...] manages the risk in a logic of safety linked to the discipline of mountaineering. [He] anticipates the constraints specific to the activity as well as the dangers [...] of the environments of evolution, notably in terms of meteorology, snow conditions, hydrology and stability of the ground” (decree of January 11, 2010).

“If the gendarmerie, the institution, chooses to train people at the level of high mountain guide, it is because there is a reason. First, there is the technical background. It is the highest personal technical background that we have in France, it is the highest level of diploma in France. So, it already gives an ability to evolve in this vertical environment of the high mountain. It also gives us the knowledge, the training and the absorption of a formation with regard to a population of people who are high mountain guides whom one can be led to rescue” (rescuer 3).

The technicity required for rescue is acquired within their training and their functions within the gendarmerie but it is also acquired in the one that leads to the qualification of guide. Among others, the qualities derived from it are expert competences to appreciate the “grounds” and to exercise complex manoeuvres of ropes and material. Landing/re-embarkation practices particularly demand these competences.

“He’s a very strong technician, I said to myself: he's the one who's going to take over, to prepare everything on the zone, to put the ropes for when, in fact, when we've pretty much packed the guy, everything is in place and we know that we can put him in the stretcher and it will be hooked, there will be no doubt about it what” (rescuer 5).

→ **The rescue facet: the core of the profession**

Rescuers consider themselves primarily as “mountain rescue workers”, confirming the ministerial decree of 6 June 2011, which reaffirms the central position of rescue activities for PGHM and, more broadly, for “specialized units” that intervene in mountain environments. The other aspects of the profession are often seen as complementary.

“The primary objective of any rescue operation shall be a set of actions which, without delay and as a first step, shall seek to remove persons, property and the environment from the harmful effects of a direct or imminent peril and out. If necessary, the implementation of judicial police measures is complementary” (Ministerial decree of 6 June 2011, pp. 3-4).

“We do a rescue operation, we're a rescuer. The fact that we are a guide, we have already integrated it

since ah, for a long time, we are evolving in a mountain environment. All these competences intersect” (rescuer 1).

→ **The judiciary facet: judicial police officer**

This aspect of the profession, which is part of the legal framework governing the profession, is often ignored, except by professionals in the mountains who are responsible for an accident liability investigation. This aspect tends to confine the rescuer in the bureaucratic procedures but some flourish there.

“It is important that any officer (police officer or policeman acting as a judicial police officer) intervening on the ground, draws up a report allowing the public prosecutor, if necessary, to open information, prosecution” (Ministerial Circular of 6 June 2011, p. 4).

“When I am in the role of investigator or investigative director, there I return to my role as a judicial police officer, I make the difference. At one point, I do my job. The minutes are used first to determine the causes of accidents [...] therefore this part of hearings, evidences on the ground. It is not only this rescue side” (rescuer 3).

“Being a gendarme, we will still try to project ourselves on a possible responsibility or not” (rescuer 4).

Rescuers therefore practice a profession that combines several facets and this, in a variable way according to the individuals.

“So, we have all those hats that intermingle and then we try to make all this happen to succeed in “carrying out the mission”” (rescuer 1).

**b. Mountaineering: a passion that “transcends” specialities**

Before being a rescuer, a doctor, a pilot or a flight engineer, team members are above all mountain practitioners. It led them to this specialty of their respective trades. The mountain is their common universe. All, to varying degrees, practicing or practicing mountaineering, climbing or skiing.

“I’m a good skier, my father taught me very early and then I love skiing. [...] I wanted a job, being outdoors, doing sports, I was skiing and everything” (rescuer 1).

“Before, I was a high-level climber. I was a competitor, I was in national French team, and at the end, around the age of 23-24. I was fed up and looked for a reconversion. I’ve always been in the middle of the mountain [...]” (rescuer 2).

“My father was a high mountain guide, a ski instructor, he was the guardian of the Vallot observatory, and of course he was in contact with the mountain rescue and thus the PGHM” (rescuer 3).

The profession of rescuer “imposes” them training times in the mountains. They are free to choose the activity and the people with whom they practice, but they also do so on their rest time.

“People train regularly [...]. People also have the intellectual honesty to stay on top through individual or collective training” (rescuer 1).

“It is the level of personal responsibility that leads us to train where we need it” (rescuer 4).

This intensive practice builds familiarity between rescuers, doctors, pilots and flight engineers, beyond their specialties. They share experiences that bring them together and which are added to the multidisciplinary trainings.

“At first, they [the rescuers and the doctors] discover us and we discover them too. Because a bergschrund at first you do not know what it is. [...] So you have must get used to one another. [...] In fact, we know the work of others. What you do not know at first. You say to yourself, but what is he doing, he will stay there, he will not stay there. You do not know what he wants. In fact, they already know what is expected of them so are they. We know what they expect a little from us” (Flight Engineer).

Mountain activities rely on knowledge and competences deeply embodied. They are mainly tacit. Manoeuvres and gestures learned in formation, repeated in training, then become quasi “natural”.

“After 30 seconds, you know the guy at the other end of the rope” (rescuer 4).

“I think it’s more reflex action. [...] You perform something automatically. It’s like, limit, I do not control my brain. I do it because I must do it, but I have no premeditated thing. I think, it does not happen a second” (rescuer 5).

### **c. Informal social practices as debriefings?**

Every morning at eight o'clock, the “*planton*”, the “*chef de cellule*”, the “*premiers à marcher*” and the rescuers scheduled for training are in the break room at the entrance of the PGHM to share a coffee. They often discuss the impressions of the day before, those about the incoming day. These are moments of conviviality where emotional ties are created and maintained.

The “*premiers à marcher*” are entitled to a second coffee when they arrive at the DZ and they will greet the crew. They discuss the remarkable or unusual interventions they made, they imagine what the day might look like, or organize their future mountaineering expeditions and tell tales about their “exploits”.

“We force ourselves, force so to say, to have coffee in the morning. First by cordiality and second it allows you to assess who will work during the day. [...] Sometimes you talk about the rescue that has happened before or what you must do. [...] It is not formal, it is without formalism, but at the same time, they discussed how they were going to do” (flight engineer).

“It’s built during missions, when you drink coffee in the morning, at noon, in the evening, or in special occasions” (pilot 1).

The “afterwork beers” at the end of the day also act as informal debriefing after the one

performed “*à chaud*” during the flights back to the DZ. For “classical” rescue operations of the kind of Mrs. Anderson’s, these informal moments are the only moments of debriefing: there were no decisions considered as problematic and no particular difficulties for the team occurred.

“You’ll see that on units like the navy or the air force where there, briefing is important at the beginning. There is the mission that takes place and at the end of the mission, there is really a big debriefing. After all, they are formatted like that. It must be done, their missions are very complicated, but when you work in the operational, in an emergency basis, you cannot operate. If we did this every time it would not be possible. We could not take off and take off quickly” (pilot 2).

In case of an accident or “major operation”, a RETEX (formal feedback) is required. The approach exists at the national level, it is recent and based on voluntary basis. It tends to generalize but is not yet systematic.

“There is one in each unit, the RETEX, formal feedback, it’s often when there are problems. It’s also when it’s going well, but we’re talking about problems. That’s why I’m trying to inform people that I’m trying to drag my ears around and say, “Here, what happened during this intervention?” I ask “can this be the subject of a RETEX?” It can be useful to others” (rescuer 1).

“On the other hand, you’ll find that, if something ever went wrong, then, yes. There, we will do [...]. You will see us all there, we will not only go outside but in an office, there we will all debrief. We’ll all be debriefing about what happened, what went wrong, what could have been improved, and so on. In addition, it must be the subject of a RETEX, a written feedback, it will be written, and it will be diffused on the different specialties: helicopters, doctors and rescuers” (rescuer 2).

This somewhat paradoxical result may be related to the threefold dimension of the profession: the mountain constructs a pre-reflective expertise, the formation of high mountain guide does not lead to talking and reporting while the status of a judicial police officer calls for the respect of the procedures, demands restitutions and the rendering of justice.

“So, we have all those hats that intermingle and then we try to make all this happen to succeed in carrying out the mission in quotes” (rescuer 1).

#### **4. Discussion and conclusion**

The aim of this paper was to understand how extreme action teams simultaneously combine the requirements of effectiveness and resilience under time constraints. We presented first-order results that initiate the research. Based on the idea that resilience is the “antechamber” of reliability, we argued that team resilience is conceived as the articulation between “on the spot” resilience and “chronic” resilience of institutionalized practices

(training, exercise) and practices carried out outside the professional framework: the passion for the mountain is common to the different specialities.

The case study allowed us to understand how rescue actors work *in situ*, during an “ordinary” and uncomplicated intervention that can be considered as “habitual” trajectory. The updated practices are discursive and material, made of complex manoeuvres, inter-specialities in a short temporal sequence. Intra-specialty and inter-specialty communications are coded, verbal and non-verbal, learned during the training sessions (Melkonian & Picq, 2010) internal to CNISAG. They are also repeated and embodied (Yakhlef, 2010) during training sessions which simulate “real” varied rescue missions on very diverse terrain: rescue in crevasses, cliffs, forest, and canyoning. Whether during the phase preceding the intervention or during the intervention itself, materiality is constantly present: means of communication (radio, telephone), machine, emergency equipment (stretcher) and mountaineering equipment (strings, relays, harnesses, helmets, specific clothing, etc.) support and empower the “performance” of the action (Gherardi, 2012).

Coordination is based on ante-intervention consultations (justification and feasibility) and post decision to intervene: the very informal briefing just prior to embarkation, intervention strategy, victim recovery and “*à chaud*” debriefing build a coordination both emerging during the course of action [co-ordination-ing: Jarzabkowski et al., 2012] and based on rules and protocols that evoke work on hospital emergency teams (Faraj & Xiao, 2006; Klein et al., 2006). For example, the distribution of the acts entrusts the “first-aid” gestures to rescuers while medical gestures are reserved to the doctor. However, this distribution may require rapid adaptation and readjustment (Schakel et al., 2016) to a more delicate situation than the one anticipated. The case described here does not make it possible to reveal these readjustments which imply other, more detailed, observations, for example, being passenger in the machine during actual rescue missions.

Trainings and exercises punctuate the career of the members of the rescue teams. They take place within and between specialities, especially during joint simulations (Bechky & Okhuysen, 2011; Melkonian & Picq, 2010). These “full-scale” simulations are variable in terms of magnitude: they range from “*bobology*” rescues to crises scenarios (see below) which conclude the training of rescuers at CNISAG. They construct and maintain specific expertise as well as “boundary” or cross-specialty expertise (Majchrzak et al., 2012). The coordination literature has shown extensively how, when expertise is heterogeneous, coordination is necessary but also fragile. In addition, if it requires work at the boundary of different expertise (Carlile, 2004), it also retroacts on speciality expertise (Barley, 2015). These inter-specialty trainings as well as the interventions experienced previously build a chronic resilience spread out over time, over a long horizon, each new intervention based on the “sedimentation” of previous interventions.

The resilience practices revealed by the case differ from the traditional literature on extreme action teams (Godé & Lebraty, 2015; Melkonian & Picq, 2010) on the particular point of organizational learning (Zhao & Olivera, 2006): most interventions do not involve formal debriefings. Indeed, when missions run smoothly, debriefings are almost “*à chaud*” (Godé & Lebraty, 2015) in the helicopter and then during the “afterwork beer”. There is no systematic formalized feedback (RETEX) is only carried out after large-scale interventions and/or when incidents or near misses have occurred during a mission. In the literature on resilience engineering (Hollnagel, 2011), this is a critical step in its construction. It is also supposed to familiarize young recruits and to promote the “sharing of mental models” of team members (Melkonian & Picq, 2010).

The coordination described during the intervention is a spatio-temporal coordination limited and focused on [machine-rescuer-physician], but in the background, it also involves

the PGHM and the DZ, other sites that ensure follow up of the operations. This spatial distribution is much more extensive in the case of large-scale rescue. “Crises”, such as the one triggered by the avalanche of the village of Montroc in 1999, involve a large number of actors and institutions that exert considerable media and legal pressure. The term “crisis” refers to interventions for which there are many victims, material damage and media repercussions. During this tragedy, relief efforts involved all the intervention forces, gendarmerie but also CRS<sup>5</sup>, civil security and voluntary non-rescue guides. In these configurations, resilience is therefore a major challenge not only for the teams themselves, but more widely for the institution of the mountain gendarmerie. It thus goes far beyond the perimeter of the teams during limited interventions. It is built through inter-specialty training that focuses on a more systemic approach where all stakeholders, including the media, participate in the deployment of crises. In these large-scale operations, the weight of rules and procedures becomes particularly important, thus placing the judicial dimension of the profession at the forefront.

What remains to be considered is a point that may seem trivial but may not be so as to build resilience on a larger scale. Shared activities in mountaineering by team members build both bodily and technical capabilities and interaction repertoires that promote what Rico et al. (2008) call, in a completely different theoretical framework, “implicit coordination”. It is made up of an ability to predict the actions and needs of others as well as dynamic adjustments made without recourse to verbal communication. This dimension echoes the work of Majchrzak et al. (2012), which highlights how valuable are practices that “transcend” disparate expertise in units or teams of experts from different fields. They are both less time-consuming than those that “traverse” them and allow cementing teams without the need to always explicit expectations and different visions.

In addition to the continuation of current results, research raises important

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<sup>5</sup> CRS are elite police forces that can intervene in mountain rescue operations.



methodological issues. It is based on a single case study and an ethnographic approach that produces deeply rooted results in the context of mountain rescue, which limits the scope for generalization (Van Maanen, 2011). These choices are based on a literature that deliberately relies on ethnographic tradition to produce localized studies (Heath & Luff, 2000). Nevertheless, according to Okhyusen and Bechky (2009), the wealth produced by multiplication of such work does not necessarily contribute to the accumulation of knowledge. Finally, this case constitutes an archetypal “simple” relief situation which, although the most frequent, is not sufficient to claim theoretical generalization.

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