

CHAPTER 4.—EXAMINATION OF GROUP BEHAVIOR DURING MINE FIRE ESCAPES

It is suggested in chapter 1 that emergency activities (including escape) are not individualistic. They tend to be group responses. If escapes from mine fires are group activities, then preparation for such events must take group behavior into account. This chapter explores the hypothesis that the miners who escaped from the three mines under study did so as members of groups. For development of this chapter, the database was examined for evidence of the existence of escape groups and for instances when individualistic behavior was paramount. Illustrations of group and/or individualistic behavior were analyzed and representative examples are provided in the following discussion.

The nature of groups was discussed in chapter 3 and the following working definition was offered: "We mean by a group a number of persons who communicate with one another often over a span of time, and who are few enough so that each person is able to communicate with all the others, not at second-hand, through other people, but face-to-face" [Homans 1950]. To determine whether or not groups existed during the fire evacuations, it is important that the concept of group be clearly defined. Therefore, the discussion started in chapter 3 will be elaborated here. The defining characteristics of group given in chapter 3 were taken from Homans [1950]. They include size, person-to-person communication, feelings that members have for each other, explicit and implicit rules for behavior, and common activities.

An additional characteristic that is sometimes used to define groups is cohesiveness. Kiesler and Kiesler [1970] state, "Cohesiveness would include not only the attraction that the group holds for its members but also any other force operating on the individual to stay in the group." Variables said to contribute to cohesiveness include "(1) the attractiveness of a group for its members," and "(2) the coordination of the efforts of the members" [Kiesler 1970]. One source of the attraction to a group occurs when "the goals or exterior tasks confronting the group are consistent with those of the individual person, and can best be handled by group action" [Cartwright and Zander 1968, in Davis 1969]. In other words, a common goal and a coordinated effort mounted to achieve that goal contributes toward the creation of a cohesive group.

As discussed in the earlier review of research (chapter 1), groups have frequently been studied in laboratory or simulation settings. These methods allowed control over variables of interest. Kiesler and Kiesler [1970] state, however, that they "find group variables conceptually imprecise and experimentally difficult to work with." Experimental control, in other words, is difficult to achieve in the study of groups. The richness of the naturalistic mine fire data may provide an opportunity for an examination of groups that cannot be found in laboratories or simulations because this environment was not

contrived and the groups were not artificially created. While there are limitations in the data set, it provides an opportunity for examining naturally occurring groups experiencing an extremely stressful situation. Furthermore, it offers views of those groups developed from the perspective of potential group members.

The remainder of this chapter will be organized into four sections. The first section will focus on characteristics of the groups. The beginning of group formation for each work crew will be examined in section two. The third section will explore counterexamples or cases when individualistic behavior took precedence over group actions. The last section will be a discussion of the ramifications of the findings for mine evacuation preparedness.

Group Characteristics

To document the existence of the escape groups, group characteristics that were defined earlier in this chapter will be considered. The most objective measure is group size. All except one of the groups studied had 8-10 members. The one outlier had only three members. These sizes would meet Homan's [1950] criteria of being, "few enough that each person is able to communicate with all the others, not secondhand, through other people, but face-to-face." The following discussion will address each group in terms of its make-up and the more subjective criteria.

The groups that were formed on each section varied in composition. Five of the eight groups were made up of production crews. In two of these cases, the crews from 2 Northwest at Adelaide and 5 South at Brownfield, stable work groups had existed for quite some time and included a section foreman or another miner with leadership capabilities. The 4 South crew at Brownfield Mine was composed of a stable work group and a mine inspector who happened to be on the section at the time of the fire. The inspector was, however, well-known to the section foreman and was trusted as a capable individual. The production crews from Adelaide Mine's 1 Right and 3 Left sections were composed of new miners and/or supervisors. While these individuals were not new to mining and the roles they assumed, neither were they familiar with each other. The smallest group, which escaped from the 6 West section at Brownfield, consisted of three individuals who were involved in the repair of a piece of equipment. Two of them were well-known to each other and routinely worked together. The third was a mine inspector who was conducting an inspection in that area. Two of the groups, from Cokedale Mine's 7 Butt and 8 Face Parallels, were formed during a maintenance shift. These groups contained collections of individuals who were performing construction and supply activities on these sections. In both of these groups, foremen were present. Some of the individuals in each group were familiar with each other, but others

were not. Similarly, some miners were familiar with the sections from which they were required to escape while others were not. In all eight cases, regardless of the prior affiliation between the people on each section or familiarity with the work area, the first action taken when warning of an emergency was received was to warn others on the section and for everyone to gather in one location.

It is not surprising that miners on a section would come together under some conditions. Coal miners typically work in groups. Each production crew conducts activities in the section with individuals filling various roles and being assigned to certain jobs. During the accomplishment of those jobs, however, the members of the crew may be dispersed throughout the section. For example, on a continuous mining section, the miner operator and helper will be in one entry while the roof bolter operator and helper are in another. The miners who are responsible for transporting coal from the face to the section's dump point for haulage to the outside will travel between the continuous miner and the dump point. Therefore, while a person can think of a section as having one work group that together complete the tasks necessary to mine coal, these miners are also doing discrete tasks within a system that may or may not allow them to be in direct communication with each other at any given time during the work shift. Casual workers and visitors such as mechanics, bratticemen, supplymen, surveyors, inspectors, and others may also be on the section. Workers were dispersed in this way on each section when the mine fire threat began at each of the mines.

Regardless of their particular location on the section, miners have certain understandings of their roles and expectations of other miners. In other words, they have what was earlier termed "explicit and implicit rules for behavior." Under these "rules," a miner is expected to come to the assistance of another during a mine emergency if at all possible. When conducting a study in a community where a major mine emergency had occurred, Beach and Lucas [1960] determined that:

In common with many mining communities, the norms shared by all individuals guaranteed mutual help. The miners' code of rescue meant that each trapped miner had the knowledge that he would never be buried alive if it were humanly possible for his friends to reach him. This code was so widely understood and unconsciously accepted that no miner-rescuer was faced with serious role conflict. At the same time, the code was not rigid enough to ostracize those who could not face the rescue role.

These rules also include strong ties between a miner and a "buddy." It is understood that these two workers hold a special relationship and are expected to come to each other's aid. These implicit rules and role definitions existed at the study mines.

When asked how concerned the workers on one section were when they first gathered together, one miner explained that most were calm but one miner was upset. "We had trouble with really only one guy on our crew, [he] just left his buddy." Saying that the miner "left his buddy" was intended to show that this individual was extremely upset. The miner's actions were explained by the coworker's comment, "He's a nervous person." As Beach and Lucas found, the expectation is that a miner will help other miners, especially a buddy, but it will not be held against an individual who is not up to the task.

The excerpts presented throughout this book offer, again and again, examples of miners expressing versions of this code and discussing attempts to live by it. It is within the context of such a code that the actions of individuals and groups must be understood. Miners living by this code would therefore set goals of not only self-protection during emergency situations, but also protecting other miners whenever possible. Potential escape group members therefore, would have an obvious common goal during the threatening situation of a mine fire.

Escape Group Formation

As mentioned earlier, production workers and other miners were scattered throughout their sections in groups of two to four individuals when they determined, by receiving warning or by their senses, that something was wrong and some action should be taken. Details about the discovery of the fires and how warnings were communicated will be discussed in chapter 6. For the purposes of this chapter, however, it is important to note that upon learning some kind of nonroutine problem existed, each miner was typically with only one or two others.

The first thing that happened after the individuals or small groups learned of a problem was the gathering of everyone in each section at one location. This group formation occurred on all eight of the affected sections. The behavior was displayed regardless of the form or content of the warning and across all job titles and individual situations. This point, which will be expanded below, is of consequence because it provides the foundation for the argument to be made that evacuation procedures and related training should focus on group action and interaction, as individual miners will naturally form such groups during emergency escape attempts.

Providing warning to the other miners on the section was the initial priority of those workers who first received word of a fire or who observed and recognized the signs of a serious fire. In some cases the supervisor, usually a section foreman, received a call or spotted smoke. It is not surprising, given the responsibilities of their positions, that these individuals instructed the miners on their sections to meet at a given location to begin evacuation. The foreman with the crew from 7 Butt at Cokedale asked a miner to help give warning to the other

miners. He directed the miner to "just make sure everybody meets up here at the [track] switch." It could be suggested that the supervisor in these situations has responsibility for the other employees and is motivated by that responsibility to warn them and to gather them together where they can be given any assistance needed during the evacuation.

While it may be true that supervisors feel responsible for the safety of miners during an emergency, this is not a complete explanation for the behavior of gathering everyone in the section together before taking other actions. This same behavior was exhibited by everyone who had earlier knowledge of the problem regardless of that person's position or job title. When a roof bolter operator answered a phone call and was told of the fire, he asked other miners nearby to help him spread the word:

I said, "I'll go to the left side. You get the guys on the right side." So I went up and told them, and we came down and the guys from the right side came down...[to the load center].

In giving warning, it was assumed that everyone would meet somewhere on the section before starting out of the mine. A shuttle car operator reported his actions upon learning of the fire in his mine as follows:

I stopped at the bolters first and I told them that there's heavy smoke coming up the intake and we're supposed to get out of here right away. See you back at the power center. That's where the rescuers were.

When hearing of the potential danger, no one started his or her evacuation alone. In every case, warning of the situation was given and instructions to join the other miners at a specific location were given.

It should also be considered that miners routinely enter and leave their working section as a group. Frequently their transportation to and from work areas is via a mantrip, which workers ride into and out of the mine with the others who work in that section. It is not remarkable, therefore, that miners went to a given location to begin the process of leaving the mine. What is of interest, however, is that in these far from routine situations, miners still adhered to this pattern of leaving together. In fact, none of the miners interviewed gave any indication that they considered starting their evacuations without the entire group. They often spoke of the actions of the groups, at this early point, as if they were of one mind:

We met at the dinner hole and all of us just went down to the mantrip and all in a single file line and we got in the mantrip and we started out. We all met down at the tool boxes. From there we walked down to the

self-rescuers and everything. Everybody picked up a self-rescuer. We had a full crew. Everybody got a self-rescuer, and we checked to make sure they were all good. We turned around and we were going to go down the intake.

In most cases, the miners interviewed seemed not to question whether or not the person notified of a danger would spread the warning throughout the section and then wait at a given location, (formally or informally designated) for the rest of the section members to arrive before proceeding out of the mine.

It is also interesting to note that miners at this early stage of group formation remained with the group regardless of their personal opinions about the safety of the groups' behavior. A utilityman told of beginning his escape riding a vehicle even though he did not think that was the best method.

[The boss] came back up and said, "Get all the fire extinguishers and let's go. We'll get in the mantrip." I went down there. I really wanted to go to the intake escapeway or something like that when he said there was a fire. I'm going to go the other way. I don't want to go that way. So we got in there and, gee, we only went a couple blocks.

The authority of the boss was not questioned, even in this potentially life and death situation. The utilityman remained a part of the group, under the boss's leadership. In another case, a similar situation arose for a miner who did not ride a jitney even though he thought that was the best way to reach safety. In this case, a mine inspector, who happened to be on that section, was the authority figure to whom he deferred the decision.

[The fire boss] said there was a mine fire and I says okay, and then I run and get my buddy and we went up the track entry. [There is no track there at that point.] We went up and around, and I had to go over in the belt entry to get the inspector. We got on our rescuers right there. And we also took a spare rescuer with us. I was going to ride the jitney out of there, but he [the inspector] wouldn't let us, so we went on foot.

What these actions say about leadership is discussed in chapter 9. However, note that once the groups gathered together, individuals started their escapes with those groups even when they felt the initial actions being taken were not the best choices given the situations at hand.

Counterexamples to Escape Group Behavior

While each of the miners started evacuation with a group made up of individuals who had been on the section at the time of warning, at times there

were situations when individualistic behavior took precedence over group actions. As mentioned previously, miners accept the role of assisting others in emergency situations, but also pardon those who cannot offer that assistance. Instances of individualistic activities and of excusing others for lack of assistance were recounted in the accounts of the mine fire escapes.

Individual decisions seemed to outweigh group behavior when the individual was convinced that there was real danger and that the group's activities were not the best response to the threat. An example is provided by the 6 West group at Brownfield Mine. The group from this mine was composed of three individuals: a maintenance foreman, a mechanic, and a mine inspector. The group started together and even remained together when the maintenance foreman was not convinced that the group's response was the best. However, as the maintenance foreman perceived an increase in the danger of the situation, he decided to act as an individual regardless of the choices made by the other group members:

When I turned around and said we got to go back, [the inspector] says no. And I says, "You can do what you want to do, I'm going back." I said, "You can follow me or do what you want." At that point I didn't give a damn who followed me or who didn't. I was getting out of a heavy concentration [of smoke].

The maintenance foreman affirmed his belief in the code of assistance, while at the same time justifying his attitude regarding acting alone if necessary:

The only way I wouldn't stay with somebody was if they disagreed with me and I knowed I had the right decision made; I mean the right escape road or something. Then if they would give me any trouble, I would go.

The maintenance foreman suggested that the other group members should follow his lead, but if they did not follow, then he would have no choice but to act alone. In this case, he was not acting for self-interest at the expense of the group good. Instead, the maintenance foreman was convinced that acting based on his decision would be best for each member of the group, but if group members chose not to follow his lead he was willing to act as an individual. There is no evidence regarding whether or not the maintenance foreman would have followed through with this behavior, because the other group members did follow him at this point.

A more extreme example of group breakdown occurred in the group that escaped from 4 South at Brownfield. At one point the group broke roughly into two smaller groups. Later, one individual was left behind under life-threatening circumstances. There was much information regarding these actions and the reasons for them volunteered during data-gathering interviews. These discussions suggest a high level of concern regarding roles and the appropriateness of the

actions of the group members. The members of the 4 South group started their evacuation together:

Then, like I said, they started separating from the pack, not waiting for the pack, the faster ones. The slower guys, some were stopping 'cause they just didn't have the wind. They were out of shape or whatever, and they just wanted to stop and take a rest.

At that point, the section supervisor went ahead with the faster subgroup and a mine inspector stayed back with the slower subgroup. There was also one individual who was not clearly a part of either group.

I said, "Let's try to stay together," and the older man, I recall him saying that he has to go at a steady pace, that he can't go fast, that he's just going to stay out ahead of us [the slower subgroup] and try to hold a slow place.

[A faster miner] comes by and says, "What's the matter old man, can't you take it?" I says, "Hey, you just go ahead, you save your own ass, don't worry about me." And that's just the way it was from there on out.

This miner remained in his position between the faster and slower subgroups and safely escaped.

The event most distressing to group members occurred when an individual in the group from 4 South became unable to continue his escape and was left behind. The actions surrounding this situation exemplify the implicit rules regarding miners' responsibilities to each other. At this point in the escape, three miners (the miner operator, the mine inspector, and a mechanic) had formed the slower subgroup and they were too far behind to communicate with the other members of the 4 South group. The continuous miner operator found it increasingly difficult to continue, and the other two miners were trying to assist him down the belt entry. "[The miner operator] said, 'I can't go no more.'" He said, 'I'm just going to stay here.'" The mine inspector felt he should stay and help, but perceived that the oxygen supply from his SCSR was becoming dangerously low. He decided to leave the other two miners behind:

I looked at the mechanic and I said, "I got to go." I said, "There is no sense in me staying." I don't know if I said that or not, but I thought about it. I know I talked to myself, "There's no sense in me staying." I said, "I can't breathe now." I said, "I know where I'm at. I can send somebody back. I'll go out and get somebody."

As can be seen in his comments, the inspector stayed to help as long as he thought was possible and then reasoned that he had to leave. He did not stop his explanation there, however, and pointed out that he could offer further assistance to the struggling miner by going for outside help. Eventually the mechanic also made this decision and left the miner operator alone.

I felt so sorry for [the miner operator], and he was struggling too hard, and I guess I made a decision there that he wasn't going to make it and that you might as well leave him and you might make it.

The miner operator was eventually helped to safety by the mechanic and the foreman who returned after they had reached fresh air.

All of the group members who knew about the miner operator's difficulties did everything they thought possible to assist him. Two even went back into the smoke after they had reached a safe area. The miner operator was asked about that point during the escape when he was left alone. His response confirms that the code allows reprieve for miners who cannot help others in need.

It don't bother me. I didn't expect—I kept telling the mechanic to keep going, don't wait for me. I didn't expect anybody to stay behind for me. I don't hold nothing against anybody.

In summary, the members of the 4 South group started their evacuation together, but as environmental conditions deteriorated, the group split. Eventually, one miner was even left to die. On the other hand, group members returned and helped this individual to safety and he held no hard feelings about the experience. This example of group behavior upholds the code of helping each other whenever possible, but of releasing others from this obligation when it cannot be fulfilled.

Emergency Evacuation Ramifications of Group Behavior

The findings reported in this chapter suggest that individuals will form a group during an emergency situation and will often act with the group regardless of personal opinions regarding the optimum response to the event. Furthermore, miners will assist each other during emergency events whenever possible. This assistance can take such forms as delaying the group's evacuation to wait for a slower group member or individuals returning to a hostile environment after reaching safety to search for a missing coworker. This does not mean, however, that no individual action takes place. Sometimes individual safety does take precedence over group safety. The individual seems to be more likely to act outside of group behavior as the perceived danger increases and as options for group action become limited.

In planning for emergency mine evacuation, group behavior should always be considered. Since miners will probably gather as a group before beginning their evacuation, issues such as time allotments for such activities, strategic locations for gathering, and appropriate leadership should be examined. It is also important to realize that miners will attempt to assist other miners who they perceive to be in danger. Awareness of this response is especially relevant for those who are trying to determine the location of missing miners during a rescue attempt. In these situations, miners may not choose the most direct route out of the mine, but may instead go toward an area where they think they may find a fellow miner needing their assistance. In training miners for escape, it may be appropriate to discuss the issues related to groups staying together versus individuals and/or subgroups splitting from the main group. It is not clear that either situation is always correct. It is clear, however, that both happen during real events. It would be helpful if discussions of when each might be fitting were conducted in a classroom setting.

In summary, emergency response planners must take into account that miners will attempt to evacuate in groups when threatened by a mine fire. Training for evacuations should take this fact into account and include the likely group-related responses in any escape procedures.

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