Pete's Predicament: Unsupported Roof

Instructor's Copy

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Contents

Introduction

This instructor's copy contains all the materials needed to conduct the exercise. These first few pages explain the purpose of the exercise, the scenario, the intended skills or learning outcomes (performance objectives) for miners who complete the exercise, how to administer the exercise, and an answer key which may be duplicated and used as an overhead transparency. The problem booklet with which the trainees work is in Appendix A. Instructors should make enough duplicates of the problem booklet for each trainee to have his or her own copy. Appendix B contains a blank answer sheet that can be duplicated and used by trainees to record their answers.

The problem booklet includes both questions and answers. After each question, feedback about correct and incorrect answers is given. Trainees should be encouraged to take a position on the issues involved in the answers to each question BEFORE looking ahead at the feedback section. Once miners have taken a position, they will be interested in debating the merits of their answers compared to the information provided in the feedback section. The information in the feedback sections is based on expert opinion for this particular problem in which a miner finds himself unintentionally under unsupported roof. The problem description, the decision alternatives, and issues that comprise the exercise were developed from Bureau of Mines research about how frequently and for what reasons miners unintentionally go under unsupported roof, and ways to prevent this behavior. The exercise communicates key ideas and concepts in a manner that helps miners better recognize and understand the reasons for this behavior, the possible consequences to self and others, and ways to prevent the problem behavior. The exercise is based on real cases. The good and bad alternative choices for each question are behaviors of miners that are likely in such situations based on the experience of a group of underground coal mining experts and Bureau of Mines research.

Exercise Summary

Read this section first. It determines if the exercise is appropriate for your organization and miner training classes. If you choose to use the exercise, review the remainder of this document prior to administering the exercise and conducting the follow-up discussion.

Format: Paper and pencil simulation exercise.

Audience: Underground coal miners, especially face crews.

Length: The problem booklet is 18 pages long. It contains a brief set of instructions, background material, a statement of the problem (i.e., Pete's predicament), five questions (with feedback about why answers are correct or incorrect), and 1 figure (section map). Each question presents a problem and a list of alternative choices, some correct and some incorrect. The objective is for trainees to select the correct choices and avoid the incorrect decisions.

Allow approximately 30 minutes for small groups of trainees to complete the five questions in the problem booklet, and an additional 30 minutes for reviewing the answers with the entire class. Depending upon participants' experience and interests, discussion of the answers may take longer. For example, new miners not experienced in roof control plans and procedures will need more time to comprehend the basic information, concepts, and procedures presented than will experienced miners. Miners who are particularly involved in roof support may find the exercise of more interest than miners who work in areas away from the face.

Setting: Underground coal mine, at the face, at the beginning of the second shift.

Scenario: The preshift examination has been completed. The entire section has been rock dusted. John, the continuous miner operator, and Eddy, his helper, advance the miner to the face of the #3 entry and begin cutting coal. Pete, a visitor to this section, is standing near the right rib watching the mining machine to observe its new water spray system. A shuttle car comes up close to the right rib. After watching the miner cut coal for less than a minute Pete starts to get worried that he is in danger of being squeezed between the continuous miner and the rib. So, he steps back around the corner into the right-hand crosscut which is rock dusted. Then he notices that about half the crosscut is unbolted and the top is dribbling small pieces of shale! Pete cannot escape into the #3 entry because the miner tailboom and shuttle car block this route. He sees that the far end of the crosscut is bolted. Pete must decide what to do to escape and to warn Eddy, John, and the shuttle car operator who are inby an unbolted crosscut. After Pete and Eddy escape, John must decide whether to abandon the mining machine and make a run for safety or to stay in the miner operator compartment under the canopy. The miners working the simulation problem are then asked to identify persons' actions and other factors that contributed to these miners unintentionally going inby an unbolted crosscut. Then the exercise reviews research about how frequently and for what reasons miners report unintentionally going under unsupported roof. (This section may be omitted if you run short on time.) The exercise concludes with a discussion of prevention techniques.

Skills: In the context of this problem scenario:

Discriminate among good and bad alternative actions when a miner finds him or herself unintentionally under unsupported mine roof and immediate escape is blocked.

Discriminate among good and bad alternative actions when a continuous miner operator finds him or herself unintentionally advanced beyond an unbolted crosscut whose top is working.

Assess and recognize persons' actions and other factors that contribute to going under unsupported roof unintentionally.

Recognize and review reasons miners report for unintentionally going under unsupported roof.

Recognize and review the relationship between seam height and the frequency with which miners report going under unsupported roof.

Recognize and review the tasks and activi ties in which miners are most frequently engaged when they unintentionally move under unsupported mine roof.

Generate and discuss plans and strategies to prevent the miners in this class from unintentionally going under unsupported mine roof at the mines where they work.

How To Use This Exercise

1. Review the exercise summary, particularly the list of skills (performance objectives) the exercise is designed to foster. Decide if the exercise is relevant for your organization.

2. Work through the exercise yourself, comparing your answers with the feedback provided.

3. Present the exercise to your class or group by giving every person a copy of the problem booklet (Appendix A). Ask persons to work together in groups of 3 or 4 to answer questions A through E. Summarize the background information and problem statement, review Figure 1, and introduce Question A. You may ask the trainees in each small group to record their answers on individual answer sheets, or you may give each small group a single answer sheet and ask someone in each group to record their group's answer. The latter approach may generate more group discussion because it encourages trainees to come to a consensus about which answers are best. After they have marked their answers to Question A, everyone in the small group should turn to the next page in their problem booklets. Then they should discuss the feedback for the answers to Question A. When the discussion is completed each person in the group again should turn the page in his or her problem booklet and answer the next question. The remaining questions should be completed in the same way.

4. Ask trainees to record their answers to each question on the answer sheet BEFORE comparing their answers and ideas to the feedback that follows each question.

5. When each group has completed the exercise, conduct a whole-class discussion about any points or issues the trainees wish to raise. You should be very familiar with the contents of the exercise so you can raise relevant issues and questions or make important observations at the appropriate time during the discussion. The instructor's discussion notes (pp. 7-8) contain information that may be used to further explain or elaborate on some of the answers provided in the trainees' problem booklet. Instructors should familiarize themselves with this information so they can mention it whenever trainees appear to be interested in knowing additional details concerning some of the answers. It may also be useful to make a transparency of the answer key on page 8 and project it at the front of the room during this phase of the exercise.

6. Do <u>not</u> read the feedback material to the class. This would be boring, and prevent the trainees from sharing their ideas. Rather, let class members identify and debate issues as <u>they</u> see fit. The exercise will provoke this dialogue. Use your knowledge of the information presented in the exercise and instructor's notes as well as your own experience as a means to clarify points, make additional points, or to raise important issues and questions.

7. Conclude the class activity by asking the miners in your class to describe what they, their co-workers and the company can do to prevent persons from going under unsupported roof. List their suggestions on a blackboard or an overhead projector transparency.

Instructor's Discussion Notes

This section contains supplementary information concerning 8 of the answers given in the trainees' problem booklets. Instructors should familiarize themselves with this material so they can mention it whenever trainees appear to be interested in knowing additional details about certain issues. None of this information is included in the trainees' problem booklet.

Question B

7. Only three continuous mining machine operators (during the mid 1980s) were killed because a massive roof fall caused their canopy to fail. In contrast, the number of people whose lives have been saved because their canopy protected them from a roof fall is many times greater. Federal law (30 CFR 75.1710) requires that the cabs or canopies used on self-propelled electric face equipment must be capable of supporting (1) a dead weight load of 18,000 pounds, or (2) 15 psi distributed uniformly over the plan view area of the structure, whichever is lesser.

9. The foreman should slide a three-quarter inch-wide 10 ft long metal tape measure up and down the full length of the test hole to see how it feels. If the metal rule slides smoothly all the way up and down the hole, the mine roof probably has no large cracks, clay, or coal veins between the strata. However, if the tip of the rule catches on a crack, the foreman should note the distance and suspect a separation in the roof. If such a condition is found, extra precautions and support in the form of longer roof bolts, headers, and cribs might be needed.

Question D

23. While they often tease, test, and play pranks, rarely do individuals or groups of miners (or other workers) deliberately contrive a situation to harm co-workers. The risks to self are too great and this type of destructive activity too strongly punished by workplace norms and company and legal sanctions.

24. Failing to post a warning device at the last row of permanent roof supports is a violation of federal law 30 CFR 75.208, which states that, except during the installation of roof supports, the end of permanent roof support shall be posted with a readily visible warning, or a physical barrier shall be installed to impede travel beyond permanent support.

Question E

26. Perhaps a true story will help illustrate how distractions and the behavior of a group of persons can contribute to miners going under bad top. A Bureau of Mines researcher once observed a group of four miners working on an electrical problem with a continuous mining machine. The mining machine was in an entry near the face. The four miners (miner operator and helper, electrician and helper) were located in the last open crosscut outby the mining machine. As they studied

a wiring schematic and were absorbed in trying to solve the electrical problem, a shuttle car approached. Still holding the large schematic, all four miners moved out of the roadway and outby the entry directly under a 5 ft x 4 ft x 4 inches thick piece of roof rock that had dropped down about 5 inches from the bolted roof and was ready to fall. The four miners studying the schematic knelt directly under the bad top. They were so interested in the schematic and the problem they were trying to solve, they failed to move even when the section foreman yelled to them! Only when the foreman approached the group, took hold of the arms of two of the men and led them away did all the four miners move out of danger, each still holding a corner of the schematic, and continuing their debate of how to fix the miner. The four miners were unaware of the bad top until the foreman barred it down and 1,000 lbs of rock fell to the mine floor with a resounding thud. Have you ever observed a similar situation?

27. No miners in the Bureau study reported unintentionally getting under unsupported top because someone had been spiteful or intentionally "set them up".

30. No miners in the Bureau study reported unintentionally getting under unsupported top because poor lighting or dust obstructed their view of the roof.

31. This is especially likely when a remotely controlled continuous mining machine is being used to make a deep cut, and the miner operator advances the miner so far that it leads the canopy of the shuttle car or bridge conveyor past permanent support. Miner operators can do this unintentionally such as when they are so focused on filling the shuttle car that they fail to attend to the location of the shuttle car. The canopy roof of the shuttle car also may obstruct the operator's view of the top.

Pete's Predicament Answer Key[2]

Question A

1. B 2. B 3. G 4. G 5. B .

6. B .

Question B

7. B 8. G 9. G 10. B .

Question C

11. G 12. G 13. G 14. B 15. G .

16. G 17. B 18. G .

Question D

19. G 20. G 21. G 22. G 23. B .

24. G 25. B .

Question E

26. T 27. F 28. T 29. T 30. F .

31. T 32. D 33. B .

[2] This page is printed in large type so that it may be copied and used as an overhead transparency.

Appendix A: Problem Booklet

Duplicate this copy of the problem booklet for use in your classes. Each person in your class should have a problem booklet while they are working the exercise. The problem booklets are reusable.

When duplicating the problem booklet it is very important to print its pages on only one side of the paper. The exercise is designed to present a series of questions that unfold over time to simulate a real life problem that is in progress. The trainee should work through the exercise a step at a time, reading each question in order and thinking about its alternative answers. After choosing among the alternatives, the trainee then turns the page and examines the feedback for that question and then goes on to the next question. Printing the problem booklet on both sides of the paper invalidates the exercise because the trainee would see a later step in the problem before having worked through the present step. This makes the exercise less interesting and far less effective.

You may obtain a copy of the problem booklet from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to lord-mary@msha.gov.

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Problem Booklet

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Instructions

This exercise tells about some miners who get into trouble. Read it one page at a time. (Don't jump ahead, but it's OK to look back.) On each page you will be asked to recognize problems, and good and bad ways to correct the problems. Some of the questions deal with how the problems came about, and how they can be prevented in the future.

Get together with two or three other individuals. As you read, discuss the questions and how they should be answered based on your own experience. Your problem booklet includes both questions and answers. Some answers are better than others. After each question, you will be asked to make choices about which answers are correct and which are incorrect. After writing your answers on the answer sheet, you are given feedback about how a group of "experts" answered the question. However, BEFORE looking ahead to see the expert's answers, it is very important that you record your answers to each question on your answer sheet.

The exercise is much more interesting and beneficial if you discuss each question with the others in your group and decide how to answer it before looking at the experts' answers. After marking your answer sheet, then look at the answers provided in the feedback section. Note any differences and discuss these with your classmates.

The events described in this exercise are based on real cases and on studies conducted by U.S. Bureau of Mines researchers.

Now, follow along as the instructor explains the background information and the problem. Then begin reading and answering the five questions.

Background

Pete has worked at Golden Rod Mine for three years as a continuous mining machine helper.

Pete's 007 section is idle today. He was sent to section 003 to observe a new water spray system on that section's continuous miner. In a few days, the new water spray system will be installed on the miner on Pete's section.

The pillars in this mine are 50' x 50' and the entries and crosscuts are 20' wide. The immediate mine roof is a thinly bedded but fairly competent shale. The top is supported by 48 in. conventional roof bolts, on 4 ft centers. Cuts may be made to a depth of 20 ft. The coal seam is 60 inches.

Section 003 has seven entries, one continuous miner, one ATRS equipped twin-boom roof bolter, and two shuttle cars. The continuous mining machine operator and the shuttle car operators are protected by canopies.

It is the Friday night before a three-day weekend.

Problem

At the beginning of the second shift, Pete travels to the 003 section in the mantrip with the rest of the face crew. He notices the section recently has been rock dusted through the last open crosscut and all the way up to the face. The preshift examination was completed earlier.

John, the continuous miner operator, and Eddy, the miner helper, show Pete the new water spray system and explain how it works. As John is doing a gas check at the face, Pete notices that the entry is bolted and rock dusted all the way to the face. Next, John trams the miner into #3 entry and begins to cut coal. After making a 20 foot cut on the left side, John repositions the miner to cut the right side. Pete stands near Eddy, the miner helper, to watch the water spray system on the miner cutting head.

As the continuous mining machine moves into position, its tail boom, and the shuttle car that just pulled up, move very close to the right rib. After observing the miner cutting coal for less than a minute, Pete begins to feel uncomfortable with the lack of space around him. Worried that he might get pinched between the rib and the continuous miner, Pete steps back and around the corner into the right-hand crosscut. As the miner continues to fill the shuttle car, out of the corner of his eye, Pete sees something move off to his left side. He looks into the crosscut and sees a few thin slabs of shale flaking from the roof about 10 feet into the crosscut. Then he sees that about half of the crosscut in which he is standing is rock dusted but not bolted! At the far end of the crosscut he sees several rows of roof bolts, and that the intersection of #4 entry and the crosscut is bolted. Study Figure 1 on the next page. Then answer the five questions that follow.

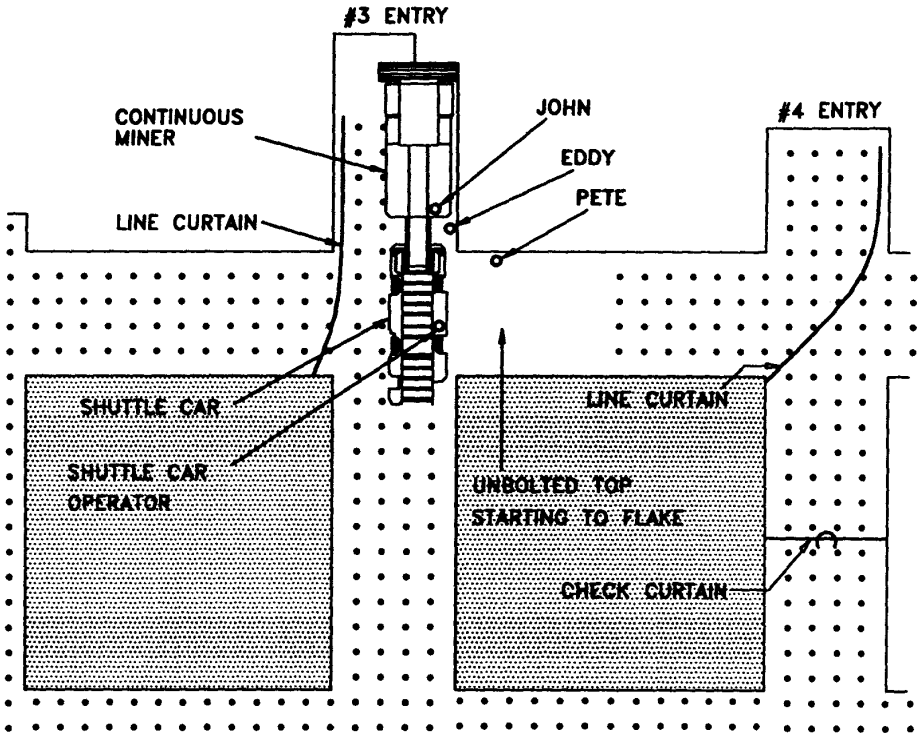

Figure 1: Pete finds himself in a bad spot

Question A

Here are six statements about what Pete might do next. After deciding whether you think each action is good or bad, mark your answer *on the answer sheet*. Place a **G** in the blank beside the statement number if you think the statement is a good idea or a **B** if you think it is bad.

What should Pete do?

1. Run through the crosscut to the #4 entry to get under permanent supports.

2. Squeeze out between the #3 entry rib and the back of the shuttle car and go outby the crosscut.

3. Don't advance any further into the crosscut. Back up to the inby rib of the crosscut at its corner into the #3 entry and stay put for now.

4. Use his cap lamp to signal the shuttle car operator to stop. The proper signal is to aim the light in the direction of the other worker(s) and to move his head back and forth, smoothly and rapidly. This motion means "No!" or "Stop!"

5. Sound the top in the crosscut (sound and vibration test). If it sounds and feels OK, stay put.

6. Yell to the miner operator, the miner helper, and the shuttle car operator about the unbolted top.

Can you think of any other good or bad choices that would be likely in situations like this? If so, list them on your answer sheet now so you won't forget to discuss them with the rest of the class later on in the exercise.

When you have finished discussing these statements with your group, and have marked your answers, turn the page and look at the feedback for Question A.

Question A Feedback

Now that you have read, discussed, and answered the 6 items in question A, review and discuss the feedback below. Compare the answers and notes to your answers and ideas. Based on your experience as a miner, feel free to debate and discuss these answers and notes.

B 1. Running through the crosscut may be tempting, but Pete is less protected the further he enters the crosscut. It is probably safer to stay where he is.

B 2. Unwise. Pete could be crushed between the #3 entry rib and the back of the shuttle car.

G 3. This place is probably less dangerous than other places further away from the corner of the crosscut rib and the bolted #3 entry.

G 4. This is the safest and fastest way for Pete to get the attention of his co-workers to tell them about the problem.

B 5. Pete's visual inspection of the roof has revealed that the top is likely to be unstable. He should not sound the top because this action could further disturb the roof and cause it to fall.

B 6. Because the continuous miner is cutting coal and filling the shuttle car, Pete might not be heard even if he yelled very loudly.

Turn the page and do Question B.

Question B

Pete uses his cap lamp to signal the shuttle car operator to stop. Then the shuttle car operator signals the miner operator who shuts down the mining machine. The shuttle car operator trams outby in the #3 entry. Pete comes out of the unbolted crosscut and both he and Eddy (the miner helper) quickly go outby in the #3 entry. When everything is quiet, the miners can hear a little shale dribbling from the roof in the crosscut.

What should John (the miner operator) do now? (Using the answer sheet, place a **G** in the blank if you think the statement is a good idea or a **B** if you think it is a bad idea.)

7. Get off the miner and run outby in the #3 entry.

8. Stay in the operator's compartment under the canopy and tram the miner back from the face and outby the unbolted crosscut.

9. Ask Eddy to tell the foreman that the roof in the crosscut is not bolted and has begun working.

10. After tramming the continuous miner outby the unbolted crosscut, raise the miner cutting head against the roof at the intersection of the crosscut and #3 entry to provide additional roof support at the intersection.

Can you think of any other good or bad choices that would be likely in a situation like this? If so, make a note about it on your answer sheet.

When you have finished marking your answers, turn the page and look at the feedback for Question B.

Question B Feedback

B 7. Miners in these types of situations often report wanting to get out of the operator's compartment and run to a safe area. However, it is much safer to stay under the canopy and to tram the continuous miner outby.

G 8. A good decision! Staying in the operator compartment protects the miner operator, and allows moving the continuous mining machine to a place where it is not likely to be covered up by a roof fall.

G 9. Immediately sending for the foreman and getting ready to bolt the unbolted crosscut from the #4 entry side is a good idea. This action can be taken at once, and the sooner the roof is supported, the less likely it is to fall. However, before bolting the remainder of the crosscut, the foreman should have a test hole drilled to see if extra precautions and additional support are going to be necessary (e.g., longer bolts).

B 10. While raising the miner head against the mine roof in the bolted intersection of #3 entry and the crosscut would provide some additional support, a large fall in the crosscut could extend into the #3 entry and around the miner head, and perhaps even outby in the bolted #3 entry. A fall could trap the mining machine and operator. Most experts think the mining machine ought to be trammed back to the second crosscut from the face. This gives the roof bolters and others working in the area plenty of room to work and a clear means to escape outby if they have to leave suddenly.

Turn the page and do Question C.

Question C

Think about the situation that placed Pete (and others) in danger. **Who or what should have prevented Pete from getting into this dangerous situation?** (Place a **G** in the blank if you think the statement is a good answer or a B if you think it is a bad answer.)

11. Pete.

12. The bolter operator from the last shift.

13. The person who rock dusted on the last shift.

14. A state or federal inspector.

15. The section foreman and/or the fireboss who conducted the preshift examination.

16. John, the continuous miner operator.

17. A better roof control plan.

18. Eddy, the continuous miner helper.

Using your answer sheet, please list any other answers you can think of for this question.

When you have finished marking your answers, turn the page and look at the feedback for Question C.

Question C Feedback

G 11. Being alert to and recognizing hazards is expected of all miners. Pete should have visually inspected the top before he moved into the entry and crosscut.

G 12. The bolter operator should have completed supporting the top, and, if that were not possible, he should have dangered off the unbolted area with warning flags hung from the last row of bolts on each side. He should also have reported the unbolted area to the boss.

G 13. The rock duster should not have dusted the area, but should have dangered off the crosscut (by hanging warning flags), and reported it to the section foreman.

B 14. While a state or federal inspector would see and cite this serious violation, the miners who work on a section cannot depend on an inspector being present. They must watch out for their own safety and the safety of their buddies. Therefore, this is a bad answer.

G 15. The person who conducted the preshift examination should have spotted the unbolted crosscut, reported the situation, and dangered off the area to prevent the crew from entering this area until the top was supported properly.

G 16. John, the miner operator, should have checked the top, and should not have advanced the continuous miner beyond the unsupported crosscut.

B 17. There is nothing wrong with the roof control plan. The problem is that the miners on the previous shift did not follow the roof control plan, and the miners on the second shift failed to conduct proper examinations and began work in violation of the roof control plan. Therefore, this is a bad answer.

G 18. Eddy, the continuous miner helper, should have checked the top, and should have warned John not to advance the continuous miner beyond the unsupported crosscut.

Turn the page and do Question D.

Question D

Think about this whole situation. The miners on section 003 at Golden Rod Mine generally work safely and productively. In situations like this, **what circumstances may have contributed to the dangerous predicament in which Pete and his co-workers found themselves?** (Place a **G** in the blank if you think the statement is a good answer or a **B** if you think it is a bad answer.)

19. The roof bolter broke down on the previous shift.

20. Lack of supplies.

21. Eagerness to leave at the end of a shift.

22. Poor communication among miners on and between shifts.

23. Dishonesty, anger, and spite.

24. Misleading cues that suggested the crosscut was bolted.

25. Failure to understand rules and regulations.

Using your answer sheet, please list any other answers you can think of for this question.

When you have finished marking your answers, turn the page and look at the feedback for Question D.

Question D Feedback

G 19. The roof bolting machine may have broken down during the previous shift, making it impossible to finish bolting the crosscut before the shift ended.

G 20. The fact that the crosscut was not completely bolted suggests there may have been a problem. Perhaps longer bolts or header boards were needed for the crosscut, or perhaps these supplies were not available on the section at the end of the first shift. However, the bolter operator (and others) should have reported any such problems, and the foreman should have obtained the necessary supplies, made sure the top was bolted, or dangered off the area and reported it to the second shift section foreman.

G 21. "Get home-itis" is a term used in studies of military aircraft accidents. Aircrews who have finished a day of flight duty are often so eager to get home, they sometimes make errors and fail to recognize hazards. The same situation may apply to other workers, especially just before weekends or holidays, when thinking about planned activities may compete for the worker's attention.

G 22. Communication on this section among miners on both shifts, and between foreman and miners across shifts, was a problem. Otherwise the unbolted crosscut would have been noticed, reported, corrected, or dangered off. Failure to communicate, or miscommunication, is often cited as a contributing factor in accidents.

B 23. While it is possible that intentional dishonesty, anger, and spite can lead to situations like this, it is unlikely. In this case there would have to have been many persons involved to make the unsupported top a "plot" to scare or harm others. Therefore, this is a bad answer.

G 24. Misleading cues undoubtedly contributed to this situation. First, the crosscut was dusted. Mine roof is not usually dusted until it has first been bolted. The crosscut was bolted at one end. The fireboss conducting the preshift examination may have seen the first few rows of bolts and the rock dust and assumed the whole crosscut was bolted. The preshift examination OK to enter and work on the section may have contributed to Pete and his co-workers not noticing the unbolted section. Earlier, the first-shift roof bolter operator failed to danger-off the section by hanging warning flags on the last row of roof bolts. The unflagged crosscut, and the rows of bolts at the end of the crosscut near #4 entry, may have contributed to the rock dust operator dusting the unbolted section, especially if the mine ventilation and rock dust contributed to poor visibility during the dusting.

B 25. Even though there are many complex rules and regulations that apply to mine safety, miners generally are very knowledgeable in these rules and how to work within the rules. The rules are regularly taught, interpreted,

and reinforced in required annual refresher training and other ongoing safety training. The underground coal mine work force in the United States has an average of approximately 12 years experience. The types of errors that are described in this exercise occur occasionally among intelligent and highly experienced workers because of misleading cues, mis- or poor communication, doing tasks out of sequence, and being distracted by other matters (like showing a visitor the new water spray system on the miner cutting head, or thinking about the upcoming three-day weekend and one's planned activities). Therefore, this is a bad answer.

Turn the page and do Question E.

Question E

Bureau of Mines researchers interviewed 268 underground coal miners from six different mines about incidents in which they had unintentionally gone under unsupported roof. Four out of every 5 of these miners said that they could recall a time when they had unintentionally gone under unsupported roof. One out of every 5 miners said that this had happened to them within the past month. See if you can predict the most common answers given by these 268 miners to questions about unintentionally going under unsupported roof. When you have finished you will have a chance to compare your answers with the findings from the Bureau's study. **For what reasons do miners report that they sometimes unintentionally go under unsupported roof?**

(Place a **T** in the blank if you think the statement is true or an **F** if you think it is false.)

26. being tired or preoccupied with personal thoughts and problems

27. being tricked or set up by another worker for spite

28. the absence of warning markers

29. the area was rock dusted but it had not been bolted

30. not being able to see the roof bolts because of poor lighting or dusty conditions

31. not being able to see if the area immediately ahead is bolted because of an obstructed view from being under a scoop or shuttle car canopy

32. What are miners most often doing when they unintentionally go under unsupported mine roof? (Choose the one best answer from the list below.)

    a. setting timbers

    b. operating a roof bolter

    c. repairing a roof bolter or a continuous mining machine

    d. walking or traveling

33. What effect does seam height have on miners unintentionally going under unsupported roof? (Choose the one best answer from the list below.)

    a. Seam height has no effect on how often miners go under unsupported roof.

    b. In lower seam heights, miners more often go under unsupported roof.

    c. In lower seam heights, miners less often go under unsupported roof.

    d. In higher seam heights very few miners report going under unsupported roof.

34. What things can you, your co-workers, and company do to prevent miners from unintentionally going under unsupported mine roof? Please list your ideas on the answer sheet.

Question E Feedback

The answer key and notes for these three multiple choice questions are based on the results of interviews with 268 underground coal miners from six different mines. These miners were asked how often and for what reasons they unintentionally go under unsupported roof. Look at this answer key and compare these notes with your answers. Note and discuss any differences.

T 26. Being tired or preoccupied with personal thoughts and problems can result in a miner not paying attention to his or her location and not perceiving hazards like unsupported mine roof.

F 27.

T 28. The absence of warning flags hung from the last row of roof bolts can also contribute to a miner entering an area of unbolted top, particularly if the miner is distracted and not alert.

T 29. Sometimes cues usually associated with bolted roof trick the miner into thinking an area has been bolted when it has not. This can happen when an area has been rock dusted before it is bolted because rock dusting normally occurs after the top is bolted.

F 30.

T 31. Miners also report that when they are operating scoops or shuttle cars, especially in low coal, the canopy can sometimes obscure the view immediately ahead and cause them to advance equipment under unsupported top.

D 32. The miners in the Bureau study reported "walking" as the activity in which they were most often engaged when they unintentionally went under unsupported roof. This "walking" activity was reported much more frequently than any other activity that unintentionally placed miners under unsupported roof. When setting timbers or working on other jobs near unsupported roof, miners tend to be more aware of the unsupported top and less likely to unintentionally move out under it. Table 1 on the last page provides a list of the activities that miners said they were doing when they realized that they had gotten out under unsupported roof.

B 33. 12 percent of the miners who worked in low seam sections (under 42 inches) reported unintentionally going under unsupported roof within the past week. The corresponding figure for miners who worked in higher seams was only 4 percent. Some of the miners who were working in low seams pointed out that it is more difficult to get a good view of the roof from a crawling position than from a standing position. Consequently, it is easier to unintentionally move out under a section of unsupported roof in low seam mines, particularly if that area is not flagged or dangered off.

Answer (d) is incorrect because the majority (81%) of miners who worked in higher seams reported that they could recall a time that they had unintentionally gone under unsupported roof. However, their responses to other questions indicate that these incidents occur *less frequently* in higher seam mines.

Table 1: Reasons miners report for unintentionally going under unsupported mine roof

Activity or Task	Frequency[1]
Walking	59
Hanging or extending ventilation tubing	11
Operating a scoop	9
Repairing a continuous miner or bolter	8
Hanging ventilation curtain	8
Rock dusting	7
Operating a bolter	7
Operating a continuous miner	6
Carrying supplies	6
Setting timbers	5
Operating a ram car or shuttle car	4
Establishing sight lines	2
Operating a mobile bridge	1
Checking for methane	1
Installing a roof strap	1
Looking for a wrench	1
Throwing cable off a continuous miner	1
Hanging cable	1
Doing a preshift examination	1
Digging out a continuous miner covered by a rockfall	1
Moving a power center	1
Pulling a continuous miner cable	1
Retrieving bolts	1
Talking to the miner operator	1
Adjusting the temporary roof support pads	1
Adjusting the cutter spray heads on the continuous miner	1
Checking a hose on the bolter	1

[1] Number of miners in the sample of 268 who reported this activity.

Appendix B: Answer Sheet

Appendix B contains a blank answer sheet. The answer sheets are consumable. You will need a new set for each class. You may ask the trainees in each small group to record their answers on individual answer sheets, or you may give each small group a single answer sheet and ask someone in each group to record their group's answer. The latter approach may generate more discussion because it encourages trainees to come to a consensus about which answers are best. If you ask for group answers, you will need one answer sheet for each 3 or 4 persons in your class. If you ask each trainee to record their own answers, you will need an answer sheet for each person in your class. In either case, it is recommended that trainees be split into small groups and asked to work through the exercise as a team.

Answer Sheet for Pete's Predicament

Question A

1. ___ 2. ___ 3. ___ 4. ___ 5. ___ 6. ___ .

Other choices: _____

_____

_____

Question B

7. ___ 8. ___ 9. ___ 10. ___ .

Other choices: _____

_____

_____

Question C

11. ___ 12. ___ 13. ___ 14. ___ 15. ___ .

16. ___ 17. ___ 18. ___ .

Other answers: _____

_____

_____

Question D

19. ___ 20. ___ 21. ___ 22. ___ 23. ___ .

24. ___ 25. ___ .

Other answers: _____

_____

_____

Question E

26. ___ 27. ___ 28. ___ 29. ___ 30.

31. ___ 32. ___ 33.

Preventive actions: _____

_____

_____