

# Decision-Making and Emergency Responses

Training for Incident Command Centers and Mine Rescue  
Teams

Colorado School of Mines  
Mine Safety and Health Program

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Training For Incident Command Centers and Mine Rescue Teams

BY

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### **Disclaimer**

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## OVERVIEW

Making decisions is a critical component of any emergency response and the success of that response is dependent upon effective decisions being made in a timely manner. It is important that personnel involved in emergency responses have a thorough understanding of how decisions should be made, and the factors present during emergencies that can impact the effectiveness of the decisions. Decision-Making and Emergency Response Training was developed to provide information to mine rescue teams and personnel staffing an incident command center about how decisions are made and how decision-making is affected by emergency situations.

This training presents a simple model for decision-making, discusses approaches to making decisions, describes factors that occur during emergencies that affect decision-making and includes several exercises designed to practice the various steps in making decisions. The training concludes with a case study involving a mine rescue scenario.

The Emergency Management Institute IS 241, *Decision-Making and Problem Solving*, served as the primary basis for this training. Other references used to develop this training presentation are included in the Reference section.

### **Purpose**

The purpose of this training presentation is to provide basic information about the process of decision-making and how this process is affected during a mine emergency. Individuals serving in an incident command center or on a mine rescue team are required to make decisions throughout the duration of the emergency response that ensure the safety of the team and the successful rescue of victims. This training will provide a structure in which information is processed that will hopefully lead to effective decision-making.

## **Target Audience**

This training has been designed for incident command center personnel and mine rescue teams. However, it can be easily adapted to emergency response personnel involved with other types of emergencies. This training can be integrated with annual classroom training or it can be given as a stand-alone training session.

## **Training Topics**

This training includes the following topics:

- Basics of Decision-Making
  - This topic presents a five-step model for problem-solving that incorporates decision-making at each step of the process.
  
- Approaches to Decision-Making
  - Four different approaches for making decisions are presented. Information that supports the use of a specific approach is discussed, along with obstacles that occur when decisions are made by groups rather than individuals. Attributes of good decision-makers are also presented.
  
- Decision-Making and Emergencies
  - Factors occurring during emergencies that affect decision-making are discussed. Additionally, the differences between an “ideal” decision environment and an “emergency” decision environment are presented.

## **Performance Objectives**

There are three objectives of this training, and include:

- Gaining a basic understanding of the decision-making process
- Applying a model for decision-making to emergency responses
- Identifying factors that impact decision-making during an emergency

## **File Format**

This training presentation was developed as a PowerPoint® file with Microsoft® Office 2007 using a Microsoft® Windows Vista® operating system. The file formats for this presentation include Microsoft® Office 2007 and Microsoft® Office 1997-2003.

## **TRAINING GUIDE**

This section presents each slide of the training presentation and includes discussion points and activities that should be completed to reinforce the content of the slide. Information about the activities, including answers where appropriate, are found immediately following the slide. Handouts are included in the next section of this Guide.

This training was designed as a single 90 to 120-minute presentation. However, it can be given in two sessions. The second case study presented at the end of the training can be used as a homework assignment and then discussed in a follow-up session if the training is given in two sessions.



## Decision-Making and Emergency Responses



### Discussion Points

- What role does decision-making play during a mine emergency?
- Why is it important to make effective decisions during a mine emergency?

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## Objectives

- Understand the decision-making process
- Apply a model for decision-making to emergency responses
- Describe the impact of an emergency environment on decision-making

### Discussion Points

- How do people make decisions?
- Is there a model that can be used to make decisions?
- What is different about making decisions during an emergency compared to a non-emergency situation?



## Basics of Decision-Making

### Discussion Points

This section presents a model for decision-making and provides detailed information about each step of the process.

## Definitions



- Problem-solving
  - Set of activities designed to analyze a situation systematically and generate, implement, and evaluate solutions
- Decision-making
  - A mechanism for making choices at each step of the problem-solving process

Decision-making is part of problem-solving and occurs at every step of the problem-solving process.

### Discussion Points

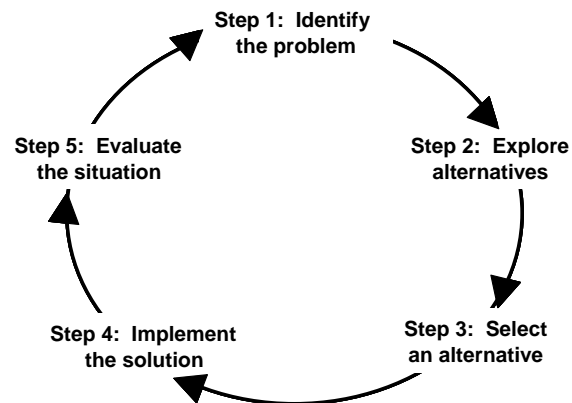
- Is there a difference between problem-solving and decision-making?
- Decision-making is about making choices.
- Decision-making occurs at every step of problem solving. (1)

### Activity:

Ask the class to define an “effective” decision and would this definition be different during an emergency? Some responses could include:

- The decision accomplishes a specific objective or mission.
- The decision is made in a timely manner.
- The decision uses resources wisely (has minimal impact on individuals implementing the decision).
- The decision minimizes damage.
- The decision keeps everyone safe.

## Problem-Solving Model



### Discussion Points

- The five-step model shown has proven effective in emergency situations.
- When using this model, each step may be completed quickly, but every step must be considered.
- It is not necessary to document each step, but it is important to think through every step. (1)

### Activity:

Yellow Light Exercise – When approaching a traffic signal and the light turns yellow, two alternatives are presented: speed up or slow down.

## Step 1: Identify the Problem

- Problem: A situation or condition that is considered undesirable that will exist in the future
- Problem vs Solution
  - Not having a mine rescue team vs not having an effective emergency response process
- Assess the problem
  - What is happening or not happening?
  - Who is involved?
  - What are the potential consequences?



### Discussion Points

- Problem identification is undoubtedly the most important—and the most difficult—step in the process. All subsequent steps will be based on how you define and assess the problem at hand.
- A **problem** is a situation or condition that will exist in the future that is considered undesirable.
- **Problem or Solution?** In carrying out Step 1, you must distinguish between a *problem* and its *solution*. The most common error in problem solving is defining problems in terms of their solutions. Sometimes people think that they are articulating problems when actually they are stating a potential solution. (1)

Here's an example: Someone might say, "The problem is that we don't have a mine rescue team." The problem, however, is not that there is not a mine rescue team.

The problem is really that there is not an effective emergency response process that has been developed and implemented.

Establishing a mine rescue team is part of the solution.

- Identifying the problem also involves analyzing the situation to determine the extent of the problem. Problem parameters include:
  - What is happening (and is not happening)
  - Who is involved
  - What the stakes are (1)

**Handout:** Checklist for Identifying, Defining, and Analyzing Problems (presents a set of questions that can help define a problem accurately).

## Step 2: Explore Alternatives

- Involves two tasks:
  - Develop alternatives
  - Evaluate alternatives



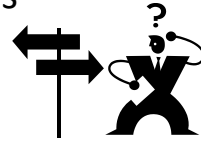
### Discussion Points

- The second step in the decision-making process is to explore alternative solutions to the problem identified in Step 1.
- This step really consists of two parts or tasks:
  1. Developing alternatives
  2. Evaluating alternatives (1)



## Developing & Evaluating Alternatives

- Processes to develop alternatives
  - Brainstorming
  - Surveys
  - Discussion groups
- Evaluate alternatives
- Identify contingencies – what could go wrong with each alternative



Case Study 1 – Develop alternatives

### Discussion Points

- Three ways to generate alternatives.
  - **Brainstorming** can be done individually or in a group. Brainstorming requires an environment in which the participants (individuals or group members) are free to “think out loud.” Participants call out as many ideas as possible. No evaluation or judging of ideas is permitted so as to encourage the free flow of creative ideas. These ideas are documented. Only after all ideas are presented should an evaluation of the ideas be conducted.
  - **Surveys** economically tap the ideas of a large group of respondents. Surveys present respondents with the problem and a series of alternative solutions.

- **Discussion groups** should consist of those who are directly involved in decision-making. In generating alternatives, the group members should:
  - Be comprehensive.
  - Avoid initial judgments (as in brainstorming).
  - Focus on the problem, not on the personalities of the people involved in the decision-making process. (But be sensitive to the impact of personalities on the process.)
- Suggested solutions must then be evaluated. A part of the evaluation is identifying contingencies – what could go wrong. Think in terms of Murphy’s Law – if anything can go wrong, it will – and identify what could get in the way of solving the problem you are facing. (1)

### **Case Study 1: Develop Alternatives**

This case study provides an opportunity to examine a problem and generate alternative solutions. Read the case study, then identify the problem and develop as many alternative solutions as you can.

### **Handout: Criteria for Evaluating Alternatives**



## Case Study 1 - What Are Your Options?

Auburn, Maine is a city of 24,000 located on the Androscoggin River, 50 miles north of Portland. Like much of southern Maine, Auburn has a growing population of retirees and elderly persons, many of whom reside in assisted-living communities.

It is early December, and much of southwestern Maine has been under the influence of a low-pressure system. Unlike most nor'easters that occur regularly this time of year, however, this system features warm air aloft with below-freezing surface temperatures. Thus, the rain that is falling is freezing on roads, trees, and electric lines. Electricity has been interrupted to a large portion of the city as wires collapse under the increasing weight of the accumulating ice.

At 11:00 p.m., the local emergency manager receives a call forwarded from emergency dispatch stating that the Owl's Nest nursing home's generator has failed. Owl's Nest is a nursing home, assisted-living community of approximately 250 residents. Of those, approximately 80 have been affected by the generator failure. These patients are in the nursing home portion of the facility, and many are chronically ill and very susceptible to the effects of the cold and dampness. For now, the Owl's Nest administrator has gathered the affected residents in the recreation room and is using blankets to keep them warm. This is not a good long-term option, however, because the temperature is expected to drop into the teens by morning.

NOTE: This case study was obtained from Reference 1.



## Case Study 1 - What Are Your Options?

### Answers to the Case Study

#### What is the problem in this case study?

If you determined that the problem in this case study centers around how to keep the nursing home residents warm, your answer is correct. (Note: If your problem statement centers on either the weather or the failed generator, please review the problem identification section of this unit again. Both the weather and the failed generator are causes of the current problem.)

#### What alternatives are available?

Some of the options that you may have developed for this case study could be:

- Evacuate the affected residents to another portion of the facility or to a shelter.
- Bring in more blankets, hot drinks, etc., to keep the residents warm.
- Bring in a portable generator and commercial space heaters.

You may have developed other alternatives as well. Remember, at this point in the problem-solving process, you should be generating alternatives only, not evaluating the feasibility of the alternatives.

## Step 3: Select Alternative

- Alternative selected should have the most advantages and the fewest disadvantages
- Consider how to implement alternative – do a “reality check”
- Outside factors that need to be considered when selecting alternative
  - Political, safety, financial, environmental, ethical



Case Study 1 – Select alternative



### Discussion Points

- Select one of the alternatives explored in Step 2 for implementation. After each alternative has been evaluated, one should stand out as having the most advantages and fewest disadvantages.
- Implementing the solution may not be easy. Carefully consider how the solution will be implemented before finalizing a selection.
- Complete a “reality check” to identify and evaluate the possible consequences of implementing the solution.
- When selecting an alternative, consider if any of these factors affected your decision to select a specific alternative or solution:
  - Political factors
  - Safety factors
  - Financial factor
  - Environmental considerations
  - Ethical factors

Not all of these factors may be readily recognizable. As you examine the situation and apply the problem-solving model, be alert for these potential limits on the solutions that you can implement. (1)

**Case Study 1:** Selecting alternatives (Use alternatives developed for previous case study exercise.)

**Handout:** Selecting Best Alternative

## Step 4: Implement the Solution

- Develop an action plan
- Determine objectives
- Identify needed resources
- Build a plan
- Implement the plan



Case Study 1 - Implementing plan

### Discussion Points

The fourth step involves five subparts:

- **Develop an action plan.** State who has to do what, with what resources, by what time, and toward what goal. Identify who must track the progress of the implementation.
- **Determine objectives.** Objectives are measurable targets that are:
  - Used to monitor progress and establish priorities.
  - Based on analysis of the situation and contingencies.
- **Identify needed resources.** Resources include people, information (data), and things.

Determine:

- What resources do I need?
- Where will I get them?
- How long will it take?

- What can others offer?
- Are there any special requirements?
  
- **Develop a plan.** It should state:
  - Who will do what (and with whom) ...
  - By when
  - Where
  - How

Remember: The plan must be communicated to all parties involved!

- **Implement the plan.** Use the action plan to put the decision in place. (1)

**Case Study 1:** Implementing plan (Use the alternative selected in the previous case study exercise.)

**Handout:** Action Planning Checklist



## Step 5: Evaluate the Solution

- Monitoring progress...
  - Has the situation changed?
  - Are more resources required?
  - Is a different alternative solution required?

**Problem-Solving is not complete unless the solution is evaluated and results are fed back into the process**

### Discussion Points

Solutions must be evaluated to determine if:

- problem has been resolved or additional actions are needed
- the situation has changed
- more resources are needed (1)

**Handout:** Checklist for Evaluating the Results

## **Approaches to Decision-Making**

### **Discussion Points**

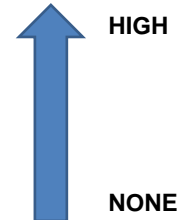
This section discusses several different approaches to decision-making and potential issues when decisions are made by a group of people rather than an individual.

## Approaches to Decision-Making

TYPE OF APPROACH  
TO DECISION-MAKING

AMOUNT OF CONTROL LEADER  
HAS OVER THE DECISION

- Individual
- Individual with consultation
- Group
- Delegation



Leader retains ultimate responsibility for decision.

### Discussion Points

- Four approaches of decision-making
  - Based on who makes the decision
  - Depending on the approach, the amount of control that the leader has over the decision drops from total to almost none. However, the leader retains ultimate responsibility.
- During some emergencies, a high degree of coordination is required. In this case, group-decision-making would be appropriate. There are other times, however, when a command decision must be made by only the leader. Several factors affect whether a decision should be made by an individual or a group.
  - **Individual Decision-Making:** In individual decision-making, the leader makes the decision alone, and input from others is limited to collecting relevant information.

- **Decision-Making Through Consultation:** In consultation, the leader shares the issue with others – requesting ideas, opinions, and suggestions – but then makes the decision. The leader considers the input of others, but the final decision may or may not be influenced by it.
- **Group Decision-Making:** In this approach, the leader works with others until a consensus is reached. Everyone's opinion and point of view is considered. Consequently, group members buy into the final decision and commit to supporting its implementation.
- **Delegating the Decision:** When delegating a decision, the leader sets the parameters, then allows someone else to make the final decision. Although the leader does not make the decision, he or she supports it. (1)

## Selecting Decision-Making Approach

- Amount of time
- Expertise of decision-maker / group
- Is the decision complex with many solutions
- Does the group share organizational goals
- Is commitment to the decision by others critical to success of the decision
- Will decision impact a few or many other groups/organizations



### Activity – Selecting Approach

#### Discussion Points

Selection of a decision-making approach should consider these factors:

- How much time is available to make a decision
- How complex the decision is
- Level of expertise of decision-maker and group
- If implementation of the decision requires cooperation of other groups
- Impact of decision on other groups or organizations (1)

#### Activity:

Review three different emergency situations and decide:

- How should this decision be made?
- What is your rationale for selecting this decision-making process?

**Handout:** Selecting a Decision-Making Approach

## Selecting Decision-Making Approach

### Individual or Group?

#### **Scenario 1: Chlorine Truck Accident**

You are the emergency manager for Perry County, Pennsylvania, a rural county near Harrisburg, PA. You have just been notified that a truck loaded with liquid chlorine has overturned along State Route 15 at New Buffalo. State Route 15 runs in a north-south direction along the Susquehanna River and is heavily traveled by trucks. New Buffalo is a small town of approximately 400 on the western shore of the Susquehanna. Two miles to the southeast of New Buffalo lies another small town, Amity Hall.

The temperature today is 85 degrees and the wind is blowing from the northeast at 10 miles per hour, gusting to 15 miles per hour.

You are not sure if the truck container is leaking but need to make a decision about whether to evacuate the area under a possible chlorine plume.

1. How should this decision be made?
  
2. What is your rationale for selecting this decision-making process?

NOTE: This exercise was obtained from Reference 1.







### **Answers to Scenario 1**

If you determined that the decision on what to do in the chlorine emergency is individual decision-making, you are correct. Unless information is available immediately, there is no time to gather input from responders before the wind carries the chlorine gas to Amity Hall. Given the weather conditions and the toxicity of chlorine, a decision must be made immediately.

### **Answers to Scenario 2**

There are two possible correct answers for this scenario, depending on the assumptions you made as you read. For example, if you determined that the decision about shelter locations should be made individually through consultation or through group decision-making, you are correct. Ultimately, the Red Cross shelter coordinator will be responsible for shelter selection. Therefore, he or she could quite reasonably gather all of the necessary information, then select the shelters. If, however, there are additional factors that make it important to gain the group's agreement on shelter selection, a group decision-making process might be preferable. The decision clearly will not be made individually, because the shelter coordinator has called a meeting. It is also unlikely that the decision would be delegated.

### **Answers to Scenario 3**

If you determined that the decision of whether or not to allow sandbagging would be made through consultation, you are correct. There are clearly too many stakeholders to make the decision individually. On the other hand, because the safety of the citizenry and first responders is at stake, the decision ultimately belongs to the emergency manager. Because there is some time available before a decision has to be made – and because tensions are running high – it is best to get input from first responders and key stakeholders (i.e., the community groups) before making a decision based on the facts of the situation.

## Successful Group Decision-Making

- Avoid “Groupthink”
  - Occurs when members of group let their need to agree with other members interfere with their ability to think critically about the decision
- Conditions leading to groupthink:
  - Overestimation of the group’s ability & power
  - A “we” vs “they” attitude
  - Pressure for conformity

### Discussion Points

- To be successful, group decision-making requires good leadership. There are requirements necessary for group decision-making, such as adequate time.
- There are also particular pitfalls unique to group decision-making, such as “groupthink.”

“Groupthink” occurs in a cohesive group when members let their need to agree with each other interfere with their ability to think about the decision critically. Three conditions may lead to “groupthink”:

- Overestimation of the group’s ability and power:
  - Allows members to ignore warning signals.
  - Allows members to feel complacent.
  - Could result from an overreaction to low self-esteem resulting from recent failures or a difficult task.

- A “we” vs. “they” attitude:
  - Leads to stereotypes of outsiders.
  - Encourages rationalization of decisions.
  
- Pressure toward conformity:
  - Results from direct pressure applied by the group to members who try to disagree.
  - Results in members who agree to remain as part of the group. (1)

## **Groupthink and Emergencies**

- Groupthink more likely to occur during emergencies
  - Time pressure forces quick decisions
  - Emergency response personnel have a high degree of cohesion.
- To prevent Groupthink
  - Encourage dissenting opinions
  - Discuss the need to remain open to other alternatives
  - Evaluate decision-making patterns for previous emergencies and take corrective actions

### **Discussion Points**

- Groupthink is more likely to occur in an emergency situation for two reasons:
  - Time pressure often requires quick decisions.
  - Personnel responding to disasters typically have a high degree of cohesion.
- To minimize groupthink during an emergency:
  - Encourage dissenting opinions.
  - Discuss the need to remain open to possibilities.
  - Examine patterns of decision-making during previous emergencies, analyze them, and then take corrective measures to prevent future groupthink. (1)

## Consensus

- Group members actively support the decision of the group, even though it might not be their personal choice
- Consensus is not 100% agreement
- Tips for achieving consensus
  - Avoid win-lose techniques
  - Look for alternatives that are second best
  - Do not encourage harmony as an objective



### Discussion Points

- Consensus is not the same as 100-percent agreement.  
In consensus, group members determine that they actively support the decision of the group, even though it might not be their personal choice.
- **Tips for reaching consensus**
  - Don't employ win/lose techniques, such as voting or negotiating favors back and forth.
  - Look for alternatives that are next most acceptable as ways to break a stalemate.
  - Don't encourage members to give in to keep harmony. (1)

## Effective Decision-Maker

### Definition

- Makes decisions with competence and confidence
- Most decisions are correct

### Attributes

- Knowledge
- Initiative
- Advice-seeking
- Comprehensiveness
- Currency
- Flexibility
- Good judgment
- Calculated risk-taking
- Self-knowledge

### Discussion Points

- **What Is an Effective Decision-Maker?**

Think of someone you know who is a good decision-maker. What makes him or her effective?

- Makes decisions with competence and confidence.
- Most decisions work out right.

- **Attributes of an Effective Decision-Maker**

What is underlying that decision-making skill? Research has shown that effective decision-makers share several attributes. Effective decision-makers tend to have the following attributes:

- **Knowledge.** The most important requirement for making sound decisions is a deep understanding of all factors. The soundness of the decision depends on how informed the decision-maker is.

- **Initiative.** Effective decision-makers assume responsibility for beginning the decision-making process and seeing it through. They take an active part in making things better.
- **Advice-seeking.** Good decision-makers know that they need help from others. They identify people who can make specific contributions to the decision-making process and ask them for their advice and counsel.
- **Selectivity.** Effective decision-makers seek pertinent data. They avoid getting bogged down by extraneous facts and figures.
- **Comprehensiveness.** On the other hand, they look at all available options and consider every possible alternative so as to make the best choice.
- **Currency.** Good decision-makers consider current conditions and take advantage of opportunities that exist at the time.
- **Flexibility.** Effective decision-makers remain open-minded about new concepts and ideas. They are willing to change course or try a different approach if better results seem likely.
- **Good judgment.** Sound decisions will not always result from merely following procedures. Decision-makers must exercise their best judgment in considering factors particular to the situation.
- **Calculated risk-taking.** The risks and results of various alternatives must be weighed and the consequences accepted, whether positive or negative.
- **Self-knowledge.** Good decision-makers know their own abilities, biases, and limitations.

Additionally, effective decision-makers will begin each decision process with a review of the information at hand (e.g., the EOP, SOPs, etc.) If the planning process is complete, many common situations will have been anticipated, and procedures for what to do in those situations will be in place. (1)



## **Decision-Making and Emergencies**

### **Discussion Points**

This next section addresses how decision-making is affected during emergencies, and factors that you can control to improve your ability to make decisions.



## Main Factors Affecting Decision-Making during Emergencies

- Stress
- Time pressures
- Consequences of wrong decision – life or death
- Sleep deprivation and fatigue



### Discussion Points

- Decisions can be as simple as delegating a routine task or as complex as responding to a major crisis.
- Decision-making in a crisis is made more difficult because of many factors. Some of these factors include:
  - Stress
  - Time pressures
  - Consequences of wrong decision – life or death
  - Sleep deprivation and fatigue (1)

## Other Factors Affecting Decision-Making During Emergencies

- Possible political pressures
- High or low blood sugar levels as a result of erratic eating patterns
- Caffeine



### Discussion Points

- During an emergency, pressure will be placed upon you to quickly make decisions. Different interests may want a decision that agrees with their particular view.
- It is also important to be aware of how you are physically feeling, particularly during prolonged emergencies. You must stay focused to enable good decision-making. It is important to eat regularly, eat healthy foods, and avoid caffeine. (1)

## Decision-Makers Under Stress

- Experience conflict with other key players
- Perceive selectively because of sensory overload (miss important information)
- Experience perception distortion and poor judgment
- Be less tolerant of ambiguity (make premature decisions)
- Experience decreased ability to handle difficult tasks and work productively
- Experience greater tendency toward aggression and escape behaviors.



### Discussion Points

- Decision-makers experiencing stress can react in multiple ways.
- Examples:
  - Having conflicts with other team members
  - Focusing only on select information, such that he/she may miss important information
  - Experiencing perception distortion
  - Exercising poor judgment
  - Making decisions prior to resolving conflicts in information
  - Being unable to handle difficult decisions
  - Demonstrating aggressive behaviors (1)

**Activity:**

During a training exercise, the ICC started to receive too much information and was not able to process all of the data. Consequently, the ICC directed one of two mine rescue teams to move to another location, and then directed that team to return to their original location without completing any relevant tasks. The captain of this mine rescue team initiated an argument with the ICC and then left the mine. They abandoned the rescue effort.

What happened in this situation? What should have the ICC done in this case?

## Decision-Makers Under Stress May:

- Consider only immediate survival goals, sacrificing long-range considerations
- Choose a risky alternative
- Get tunnel vision
- Succumb to “groupthink”

### Discussion Points

- Additional reactions to stress include:
  - Thinking in the short-term
  - Inadequately assessing risk
  - Having tunnel vision
  - Accepting "groupthink" (1)

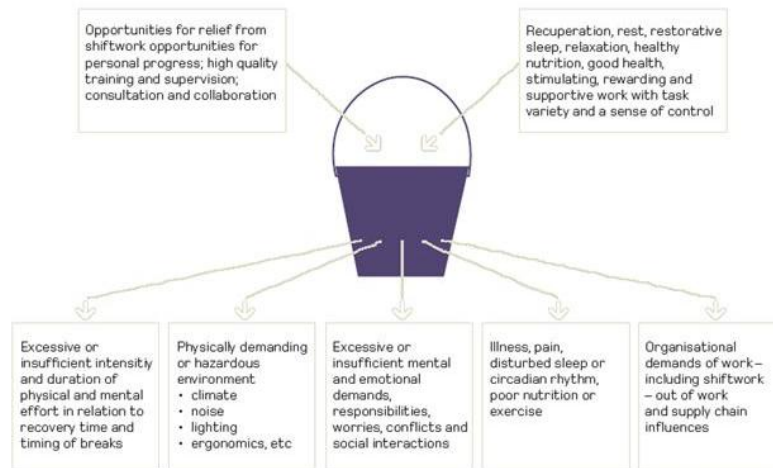
## How to Reduce Stress

- Be Systematic - follow problem-solving model
- Delegate some tasks – rely on experts
- Attend training
  - Stressors are no longer stressful
- Take breaks / sleep / eat nutritious foods

### Discussion Points

- Ways to avoid stress or reduce stress levels include:
  - Following the problem-solving model
  - Delegating tasks
  - Attending training that involves role playing as a decision-maker – practice making decisions makes it easier during real emergencies
  - Taking care of yourself by taking breaks, sleeping, and eating nutritious foods (1)

# Bucket Model of Fatigue



Source: New Zealand Dept. of Labour

## Discussion Points

- Factors that cause fatigue:
  - Excessive physical or mental effort relative to recovery time and breaks
  - Physically demanding or hazardous environment
    - heat stress
    - cold stress
    - noise
    - poor lighting
    - repetitive motions
    - excessive physical exertions
  - Excessive mental and emotional demands, responsibilities, worries, conflicts and social interactions
  - Illness/Pain
  - Disturbed sleep or circadian rhythm
  - Poor nutrition

- Exercise
- Organizational demands of work
  - Shiftwork/overtime
    - ✧ Changing shifts
    - ✧ Rotating shifts backwards (night-afternoon-morning)
    - ✧ Switching to day schedule on days off
  - Lack of breaks
  - Reduced number of days off
  - Being out of work
- Factors that reduce fatigue:
  - Relief from shiftwork
  - High quality training
  - High quality supervision
  - Rest
  - Restorative sleep
  - Good health
  - Good nutrition
  - Rewarding work
  - Sense of control (2)



## Fatigue and Performance

- 24 hours of sustained wakefulness, performance decreased to a level equivalent to a blood-alcohol level of .10 percent
  - Details are missed
  - Accuracy is impaired
  - Performance is slowed

### Discussion Points

- The effect of sleep deprivation related to performance is comparable to drinking alcohol. (3)

### Note:

During this study, the task tested was tracking a moving circle on a computer screen.

## Decision Environments

### Ideal Environment

- All possible information is known
- All information is accurate

### Emergency Environment

- Lack of information
- Conflicting information
- Information may not be accurate
- Uncertainty

**Hindsight is better than Foresight in making decisions!**

### Discussion Points

- Every decision is made within a decision environment - the collection of information, alternatives, values, and preferences *available at the time of the decision*.
- An ideal decision environment includes all possible information, all of it accurate, and every possible alternative.
- Both information and alternatives are constrained because the time and effort to gain information or identify alternatives are limited.
  - The time constraint simply means that a decision must be made by a certain time.
  - The effort constraint reflects the limits of manpower, money, and priorities. (You wouldn't want to spend three hours and half a tank of gas trying to find the very best parking place at the mall.)
- Since decisions must be made within this constrained environment, *the major challenge of decision-making is uncertainty*. A major goal of decision analysis is to reduce uncertainty. Because one can almost never have all information needed to make a decision with certainty, so most decisions involve an undeniable amount of risk.

- The fact that decisions must be made within a limiting decision environment suggests two things.
  - First, hindsight is so much more accurate and better at making decisions than foresight. (As time passes, the decision environment continues to grow and expand. New information and new alternatives appear – even after the decision must be made. Armed with new information after the fact, the hindsighters can many times look back and make a much better decision than the original maker, *because the decision environment has continued to expand.*)
  - Second, since the decision environment continues to expand as time passes, it is often advisable to put off making a decision until close to the deadline. (Information and alternatives continue to grow as time passes, so to have access to the most information and to the best alternatives, do not make the decision too soon. Now, since we are dealing with real life, it is obvious that some alternatives might no longer be available if too much time passes; that is a tension we have to work with, a tension that helps to shape the cutoff date for the decision.) (4)

## Delaying Decisions

### Benefits

- Decision environment will be larger – have more information
- New alternatives may be identified
- Preferences may change

### Risks

- Decision maker may become overwhelmed
- Some alternatives may no longer be available
- Conditions may change

### Discussion Points

- Delaying a decision as long as reasonably possible provides three benefits:
  - The decision environment will be larger, providing more information. There is also time for more thoughtful and extended analysis.
  - New alternatives might be recognized or created.
  - The decision-maker's preferences might change. With further thought, wisdom, and maturity, you may decide not to buy car X and instead to buy car Y.
- Delaying a decision involves several risks:
  - As the decision environment continues to grow, the decision-maker might become overwhelmed with too much information and either make a poorer decision or else face decision paralysis.
  - Some alternatives might become unavailable because of events occurring during the delay. In a few cases, where the decision was between two alternatives (attack the

- pass or circle around behind the large rock), both alternatives might become unavailable, leaving the decision-maker with nothing.
- Passing up a bargain and then when you go back to buy the item, it is sold out.
- In a competitive environment, a faster rival might make the decision and gain advantage.
- Another manufacturer might bring a similar product to market before you (because that company didn't delay the decision).
  - Opposing army might have seized the pass while the other army was "letting the decision environment grow." (4)

## Is Too Much Information Problematic?

- More time is needed to process additional information
- Information overload may occur (may forget pertinent information)
- Select only information that supports a preconceived solution
- Mental fatigue may occur
- Decision fatigue may occur



### Discussion Points

- Many decision-makers have a tendency to seek more information than required to make a good decision.
- When too much information is sought and obtained, one or more of several problems can arise.
  - A delay in the decision occurs because of the time required to obtain and process the extra information. This delay could impair the effectiveness of the decision or solution.
  - Information overload will occur. In this state, so much information is available that decision-making ability actually declines because the information in its entirety can no longer be managed or assessed appropriately. A major problem caused by information overload is forgetfulness. When too much information is taken into memory, especially in a short period of time, some of the information (often that received early on) will be pushed out. *The example is sometimes given of the man who spent the day at an information-heavy seminar. At the end of the day, he was*

*not only unable to remember the first half of the seminar but he had also forgotten where he parked his car that morning.*

- Selective use of the information will occur. That is, the decision-maker will choose from among all the information available only those facts that support a preconceived solution or position.
- Mental fatigue occurs, which results in slower work or poor quality work.
- Decision fatigue occurs where the decision-maker tires of making decisions. Often the result is fast, careless decisions or even decision paralysis – no decisions are made at all.
- The quantity of information that can be processed by the human mind is limited. Unless information is consciously selected, processing will be biased toward the first part of the information received. After that, the mind tires and begins to ignore subsequent information or forget earlier information. (Have you ever gone shopping for something when you looked at many alternatives – cars, knives, phones, TVs – only to decide that you liked the first one best?) (4)



## Case Study 2

### **Case Study:**

This exercise involves evaluating an underground mine following a mine fire. The evaluation consists of determining the hazards present, how the evaluation would proceed, and what conditions should be evaluated and reported, and the procedures that should be followed in resealing the area of the mine affected by the mine fire. Utilize the problem-solving model.

If time is limited, then the exercise can be shortened by reducing the number of tasks the recovery team must accomplish, or it can be a homework assignment.



## CASE STUDY 2

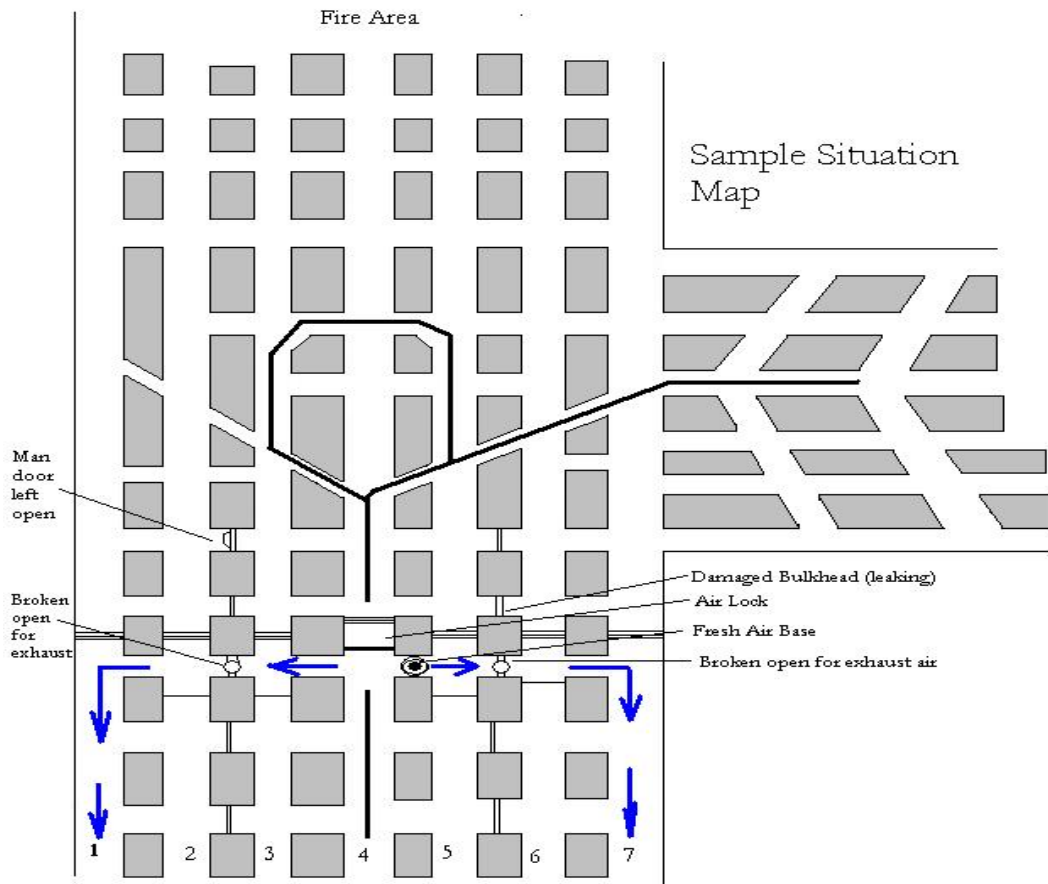
The team will practice assessing post disaster conditions to determine the hazards present and the procedures that should be followed in carrying out the recovery work.

### Scenario:

Because efforts to fight the fire in a single level mine have failed, an area of a mine has been sealed. The plan is now to reopen the sealed area by means of progressive ventilation. Recent air samples indicated no traces of CO in the sealed area and a low oxygen level. Another team has already constructed an air lock in No. 4 entry.

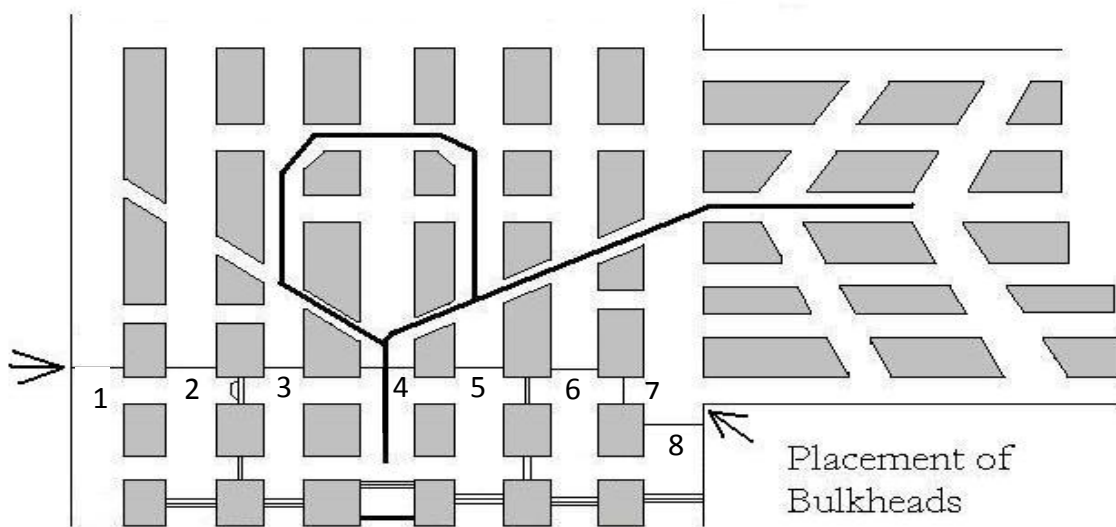
Assignment – Explore and assess conditions. Answer the following questions:

1. What hazards might you encounter as you explore the area?
2. How would you advance and what tests should you make as you advance?
3. What conditions should you be reporting on?
4. How many bulkheads are needed to reseal the unexplored area and where should the bulkheads be placed?



**Answers:**

1. May encounter:
  - a. Toxic or explosive gases, low oxygen levels
  - b. Weakened ground conditions (because of heat from fire)
  - c. Hot spots or smoldering material (could flare up into fires or cause a gas ignition)
2. How to advance:
  - a. Tie in all entries and crosscuts and take temperature readings, test the back and sides and test for gases as they advance.
  - b. Describe what order to explore the entries and crosscuts.
3. What to report:
  - a. Gas conditions
  - b. Ground conditions
  - c. Condition of ventilation controls
  - d. Condition of power lines, communication lines, or air or water lines in the area
4. How many bulkheads needed:
  - a. Eight – see maps.



## Discussion



## **HANDOUTS**

All handouts were obtained from Reference 1 and reformatted for generic use.

## Checklist for Identifying, Defining, and Analyzing Problems

Question	Yes	No
1. Is this a new problem?	<input type="checkbox"/>	<input type="checkbox"/>
2. Is the problem clearly and precisely stated?	<input type="checkbox"/>	<input type="checkbox"/>
3. What assumptions am I making about the problem? Are they true?	<input type="checkbox"/>	<input type="checkbox"/>
4. What would happen if <u>nothing</u> were done about this problem?		
5. Can the problem be restated in other terms? If yes, how?	<input type="checkbox"/>	<input type="checkbox"/>
6. What <u>data</u> are known that bear on the problem?		
7. Is the information accurate?	<input type="checkbox"/>	<input type="checkbox"/>
8. Are there any precedents or rules about other procedures that apply to the problem? If so, what precedents or rules apply?	<input type="checkbox"/>	<input type="checkbox"/>
9. What additional facts are needed to analyze the problem? (List)		
10. Is it possible to interpret the facts differently? How would that affect the problem's solution?	<input type="checkbox"/>	<input type="checkbox"/>
11. Do I have to make this decision, or does someone else? If this decision is someone else's to make, whose is it?	<input type="checkbox"/>	<input type="checkbox"/>

## Criteria for Evaluating Alternatives

Step	Questions to Ask
1. Identify Constraints	Do any of the following factors serve as a limitation on this solution? <ul style="list-style-type: none"><li>▪ Technical (limited equipment or technology)</li><li>▪ Political (legal restrictions or ordinances)</li><li>▪ Economic (cost or capital restrictions)</li><li>▪ Social (restrictions imposed by organized groups with special interests)</li><li>▪ Human resources (limited ability of relevant people to understand or initiate certain actions)</li><li>▪ Time (requirements that a solution be found within a prescribed time period, thereby eliminating consideration of long-range solutions)</li></ul>
2. Determine Appropriateness	Does this solution fit the circumstances?
3. Verify Adequacy	Will this option make enough of a difference to be worth doing?
4. Evaluate Effectiveness	Will this option meet the objective?
5. Evaluate Efficiency	What is the cost/benefit ratio of this option?
6. Determine Side Effects	What are the ramifications of this option?

## Selecting Best Alternative

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

**If you have more than one clear solution, can any be combined?**

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

<b>Solution:</b>	
<b>Limiting Factors:</b>	
<b>Other Factors:</b>	Political:
	Safety:
	Financial:
	Environmental:
	Ethical:
	Other:

**If you have more than one clear solution, can any be combined?**



## Action Planning Checklist

*Use the following questions to help you develop any details needed to plan for implementation of the decision.*

1. Will the decision be implemented as it stands or will it have to be modified?

- As it stands
- With modifications (List)

2. Does the decision fit the problem and conditions specified earlier?

- Yes
- No

3. Is this still the best option?

- Yes
- No

(If no, what has changed?)

4. What are the side effects of this decision?

5. Who is responsible for taking action?

6. Are the specific targets to be accomplished and the techniques for accomplishing them defined?

Yes

No

If no, what targets and techniques required further definition?

7. What specific activities must take place to implement this decision? In what sequence?

8. What resources will be needed to implement this decision?

9. What is the schedule or timetable for implementation of each step in the action plan?

## Checklist for Evaluating the Results

*Use the questions below as a guide for evaluating the results of your decision-making.*

Question	Yes	No
1. How will you know if the proposed decision has worked?		
Is it measurable? If yes, how?	<input type="checkbox"/>	<input type="checkbox"/>
2. Does the decision and action plan make use of existing channels of communication to generate feedback?	<input type="checkbox"/>	<input type="checkbox"/>
3. Will the feedback test the effectiveness of the decision?	<input type="checkbox"/>	<input type="checkbox"/>
4. Will the feedback be sufficient to reflect changing circumstances and conditions that might occasion the need to modify the plan?	<input type="checkbox"/>	<input type="checkbox"/>
5. Is the solution achieving its purpose?	<input type="checkbox"/>	<input type="checkbox"/>
6. Is timely information generated so that it can be supplied to operational, administrative, and policy units in the jurisdiction?	<input type="checkbox"/>	<input type="checkbox"/>

## Selecting a Decision-Making Approach

Use the questions below as a guide to developing a decision-making approach. Answer each of the questions below.

- If the response to question 1 is “No,” it may be preferable to make the decision individually or in consultation with key players.
- If the response to question 2 is “No,” it may be preferable to make the decision through consultation, with a group, or by delegation.
- If the majority of your responses are “Yes,” group decision-making may be preferable.
- If the majority of your responses are “No,” individual decision-making may be preferable.

Question	Yes	No
1. Do you have a reasonable amount of time to make the decision?	<input type="checkbox"/>	<input type="checkbox"/>
2. Does the leader have enough expertise to make a good decision?	<input type="checkbox"/>	<input type="checkbox"/>
3. Do the potential group members have enough expertise to make a good decision?	<input type="checkbox"/>	<input type="checkbox"/>
4. Do the others involved share the organizational goals to be attained by solving the problem?	<input type="checkbox"/>	<input type="checkbox"/>
5. Is the decision complex with many possible solutions?	<input type="checkbox"/>	<input type="checkbox"/>
6. Is commitment to the decision by other people critical?	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the decision likely to cause serious conflict among the people affected by it?	<input type="checkbox"/>	<input type="checkbox"/>
8. Will the decision directly impact many agencies, individuals, or community members?	<input type="checkbox"/>	<input type="checkbox"/>
9. Will the decision directly impact only a select few?	<input type="checkbox"/>	<input type="checkbox"/>

## QUIZ

The following questions are intended to evaluate the knowledge gained from participating in this training. These questions can be used as a stand-alone quiz, or can be incorporated into a larger examination if this training presentation is given as a single session of a larger training course

1. The critical first outcome in the problem-solving process is:
  - a. A well-analyzed solution
  - b. A clearly identified problem statement
  - c. A challenge that embodies an undesirable situation
  - d. A definition of the scope of the issue.
  
2. One cause of “groupthink” is:
  - a. Genuine consensus
  - b. Inclusiveness
  - c. Lack of power
  - d. Pressure toward conformity
  
3. If limited time is a factor in decision-making, it is preferable to have a/an \_\_\_\_\_ make the decision.
  - a. Group
  - b. Individual
  
4. Decision-making is best done \_\_\_\_\_ an emergency.
  - a. Before
  - b. During
  
5. The following is not an impediment to decision-making in a crisis:
  - a. Lack of information
  - b. Perceived or real time pressure
  - c. An action plan
  - d. Conflicting political agendas
  
6. Problem-solving is part of decision-making.
  - a. True
  - b. False
  
7. Number the five steps in the problem-solving model below in the correct order.  
\_\_\_\_\_ Explore alternatives  
\_\_\_\_\_ Evaluate the solution  
\_\_\_\_\_ Implement the solution  
\_\_\_\_\_ Identify the problem  
\_\_\_\_\_ Select an alternative

8. Step 4, Implement a Solution, involves all of the following except:
- a. Develop an action plan
  - b. Determine objectives
  - c. Identify needed resources
  - d. Evaluate the results

*Match the attribute in Column A with the description in Column B.*

- |                                  |  |
|----------------------------------|--|
| 9. _____ Knowledge               | a. Effective decision-makers remain open-minded about new concepts and ideas. They are willing to change course or try a different approach if better results seem likely.                       |
| 10. _____ Advice-seeking         |  |
| 11. _____ Comprehensiveness      |  |
| 12. _____ Flexibility            | b. The most important requirement for making sound decisions is a deep understanding of all factors. The soundness of the decision depends on how informed the decision-maker is.                |
| 13. _____ Calculated risk-taking |  |
|                                  | c. Good decision-makers look at all available options and consider every possible alternative so as to make the best choice.   |
|                                  | d. The risks and results of various alternatives must be weighed and the consequences accepted, whether positive or negative.  |
|                                  | e. Good decision-makers know that they need help from others. They identify people who can make specific contributions to the decision-making process and ask them for their advice and counsel. |

14. Fatigue can affect performance by:

- a. Missing details
- b. Improving accuracy
- c. Increasing performance levels
- d. Improving reaction time

15. Decision-environments during emergencies are usually defined by:

- a. Sufficient information
- b. High level of certainty
- c. Accurate information
- d. Conflicting information

## ANSWERS

1. b
2. d
3. b
4. a
5. c
6. b
7. 2 5 4 1 3
8. d
9. b
10. e
11. c
12. a
13. d
14. a
15. d



## REFERENCES

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(<http://training.fema.gov/EMIWeb/IS/is241.asp>)
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(<http://www.osh.dol.govt.nz/publications/booklets/shiftwork-fatigue2007/page1.shtml>)
3. Williamson, AM and Feyer, AM. Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. *Occup Environ Med* 57:649-655, 2000.
4. Harris, Robert. *Introduction to Decision-Making, 2008*.  
(<http://www.virtualsalt.com/crebook5.htm>)

## OTHER RESOURCES

1. Edmund, Norman. *Decision-Making: A guide to Creative Decision-Making and Critical Thinking*. (<http://www.decisionmaking.org/decisionmakingbooklet.pdf>)