Annotated Bibliography of Relevant Issues in Human Escape and Rescue outside of the Mining Industry

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1 Executive Summary

The NIOSH Pittsburgh Research Laboratory, desiring a more complete and accurate understanding of relevant issues in human escape outside of the mining industry, requested the preparation of a written report and annotated bibliography summarizing the available documentation on escape and rescue strategies, practices, and regulations currently in use in the United States industry and the military the could be relevant to the mining industry. An extensive literature search found 293 documents of potential relevance to NIOSH/PRL. These documents include refereed journal papers, technical reports, books, trade magazines and government documents. Non mining documents originate in a variety of domains such as the military, aviation, maritime, rail, construction, offshore, and nuclear and describe issues surrounding a variety of events such as avalanches, cave ins, transportation accidents, building collapses, mountain rescues, and trench or well collapses.

The report is presented in four sections. This Executive Summary is Section 1. Section 2 provides a detailed summary of 18 papers and books that make important contributions thought to be most relevant to the NIOSH/PRL domain. Section 3 provides short bibliographic references to all 293 primary sources. Section 4 structures these documents, providing abstracts when available, into the following five primary categories, and forty one sub categories. The numbers in parenthesis in the following table indicate the number of information sources found in each category.

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1 Executive Summary

Each of these five categories have major themes of potential interest to the NIOSH/PRL. These themes are summarized here and discussed in more detail in the summary of significant papers in Section 2.

The first two themes, organizational issues and behavioral issues, emerged from our category 1, Personnel and Human Behavior, and category 2, Command Center and Control. The theme of many contributors is that improving the ability to manage high stress crisis situations requires more than doctrine and skill training. The literature strongly argues that attention must be given to organizational and behavioral issues such as team resource management, inter and intra organizational communications, organizational improvisation, stress management, personal leadership and emotional intelligence. 73 references to behavioral and organizational topics and 38 references on decision making processes and interpersonal relations are contained in the bibliography and 8 important papers are reviewed in sections 2.1 and 2.2 of this report.

The third theme is that progress is being made in the development of technology to support confined space evacuation, search and rescue operations. These advances include innovative methods of combining sensors with intelligent technology, development of remote operating vehicles, guiding evacuation using sound, and improved communication technology. 61 technology references are described in the bibliography and 5 important papers are reviewed in section 2.3.

There are 162 references to Rescue Team and Responder Strategies and Techniques. Two of the most significant sources are reviewed in section 2.4. The development of standards has become a critical part of the evolution of emergency and safety management. The bibliography contains 63 references to standards and the standard setting process and two of the most important contributions are reviewed in section 2.5.

Finally, the literature captures a number of case study descriptions of events that involved crisis management and/or rescues descriptions relevant to this report. These events include the Mann Gulch Fire, Piper Alpha fire/explosion, 9/11, Prinsendam fire, Estonia sinking, several well and trench rescues, a metro rail fire, Hurricane Katrina, Hanshin Earthquake and others.

This document is meant to be used and is designed to be easily accessible to users with differing interests. The user that wishes to perform a conventional search of the database by author will use the bibliography in section 3. Section 4 provides subject bibliographies by functional category. The user wishing to explore a specific topic will start with the subject bibliographies by functional category in Section 4. For example, a user interested in escape behavior could immediately access the 14 references and their links in section 1.2. A user wishing to acquaint her/himself with significant primary sources should read the reviews of the 18 papers described in Section 2.

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2 Important Contributions

The extensive literature search on relevant issues in human escape and rescue outside the mining industry revealed 293 documents of potential interest to the National Institute for Occupational Safety and Health Pittsburg Research Laboratory (NIOSH/PRL). These documents include refereed journal articles, conference proceedings, technical reports, books, trade magazines and government documents. The following libraries and information sources were used for this study:

- FEMA Library, Emmetsburg, MD
- Department of Transportation Library
- Hazlit, Natural Hazards Center Library, University of Colorado
- Disaster Research Center at the University of Delaware
- The George Washington University Library
- Google and Google Scholar

The retrieved references and documents were stored in Endnote X2, a commercial reference management software package. All documents have been classified into the five major categories and forty one subcategories. The category structure was based on the requirements outlined by NIOSH/PRL and is presented in detail in section 4. To facilitate the search for a relevant document the documents, if appropriate, were put into multiple categories and subcategories.

In this section we present those contributions thought to be most useful to the NIOSH/PRL domain. For each of the selected eighteen contributions we provide a summary review. Since most of these contributions are related to more than one category we identified the following five cross-cutting themes (number of contributions in braces).

- Organizational Issues (4)
- Behavioral Issues (4)
- Advanced Technologies (5)
- Rescue Strategies and Techniques (2)
- Standards and Standard Operating Procedures (3)

Each section starts with a list of the selected references followed by a summary of each contribution.

2.1 Organizational Issues

The following important contributions have been identified:

- Drabek, T. E. (1985). "Managing the Emergency Response." Public Administration Review **5**: 85-92.
- Sjöberg, M., C. Wallenius, et al. (2006). "Leadership in Complex, Stressful Rescue Operations: A Qualitative Study." Disaster Prevention and Management **15**(4): 576-584.
- Fraher, A. L. (2005). "Team Resource Management (Trm): A Tavistock Approach to Leadership in High-Risk Environments Resonances of 9/11." Organisational and Social Dynamics **5**(2): 163-182.
- Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

2.1.1 Drabek (1985)

Drabek, T. E. (1985). "Managing the Emergency Response." Public Administration Review **5**: 85-92.

Thomas Drabek was one of the first Social Scientists to examine in detail the organizational interactions during the response to large scale disasters. In this classic paper he describes how these organizational interactions are determined by the context in which they occur. He examines the influence of the localism, diversity of practice, and lack of standardization in the American emergency management scene. Progress has been made in all of these realms, particularly since 9-11, but the resulting fragmentation of effort is still characteristic of the response to large scale events. With this contextual background, Drabek examines who actually responds and how coordinating strategies are developed and infers implications of emergency management. His insights have formed the basis for much of the emergency management related social science research for over two decades. These insights include (pp 90-91)

- Search and Rescue actions following large scale events cannot be centrally coordinated and reflect the structural reality of a local, diverse and fragmented response
- Disaster demands will require emergency managers to adaptively change their response structure and operating systems. This dynamic is forced when intra-organizational and external influences pull toward decentralization while internal structure and systems are designed to support centralization

- The degree to which adaptive response networks emerge is determined by the type and scope of the event, the quality of pre-planning, and the pre-disaster existence and quality of interpersonal relationships.
- The immediate response is performed by core local government agencies. A critical task is the integration of these organizations with the Federal, state, and volunteer components that are mobilized to respond to the disaster. This is particularly difficult when "prior working relationships have been minimal (p. 91).
- The loosely coupled, decentralized nature of the American system is actually a strength. Drabek joins Russell Dynes and Henry Quarantelli in a criticism of attempts to impose rigid command and control systems on this decentralized system.

Drabek concludes that we should adopt strategies of team building, rather than imposition of command and control structures and that "administrative models of emergency management must mesh with the political and structural realities inherent in American society.

2.1.2 Sjöberg et al. (2006)

Sjöberg, M., C. Wallenius, et al. (2006). "Leadership in Complex, Stressful Rescue Operations: A Qualitative Study." Disaster Prevention and Management **15**(4): 576-584.

Sjoberg et al., noting a dearth of research linking performance with leadership during stressful events conducted a study, using the grounded theory approach, with the aim of developing "a theoretical understanding of leadership in stressful, complex, rescue operations. Their target population for this qualitative study were Swedish rescue services in four event types: a flood, a derailment of a train carrying cars of propane, a wildfire, and a building fire resulting in the death of a fire fighter. Twenty rescue operations commanders from these events were interviewed. The authors find that performance is directly related to the quality of pre-event working conditions and relationships, the ability of leaders to accurately appraise the situation, and the leader's stress reaction. A qualitative model is developed and potential performance problems are identified and discussed. The authors particularly note the persistence of problems caused by role shifts during long lasting operations, the application of procedures developed for routine events to complex events, and the inability to effectively integrate the expanded staffs required during the response to complex events. Although the research is very qualitative and constrained by a small sample size, it does provide empirical support to observations made by many social science observers of emergency operations.

2.1.3 Fraher (2005)

Fraher, A. L. (2005). "Team Resource Management (Trm): A Tavistock Approach to Leadership in High-Risk Environments Resonances of 9/11." Organisational and Social Dynamics **5**(2): 163-182.

Professionals in high risk/high hazard occupations undergo extensive skill training and performance evaluation. However, human errors that are not captured and corrected continue to occur in high performing groups such as airline crews, fire crews, and rescue teams, often leading to catastrophic consequences. Situations faced during crises situations are often unique and do not fit the experience of team members, requiring innovation and creativity under extreme stress. Amy Fraher (p. 165) states that "research has shown that 'in leadership positions almost 90 percent of the competencies necessary for success are social and emotional in nature' (Cherniss, 2000, *The Handbook of Emotional Intelligence,* 9 434). The contribution of Fraher's paper is her recognition that emotional intelligence of the leader has a significant influence on the effectiveness and dynamics of the group and that the effectiveness of the group is the key to organizational survival and success. She proposes a team training method based on the Tavistock method to reduce the occurrence of errors in groups and to enhance the ability of groups to innovate, create, and collaborate. The Tavistock approach was developed in the United Kingdom in response to organizational failures experienced in World Wars I and II. The method focuses on the processes that occur within a group, particularly the dynamics associated with authority. The approach treats the group as a whole, as opposed to T group exercises developed and used for team management training by the National Training Laboratory (NTL). The resulting approach, the author claims, moves high risk teams beyond an error prevention focus, to a more holistic approach that encourages error capture, error management, and team learning. Fraher's book *Group Dynamics for High-Risk Teams: A Team Resource Management (TRM) Primer* (iUniverse Press, 2005. 116 pp.) provides greater detail on the origins and techniques of the Tavistock Method and a history of catastrophic group failures.

2.1.4 Weick (1993)

Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

Karl Weick's review of the 1949 Mann Gulch fire disaster where 13 members of a 15 member wild fire crew were killed is a seminal paper in the study of organizational behavior during crisis conditions. The objective of his analysis was to "focus on two questions: Why do organizations unravel? And how can organizations be made more resilient?" (p. 628). The primary contribution made by Weick in this paper is that he focuses on the process of organizational sensemaking rather than on decision making as the critical source of organizational resilience or vulnerability. Organizations can lose their ability to structure their environment in a way that provides a basis for rational

action. Group effectiveness can disintegrate when an episode occurs that makes group members "suddenly and deeply feel that the universe is no longer a rational, orderly system. What makes such an episode so shattering is that both the sense of what is occurring and the means to rebuild that sense collapse together."(p. 633). Sensemaking is a continuing process of trying to "create order and make retrospective sense of what occurs" (p. 635). Weick describes the failed process of the smokejumpers in Mann Gulch to make sense of what they were experiencing using faulty analogies to past events, the breakdown of authority relationships, and the resulting disorganized flight reaction leading to the deaths of all but three members of the crew. Weick attributes the panic reaction to the disintegration of the group, not to the actual danger faced by the firefighters. He discusses the factors that led to this disintegration and concludes his paper with a discussion of structures for increasing organizational resilience and mitigating group vulnerability. He has expanded on these themes in detail in his book *Sensemaking in Organizations* (Sage, 1995) and in later writings.

This paper has been used as a foundation for a continuing stream of research on topics such as high reliability and high performing organizations, the meaning and importance of situational awareness, and the criticality of a common operating picture during crisis events.

2.2 Behavioral Issues

The following important contributions have been identified:

- Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.
- Lois, J. (2003). Heroic Efforts : The Emotional Culture of Search and Rescue Volunteers. New York, New York University Press.
- Klein, G. A. (1989). Recognition-Primed Decisions. Advances in Man-Machine Systems Research. W. Rouse. Greenwich, CT, JAI Press, Inc. **5:** 47-92.
- Wallenius, C. (2001). "Why Do People Sometimes Fail When Adapting to Danger? A Theoretical Discussion from a Psychological Perspective." International Journal of Mass Emergencies and Disasters **19**(2): 145-180.

2.2.1 Ockerby (2001)

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Peter Ockerby addresses the important and persistent issue of persons in authority making bad decisions based upon erroneous assumptions about the behavior of people in crisis situations. In particular, the assumption that people will panic when in a crisis situation has led many in authority to withhold information that would have enabled people to initiate self protective actions. Ockerby focuses on the maritime domain where he observes that these false assumptions during a maritime emergency lead "to the misconception that notifying passengers that an emergency or potential emergency exist will result in large-scale panic. Consequently the decision to raise the alarm and begin preliminary evacuation preparations is often delayed with resultant disastrous consequences". (p 8.) Incidents where delayed alarms led to disastrous consequences are reviewed by Ockerby, including the catastrophic loss of life caused by the sinking of the ro-ro ferry Estonia in 1994.

A significant body of social science research has shown that panic is not a valid construct to explain crowd behavior during crisis situations (e.g. see Lee Clarke, Enrico Quarantelli, Janis and others). Ockerby sets out to show that in the maritime community, the majority of ships officers on passenger ships still believe that panic is a natural occurrence in an emergency and that sounding an alarm will cause panic. He builds on a study conducted by Harbst and Madsen for the International Maritime Organization in 1993. They found that when an emergency occurs warnings are critical since only 10 % of passengers will accept that they are in danger without additional warnings or cues, and that 60% will initially ignore all signs of danger. Once warned, 85% take protective

action and less than 3% will panic. In spite of social science research and IMO findings, Ockerby's questionnaires and interviews showed that the perception that passengers will panic is still held by the majority of officers, but that these perceptions were typically based on observations of second hand accounts of rational flight behavior acerbated by poor warnings and communications from the crew. His recommendations for officers in charge of passenger ships apply to all domains where groups of people are subject to unanticipated and unknown dangers:

- Don't confuse rational stress and flight behavior with panic.
- An alarm in isolation is ineffective, people require multiple cues and adequate alert messages.
- When in doubt, emergency and evacuation procedures should be initiated.
- Training programs should incorporate training in forms of behavior under stress.

2.2.3 Lois (2003)

Lois, J. (2003). Heroic Efforts : The Emotional Culture of Search and Rescue Volunteers. New York, New York University Press.

Jennifer Lois, in a book developed from her doctoral research at the University of Colorado, Boulder, examines the emotional culture of a mountain rescue group, voluntarily choosing to act altruistically in a high risk environment. She addresses a set of issues that helps the reader to understand how individual emotions and group socialization effect why people volunteer in high risk situations, why they will place themselves in danger for others, and how groups engaged in these activities are formed and maintained. She examines what she calls "socialization to heroism" (p. x): the interaction between individualism and collectivism, the role of gender, and the management of emotions, intimacy and relationships. Her target group is an all volunteer wilderness rescue team, but her findings are applicable to select groups engaged in similar activities (e.g. mine rescue teams, urban search and rescue teams). She concludes her book with an integrative chapter on "Heroic Efforts" in which she discusses these themes:

- Members of the group achieved an external and internal identity as heroes. The internal recognition was achieved by rigorous socialization to group norms, the external recognition was gained by completing a successful rescue.
- Members must live in a difficult emotional culture marked by dealing with crisis events. This impacts their own emotional well being, their families and other relationships. Rescuers had to navigate a difficult emotional terrain in addition to the physical demands of their task. They must manage their own emotional reactions, and interact on an emotional level with victims and victims' families.
- The role of emotions plays a large role of the hero. The rescuers must have the ability to tightly control their own emotions during a crisis situation. The social recognition and admiration of others makes the role of hero possible. The hero is

allowed to feel proud and admired, but must maintain an appropriately humble persona.

2.2.3 Klein (1989)

Klein, G. A. (1989). Recognition-Primed Decisions. Advances in Man-Machine Systems Research. W. Rouse. Greenwich, CT, JAI Press, Inc. **5:** 47-92.

In his influential paper Gary Klein introduces the recognition-primed decision (RPD) model of decision making. Klein argues that people can not use classical decision making models like multi-attribute utility analysis in time-critical complex real-world situations. Klein's RPD model is based on observations in real-world settings from the fire fighting and military domain. He argues that decision makers in these environments have to generate, monitor, and modify plans to meet the needs of the operations. Klein's RPD model is based on the following characteristics:

- "Situational recognition allows the decision maker to classify the task as familiar or prototypical.
- The recognition as familiar carries with it recognition of the following types of information: plausible goals, cues to monitor, expectancies about the unfolding of the situation, and typical reactions.
- Options are generated serially, with a very typical course of action as the first one considered.
- Option evaluation is also performed serially to test the adequacy of the option, and to identify weaknesses and find ways to overcome them.
- The RPD model includes aspects of problem solving and judgment along with decision making.
- Experienced decision makers are able to respond quickly, by using experience to identify a plausible course of action as the first one considered rather than having to generate and evaluate a large set of options.
- Under time pressure, the decision maker is poised to act while evaluating a promising course of action, rather than paralyzed while waiting to complete an evaluation of different options. The focus is on acting rather than analyzing." (Klein and Klinger, 2002)

The RPD model is not meant to replace analytical decision models but it is helpful in understanding how decisions are made under tight time constraints. The underlying principles have an impact on the development of decision support and training systems and are widely used in Cognitive Systems Engineering.

2.2.4 Wallenius (2001)

Wallenius, C. (2001). "Why Do People Sometimes Fail When Adapting to Danger? A Theoretical Discussion from a Psychological Perspective." International Journal of Mass Emergencies and Disasters **19**(2): 145-180.

Claes Wallenius, of the Swedish National Defense College, investigates why in life threatening situations some people adopt maladaptive reactions that diminish their chance of survival while others perform better than they expect. His particular focus is on exploring how major psychological theories explain maladaptive reactions. He discusses how these theories help us understand how we detect danger and how we adapt to danger. The utility of this paper is in its value in developing strategies and techniques that could counter the causes of maladaptive reactions for persons exposed to high risk environments. Wallenius examines the psychological framework for responding to threats developed through evolution (Darwinian theory), psychoanalytic tradition (Freudian theory) and cognitive theory. The three theories offer different views of how be detect and adapt to threats. We have developed evolutionary responses that serve us to enhance our physical capabilities and the ability to focus when faced with dangers "limited in time and space and of minor complexity" (p. 151). Freudian theory focuses on the "emotional and subconscious level of stimulus processing (p. 150) and the protection of ego can lead to the denial or explain away signs of danger. Cognitive theory explains how we cope by going through two appraisal processes when faced with potential danger. The first appraisal is to determine whether or not danger exists. The second appraisal is the determination of what action to take. Wallenius provides a detailed examination of the assumptions made in each of these theoretical constructs and integrates his results into a description of possible maladaptive performance reactions and a framework of adaptation mechanisms, and their strengths and weaknesses, at different levels. He concludes with four principal explanations for maladaptation (pp 172-173).

1. "There are limitations on the human capacity for information processing….Stimuli that we are not used to or not expecting will be more difficult to process, especially if it is complex and difficult to appraise". This limit is both quantitative and qualitative.
2. "There are limitations on the human capacity to process distressing emotions. Extremely strong emotions may overload the system. Unpleasant emotional reactions, such as worry, fear, or anxiety, may be repressed and information that activates those emotions may be denied."
3. "Reactions that in other contexts have been successful in adaptation are activated in the 'wrong' context."
4. A person may employ multiple "different adaptive strategies that conflict with each other."

2. 3 Advanced Technologies

The following important contributions have been identified:

- Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. Preliminary Report.
- Casper, J. and R. R. Murphy (2003). "Human-Robot Interactions During the Robot-Assisted Urban Search and Rescue Response at the World Trade Center." Systems, Man, and Cybernetics, Part B, IEEE Transactions on **33**(3): 367-385.
- Li, F., P. Han, et al. (2007). A Wireless Localization Method Used in Coal Mine, Harbin, China, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.
- Singer, E. (2004). "Send in the Rescue Rats." New Scientist **183**(2466): 21.
- Inoue, K., M. Yamamoto, et al. (2005). Design of Search Balls with Wide Field of View for Searching inside of Rubble, Kobe, Japan, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

2.3.1 DHS (2005) / Casper and Murphy (2003)

- Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. Preliminary Report.

- Casper, J. and R. R. Murphy (2003). "Human-Robot Interactions During the Robot-Assisted Urban Search and Rescue Response at the World Trade Center." Systems, Man, and Cybernetics, Part B, IEEE Transactions on **33**(3): 367-385.

There are several new technologies used to support the location in and rescue from confined spaces. Nowadays many researchers experiment with robots for Search and Rescue operations. The leading institution in this field is the Center for Robot Assisted Search and Rescue (CRASAR) located at the University of South Florida (http://www.crasar.org/). Director Dr. Robin Murphy leads several research projects experimenting with the use of robots and unmanned systems. The center deployed robots during the response to 9/11 and they also field tested some of their systems after the Hurricanes Katrina and Charley. There are two major, closely related, initiatives dealing with rescue robots: (1) Robocup Rescue and (2) the NIST standardization efforts related to rescue robots. Robocup Rescue is a competition environment for rescue robots with

annual competitions (http://www.robocuprescue.org/rescuerobots.html). Many international research teams present their robots and compete in a standardized environment. This environment has three different areas with varying difficulties. The yellow portion represented a slightly damaged office building; the orange arena contained multiple stories, covered areas, more rubble, and negative obstacles (holes). The red portion was all rubble with multiple levels that had unstable access. NIST is involved in designing these courses and developing metrics for performance measuring (http://www.isd.mel.nist.gov/US&R_Robot_Standards/).The NIST web site includes a variety of documents related to this topic.

Casper and Murphy (2003) describe their experience with human-operated rescue robots at the World Trade Center site after the 9/11 attacks where CRASAR robots have been deployed to support the search for victims. This paper is particularly interesting because it documents the first civil application of search and rescue robots during a real incident. CRSAR deployed ten different robot types and actually tested three. The tested robots were comparably small (man-packable) and tele-operated. Casper and Murphy analyzed the performance of the robots and come up with seventeen findings related to areas of environmental conditions, human-robot interfaces, task performance, social informatics, and communication. Some of the key observations include:

- The problem was not about navigating over the rubble but getting into the rubble.
- Communication is critical: The robots had dropouts for about 25% of the time.
- The robots lacked image processing skills and needed significant time for light adjustment.
- Good human-robot interfaces are critical.
- Robot teams must be integrated into existing command structures and should be responsible for clearly defined tasks.

CRASAR's work lead to standardization efforts related to search and rescue robots. In (Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology, 2005) initial findings are presented. This work is highly relevant because it defines the requirements for robots and the metrics for their applicability for various disaster situations.

2.3.2 Li et al (2007)

Li, F., P. Han, et al. (2007). A Wireless Localization Method Used in Coal Mine, Harbin, China, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

One of the most critical tasks for any rescue operation is to locate the trapped victims as soon as possible. Li, F., P. Han, et al. (2007) present a wireless location method which can be used in coal mines. Their approach is comparable to location methods used with Geographic Positioning Systems (GPS) where triangulation is utilized to calculate the actual position of a GPS device. The authors developed the localization method for actual

conditions in coal mines. They use beacons with known locations, object nodes which are hand-carried by coal miners and distance measuring algorithms based on radio frequency (RF) propagation times. At known coordinates beacons are placed along both sides of the supply line in a coal mine. Dependent on the tunnel characteristics distances between beacons should be between thirty and fifty meters. Existing classic localization methods are then used to measure distances and to locate the object nodes. The paper also discusses hardware and power management aspects that influence the precision of their model. A successful implementation of the system would not just allow the location of workers after an incident – it may also be used for real time monitoring of the locations of all coal miners during regular work. Nevertheless, there are still some major challenges. Open questions are related on where to position the beacons efficiently and how to ensure communication between the units during incidents. But even if the exact location of the workers can not be determined after an accident the system could be used to store the pre-event positions of the workers.

2.3.3 Singer (2004) and Inoue et al (2005)

- Singer, E. (2004). "Send in the Rescue Rats." New Scientist **183**(2466): 21.

- Inoue, K., M. Yamamoto, et al. (2005). Design of Search Balls with Wide Field of View for Searching inside of Rubble, Kobe, Japan, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Other innovative approaches include the use of rats (Singer, 2004) or search balls (Inoue, K., M. Yamamoto, et al., 2005). These research initiatives are still in their initial phase but the articles show that non-traditional approaches can be successfully applied to the Search and Rescue domain.

In her short paper "Send in the rescue rats" Singer (2004) discusses the new idea of using rats to search for disaster victims. The article urges that rats have an exquisitely sensitive sense of smell and can crawl just about anywhere. This combination makes them ideal candidates for sniffing out buried survivors. The researchers identified the neural signals rats generate when they have found a scent that they are looking for. "When a dog is sniffing a bomb, he makes a unique movement that the handler recognizes," says John Chapin, a neuroscientist at the State University of New York in Brooklyn who is collaborating on the project. "Instead of the rat making a conditioned response, we pick up the response immediately from the brain." Each rat has electrodes implanted in three areas of the brain. The electrodes, each consisting of an array of up to 32 stainless steel wires 75 micrometers in diameter, are permanently implanted in the brain and can give accurate signals for up to nine months. The researchers trained the rats to search for human odor by stimulating the rat's brain when it found its target smell. Once the rats were trained, they were set to forage for the target smell, while electrodes recorded their neural activity patterns. This allowed researchers to identify the brainwave patterns associated with finding that smell. They were also able to train the rats to sniff out the

explosives TNT and RDX – key after terrorist attacks that may leave buildings harboring unexploded bombs. Signals from the rat's brain will be relayed to a radio transmitter pack strapped to the animal's back. Rescuers will be able to follow the rat's position by tracking these signals. The authors are also developing software that will recognize the "aha!" moment when the rat has found its target, so rescuers will know where to start digging.

In their paper "Design of search balls with wide field of view for searching inside of rubble" Inoue, K., M. Yamamoto, et al. (2005) explore a new method of searching for victims under rubble. The developed search balls contain sensors for searching disaster victims and a radio transceiver. If many balls are thrown into rubble, they will scatter throughout the rubble. The sensor information from the balls is transmitted by radio out of the rubble and monitored at safe area by rescuers. Two types of search balls with wide fields of view were developed: one type has three fixed wireless cameras, and the other has two wireless cameras rotated by a motor. Both types have infrared LEDs for illumination, a radio receiver for communication with monitoring computers, batteries and electronic circuit; these components are packed into sphere impact-resistant outer shells. Impact-resistance of the balls was tested by drop experiments on wooden floors. It is, however, difficult to search inside of rubble entirely using only search balls. Thus rescuers or rescue robots have to search the remaining areas.

2.4 Rescue Strategies and Techniques

The following important contributions have been identified:

- Sargent, C. (2000). Confined Space Rescue, Fire Engineering Books.
- Boer, L. and S. van Wijngaarden (2004). "Directional Sound Evacuation from Smoke-Filled Tunnels." Proceedings of the first International Symposium, Safe and Reliable Tunnels Innovative European Achievements: 4-6.

2.4.1 Sargent (2000)

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Books.

Confined Space Rescue is the most dangerous public safety operation and therefore training in the right procedures and with the right equipment is critical to mission success. There are many operating guidelines, standards and regulations related to this topic and due to the immense number of such documents it is hard to obtain a practice relevant overview on this subject. This book, written by a veteran rescuer, aims to be an instructional book for practitioners. It "is a comprehensive, single-source guide to such areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation,

retrieval systems, backup teams, and operational procedures" (cover text). Since the book is a text book it also includes questions at the end of each chapter and answers are included in the appendix for review. Sargent recognizes the importance of team behavior and he includes such important topics as team training and incident command. Several helpful checklists are presented throughout the book.

2.4.2 Boer and van Wijngaarden (2004)

Boer, L. and S. van Wijngaarden (2004) argue that in environments with low visibilities directional sound systems can lead to faster evacuation times. The article cites results of several field experiments performed in smoke-filled environments where people have to self-evacuate. Sound beacons developed by Withington that produce a pulsating, hissing noise typically have high success rates but when tested in smoke filled tunnels the success rate drops significantly. The lesser success can be attributed to less instruction; the test participants knew "there are sound beacons over the emergency exits" but didn't have a clue about the sound these beacons produced. The concept of directional sound evacuation can become much stronger if the sound is self-explanatory like the "exit here" signs. Ideally, this would be sufficient to guide the entrapped population without any advance instruction. The authors developed a new sound which was easy to localize and self-explaining. The new beacons guided human behavior adequately and the success rate in a smoke filled tunnel was 87% although no prior instructions have been given. Using comparable sound structures for mines could help to find shelter areas and exits.

2.5 Standards and Standard Operating Procedures

The literature review for this section revealed many relevant papers and contribution but real landmark contributions could not be identified. Instead we chose two representative contributions. These papers give understandable introductions to important standards and on how develop operational guidelines. We also include an online database for relevant standards.

- Schaefer, B. (2003). "Developing Standard Operating Guidelines." Fire Engineering **156**(10): 24-32.
- Eady, M. (2006). "The Rescue Technician and NFPA Standards." Fire Engineering **159**(9): 87-92.
- American National Standards Institute (ANSI). "Homeland Security Standards Database." (http://www.hssd.us/)

2.5.1 Schaefer (2003)

Schaefer, B. (2003). "Developing Standard Operating Guidelines." Fire Engineering **156**(10): 24-32.

Schaefer, B. (2003) describes the Washington County Fire Department Standard Operating guidelines. The article provides insights into the composition of Rapid Intervention Teams (RIT). It also gives specific details on who is responsible for doing what and roles of team members. It further goes on to discuss the minimal equipments required by the RIT. The article also mentions procedures in a sequential manner. After going through the RIT setup the article talks about the T.E.A.R principle – Team Leader, Extrication, Air and Rope. Rapid Intervention Teams and the T.E.A.R. principles are the real take away of the article and efforts should be made to apply these principles to the coal mining industry.

2.5.2 Eady (2006)

Eady, M. (2006). "The Rescue Technician and NFPA Standards." Fire Engineering **159**(9): 87-92.

Eady, M. (2006) provides an easy to understand overview of three major rescue standards: NFPA 1670 – "Standard on Operations and Training for Technical Search and Rescue Incidents"; NFPA 1006 – "Standard for Rescue Technician Professional Qualifications"; NFPA 1983 – "Standard on Fire Service Life Safety Rope and Equipment for Emergency Services".

NFPA 1670 focuses on organizations that are working to achieve a particular level of competency to operate at several different technical disciplines. However it is not meant to address individual rescuer skills or qualifications. NFPA 1006 addresses standards for rescue technician professional qualifications. It also establishes minimum job performance requirements. NFPA 1983 is used primarily by manufacturers for minimum design performance, testing and certification requirements.

2.5.3 American National Standards Institute (2008)

American National Standards Institute (ANSI). "Homeland Security Standards Database." (http://www.hssd.us/)

The Homeland Security Standards Database (HSDD) provides one-stop access to standards critical to the jobs of first responders, code officials, and others charged with keeping America safe. The American National Standards Institute (ANSI) is working with the U.S. Department of Homeland Security (DHS), standards developing

organizations, and other stakeholders to identify and classify those standards that are pertinent to the area of homeland security. The current version deals largely with the area of first responders. This is being done in cooperation with the Responder Knowledge Base (www.rkb.us) and uses the Standardized Equipment List (SEL) from the Interagency Board (www.iab.gov) as the basis for the classification structure. As the project matures, additional aspects of homeland security will be included.

There are several ways to access the information in the database. Documents can be looked up by topic, through a general search page or users can be automatically notified through an alert feature when new documents are added, or when a document is revised.

HSDD currently has the following main topic categories:

- Threats
- Emergency Preparedness and Response
- Borders and Transportation
- Information Analysis and Infrastructure Protection
- US DHS Adopted Standards

These major categories are further broken down into various subcategories. The search feature is helpful if somebody is interested in standards from various categories. For example, a search for the keyword “rescue” currently finds 109 documents. The detailed records include, amongst others, information on the title, scope, keywords, approval date, and ordering information. An example is given in Figure 1.

NFPA	**National Fire Protection Association**
Document #:	NFPA 1006-2008
Title:	NFPA 1006: Standard for Technical Rescuer Professional Qualifications, 2008 Edition
Scope:	Ensure that all your rescue technicians are up to the task. Apply the latest job criteria with the 2008 NFPA 1006. NFPA 1006: Technical Rescuer Professional Qualifications establishes the minimum job performance requirements necessary for fire service and other emergency response personnel who perform technical rescue operations. These include rope rescue, surface water rescue, vehicle and machinery rescue, confined space rescue, structural collapse rescue, subterranean rescue, dive rescue, wilderness rescue, and trench rescue. Among the significant changes in the expanded 2008 edition are: Water chapters have been organized by type of environment - surface, swift, dive, ice, and surf Division of the subterranean chapter into two chapters--Mines & Tunnels and Caves Each chapter has been split into two levels--Level I and Level II. Increase effectiveness and mitigate risks in an inherently dangerous occupation. Order today and put the 2008 NFPA 1006 to work for you. (Softbound, Approx. 82 pp., 2008)
Keywords:	
Committee:	
SDO Approval Date:	
ANSI Approval Date:	1/2/1900
Date File Updated in Database:	Jun 27 2008 5:56PM
Ordering Information:	ESS-NFPA Phone: Email:
Taxonomy information:	Emergency Preparedness and Response -- Training
Related Resources:	

Figure 1: HSSD Sample Record

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3 Bibliography

"Piper Alpha - a Damning Report on Safety Measures." (1991). Fire International **15**(126): p. 14+.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
5.0 Event Type
5.14 Offshore

"The Bottom Line - You Can't Walk from a Platform." (1992). Fire International **16**(133): p. 30-31.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.14 Offshore

Abi-Zeid, I. a. D., Bernard. (2003). "Using a Geographic Decision Support System to Plan Search and Rescue Operations." International Journal of Emergency Management **1**: 16.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
3.5 Technology

Agencies, F. "Working in Confined Spaces." National Aeronautics and Space Administration.

Categories:
4.0 Standardization
4.2 Practices
5.0 Event Type
5.3 Aviation
5.17 Space

---

3 Bibliography

Aguirre, B. E. "Planning, Warning, Evacuation, and Search and Rescue: A Review of the Social Science Research Literature."

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
1.4 Local Community Interface

Aguirre, B. E., D. E. Wenger, et al. (1995). "The Social Organization of Search and Rescue : Evidence from the Guadalajara Gasoline Explosion." International Journal of Mass Emergencies and Disasters **13**(1): 67-92.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.3 Interpersonal Dynamics
5.0 Event Type
5.7 Fire

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
4.0 Standardization
4.2 Practices
4.4 Training Standards
5.0 Event Type
5.5 Confined Space
5.7 Fire
5.19 Tunnel

American National Standards Institute (ANSI). "Homeland Security Standards Database." Retrieved August 18, 2008, from http://www.hssd.us/.

Categories:
4.0 Standardization
- 4.1 Language
- 4.2 Practices
- 4.3 Symbols
- 4.4 Training Standards

American National Standards Institute. and National Fire Protection Association. (1991). Manual for Aircraft Rescue and Fire Fighting Operations. Quincy, MA, National Fire Protection Association.

Categories:
4.0 Standardization
- 4.1 Language
- 4.3 Symbols
- 4.4 Training Standards

5.0 Event Type
- 5.3 Aviation

Amyotte, P. R. and A. M. Oehmen (2002). "Application of a Loss Causation Model to the Westray Mine Explosion." Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers, Part B **80**(1): 55-59.

Categories:
2.0 Command Center and Control
- 2.5 Procedures
- 2.6 Training Requirements

5.0 Event Type
- 5.11 Mine

---

3 Bibliography

Anon (2000). "Mine Health and Safety Council Award Scheme - Recognising High Standards of Health and Safety." Journal of the Mine Ventilation Society of South Africa **53**(4): 165-166.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
4.0 Standardization
    4.4 Training Standards
5.0 Event Type
    5.11 Mine

Anon (2003). "Safety Guide Aims to Reduce Death Toll." Mining, Quarrying and Recycling **32**(1): 24.

Categories:
3.0 Rescue Team and First Responder
    3.1 Equipment
    3.6 Training
5.0 Event Type
    5.15 Quarrying

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Categories:
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
    3.4 Specialized Duties of Team Members
    3.6 Training
4.0 Standardization
    4.2 Practices
5.0 Event Type
    5.13 Nuclear
    5.15 Quarrying

Ashmore, F. S. (1987). "Only the Best for Off-Shore Protection but It May Not Fit the Job Elsewhere." Fire **80**(990): 31.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.14 Offshore
5.7 Fire

Awad, S., S. Fagan, et al. (2005). "Bridging the Communication Gap in the Operating Room with Medical Team Training." The American Journal of Surgery **190**(5): 770-774.

Categories:
3.0 Rescue Team and First Responder
3.6 Training

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.3 Leadership
2.0 Command Center and Control
2.1 Communications
2.2 Decision Making Process
2.3 Interpersonal Dynamics
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

Barbera, J. and A. Macintyre (1996). "Urban Search and Rescue." Emergency Medicine Clinics of North America **14**(2): 399-412.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

---

3 Bibliography

Barney, G. (1998). "Safety Rescue of Persons Trapped in a Lift Car." Elevator World **46**(3): 110.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

Basham, P. W. and R. A. Page (1985). Earthquake Hazards in the Offshore Environment. Washington, DC 74 p.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.14 Offshore

Batley, L. (1998). "Canadian Training for Confined Spaces." Fire International(163).

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.6 Training
4.0 Standardization
4.4 Training Standards
5.0 Event Type
5.5 Confined Space

Bea, K. and Library of Congress. Congressional Research Service. (2005). Urban Search and Rescue Task Forces Facts and Issues. Washington, D.C., Congressional Information Service, Library of Congress,.

Categories:
4.0 Standardization
4.2 Practices

Bercha, F. G. (2001). Escape, Evacuation, and Rescue Research Project, Bercha Engineering Limited.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Bercha, F. G., E. Radloff, et al. (2003). Development of Canadian Performance-Based Eer Standards, Honolulu, HI, United States, International Society of Offshore and Polar Engineers.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
4.0 Standardization
4.2 Practices
5.0 Event Type
5.14 Offshore

Blakely, R. D. (1992). "Briefing Families in a Search and Rescue Operation: A Personal Perspective." Emergency Preparedness Digest **19**(4): p. 15-18.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.1 Communications

Blitch, J. (2002). "Robot Intelligence for Tunneling and Confined Space Search and Rescue." NIST Special Publication: 309.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.19 Tunnel

---

3 Bibliography

Blitch, J. G., R. R. Murphy, et al. (1996). Knobsar : An Expert System Prototype for Robot Assisted Urban Search and Rescue, Colorado School of Mines, 1996.**:** viii, 145 leaves.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology

Boer, L. (2003). "Behavior of Drivers During Tunnel Evacuation." (Re) claiming the Underground Space: Proceedings of the ITA World Tunnelling Congress 2003, 12-17 April 2003, Amsterdam, The Netherlands.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.19 Tunnel

Boer, L. and S. van Wijngaarden (2004). "Directional Sound Evacuation from Smoke-Filled Tunnels." Proceedings of the first International Symposium, Safe and Reliable Tunnels Innovative European Achievements: 4-6.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
4.0 Standardization
4.2 Practices
5.0 Event Type
5.19 Tunnel

Both, W. (1983). Some Guidelines on Self-Rescue, Rescue and Fire Protection Techniques for Use in the Drivage of Auxiliary-Ventilated Roadways with Full-Face Coal-Cutting Machines, Sheffield, Engl.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.11 Mine

Boulougouris, E. K. and A. Papanikolaou (2002). Modeling and Simulation of the Evacuation Process of Passenger Ships. Proc. 10th Int. Congress of the International Maritime Association of the Mediterranean (IMAM 2002). Crete.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
3.0 Rescue Team and First Responder
3.5 Technology
3.6 Training
5.0 Event Type
5.9 Maritime

Bourgoyne, A. T. and M. R. Chauvin (1988). An Experimental Study of Suppression of Obstructed Gas Well Blowout Fires Using Water Sprays. Gaithersburg, MD 52 p.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.7 Fire

---

3 Bibliography

Boyle, P. and E. J. Smith (2000). Emergency Planning Using the Hse's Evacuation, Escape and Rescue (Eer) Hazop Technique, Manchester, UK, Institute of Chemical Engineers, Rugby, Engl.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.6 Training
4.0 Standardization
4.4 Training Standards
5.0 Event Type
5.14 Offshore

Brake, R. (2000). "Integrated Strategy for Emergency Egress from an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **53**(2): 53-61.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.6 Training
5.0 Event Type
5.11 Mine

Brake, R. and G. Bates (2001). "Criteria for the Design of Emergency Refuge Stations for an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **54**(2): 5-13.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.11 Mine

Bresser, G., B. Kampmann, et al. (1994). "Entwicklung Und Erprobung Neuer Filterselbstretter (New Filter Self-Rescuers)." Glueckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **130**(10): 716-719.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.11 Mine

Brumley, A. and L. Koss (1998). "The Need for Statistics on the Behavior of Passengers During the Evacuation of High Speed Craft." Proceedings of FAST **97**.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Bryan, J. (1999). "Human Behaviour in Fire: The Development and Maturity of a Scholarly Study Area." Fire Mater **23**(249): 253.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Bystron, H. (1983). Role of Budryk's Throttling Air Doors in Stabilizing Ascensional Ventilation of Mine Workings in Case of a Fire, Sheffield, Engl.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

---

3 Bibliography

Carlisle, T. D., T. B. Kyte, et al. (2007). Rail Crew Resource Management (Crm): Survey of Teams in the Railroad Operating Environment and Identification of Available Crm Training Methods.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
3.0 Rescue Team and First Responder
    3.6 Training
5.0 Event Type
    5.16 Railroad

Casper, J. and R. R. Murphy (2003). "Human-Robot Interactions During the Robot-Assisted Urban Search and Rescue Response at the World Trade Center." Systems, Man, and Cybernetics, Part B, IEEE Transactions on **33**(3): 367-385.

Categories:
3.0 Rescue Team and First Responder
    3.1 Equipment
    3.5 Technology

Cawley, J. C. (2001). Electrical Accidents in the Mining Industry, 1990-1999, Chicago, IL, Institute of Electrical and Electronics Engineers Inc.

Categories:
3.0 Rescue Team and First Responder
    3.5 Technology
5.0 Event Type
    5.11 Mine

Christ, R. D. and R. L. Wernli (2007). The Rov Manual a User Guide to Observation-Class Remotely Operated Vehicles. Amsterdam ; Boston ; London, Butterworth-Heinemann**:** xviii, 308 p.

Categories:
3.0 Rescue Team and First Responder
    3.5 Technology
    5.9 Maritime

Clark, L. (2002). "Panic: Myth or Reality." Contexts **1**(4): 21-26.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Coates, M. L., Kate (1989). "Offshore Drilling Rig: North Sea, Off Aberdeen, Grampian." Fire Prevention(225): p. 47.

Categories:
5.0 Event Type
5.7 Fire
5.14 Offshore

Collins, L. (2004). "Close Call in Trench/Excavation Rescue." Fire Engineering **157**(9): 51-62.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.19 Tunnel

Collins, L. (2004). Technical Rescue Operations. Tulsa, Okla., PennWell Corp.

Categories:
4.0 Standardization
4.2 Practices
4.4 Training Standards

Cone, D. (2000). "Rescue from the Rubble: Urban Search & Rescue." Prehospital Emergency Care **4**(4): 352-357.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

---

3 Bibliography

Cooper, D. (2005). Fundamentals of Search and Rescue, Jones & Bartlett Publishers.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.6 Training

Cooper, G., M. White, et al. (1980). "Resource Management on the Flightdeck: Proceedings of a Nasa." Industry Workshop.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.3 Aviation

Cottam, H. a. S., Nigel. (1998). "Knowledge Acquisition for Search and Rescue Planning " International Journal of Human-Computer Studies **48**: 24.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
3.0 Rescue Team and First Responder
3.3 Qualifications
3.5 Technology
3.6 Training

Covert, K. (2000). U.S. Air Force Special Forces : Pararescue. Mankato, Minn., Capstone Books.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.3 Aviation

Crook, J. (1989). "The Aftermath of Piper Alpha." Fire Prevention(225): p. 28-32.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
4.0 Standardization
4.2 Practices
5.0 Event Type
5.14 Offshore

Crook, J. (1992). "Protection of Platforms from Gas Blasts." Fire International **16**(133): p. 26-27+.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.14 Offshore

Crossland, P., A. Furnell, et al. (2005). Modelling and Assessment of an Offshore Rescue Vessel, Halkidiki, Greece, American Society of Mechanical Engineers, New York, NY 10016-5990, United States.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.14 Offshore

Daley, M. (2004). "Trench Collapse Response for Initial-Alarm Companies." Fire Engineering **157**(10): 107-112.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.19 Tunnel

---

3 Bibliography

---

de Gelder, B., J. Snyder, et al. (2004). "Fear Fosters Flight: A Mechanism for Fear Contagion When Perceiving Emotion Expressed by a Whole Body." Proceedings of the National Academy of Sciences **101**(47): 16701.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Categories:
2.0 Command Center and Control
2.4 Personnel Qualification
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.1 Equipment
3.6 Training
5.0 Event Type
5.11 Mine

Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. **Preliminary Report**.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.4 Specialized Duties of Team Members
3.5 Technology
4.0 Standardization
4.2 Practices

Drabek, T. E. (1981). Managing Multiorganizational Emergency Responses : Emergent Search and Rescue Networks in Natural Disaster and Remote Area Settings. Boulder, CO, Institute of Behavioral Science, University of Colorado.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
3.0 Rescue Team and First Responder
3.6 Training

Drabek, T. E. (1985). "Managing the Emergency Response." Public Administration Review **5**: 85-92.

Categories:
4.0 Standardization
4.2 Practices

Drangeid, S. O. (2003). "Will Stricter Regulations Improve Disaster Management? A Discussion of the Norwegian Petroleum Directorate's Experience with the Use of Functional Legal Requirements." International Journal of Emergency Management **1**(2): p. 268-277.

Categories:
4.0 Standardization
4.2 Practices
5.0 Event Type
5.14 Offshore

Eady, M. (2006). "The Rescue Technician and NFPA Standards." Fire Engineering **159**(9): 87-92.

Categories:
4.0 Standardization
4.4 Training Standards

---

3 Bibliography

Echternacht, J. E. (1981). Gaseous Fire Protection Extinguishing Agents for Offshore. Boston, MA 8 p.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.14 Offshore

Edgerly, B. (2005). "Survivability and Rescue Transceiver Technology." Fire Engineering **158**(5): 122-125.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Entin, E., C. Kerrigan, et al. "Development of a Search and Rescue Simulation to Study the Effects of Prolonged Isolation on Team Decision Making."

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
2.0 Command Center and Control
2.2 Decision Making Process

Ersland, S., Sund, A., and Weisaeth, Lars. (1989). "The Stress Upon Rescuers Involved in an Oil Rig Disaster " Acta Psychiatrica Scandinavica **80**: 12.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.2 Escape Behavior
2.0 Command Center and Control
2.3 Interpersonal Dynamics

Evans, D. D. (1984). Control of Blowout Fires with Water Sprays. Washington, DC 95 p.

Categories:

3.0 Rescue Team and First Responder
- 3.1 Equipment
- 3.5 Technology

5.0 Event Type
- 5.14 Offshore
- 5.7 Fire

Fahy, R. F. (2002). "Tools for the Simulation of Human Behavior." Fire Protection Engineering **101**(47): 16701-16706.

Categories:

1.0 Personnel and Human Behavior
- 1.2 Escape Behavior

3.0 Rescue Team and First Responder
- 3.5 Technology

FEMA (2000). Urban Search and Rescue (Us&R) Incident Support Team (Ist) Operations Manual. FEMA.

Categories:

3.0 Rescue Team and First Responder
- 3.2 Protocols and Methods

4.0 Standardization
- 4.4 Training Standards

Ferguson, S. and E. LaChapelle (2003). The Abcs of Avalanche Safety, Mountaineers Books.

Categories:

3.0 Rescue Team and First Responder
- 3.1 Equipment

5.0 Event Type
- 5.2 Avalanche

---

3 Bibliography

Fermaud, C., E. Maerki, et al. (1997). "Rendering the Swiss Railway Alptransit Safe." Tunnelling and Underground Space Technology **12**(3): 369-375.

Categories:
4.0 Standardization
4.4 Training Standards
4.2 Practices
5.0 Event Type
5.19 Tunnel

Fiscor, S. (2004). "Minexpo 2004 Preview." Engineering and Mining Journal **205**(8): 16-18.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.11 Mine

Fleming, M., R. H. Flin, et al. (1998). "Risk Perceptions of Offshore Workers on Uk Oil and Gas." Risk Analysis **18**(1): p. 103-110.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
5.0 Event Type
5.14 Offshore

Flin, R. (1995). "Crew Resource Management for Teams in the Offshore Oil Industry." Journal of European Industrial Training **19**(9): 23-27.

Categories:
2.0 Command Center and Control
2.4 Personnel Qualification
3.0 Rescue Team and First Responder
3.6 Training

Flin, R., P. O'Connor, et al. "Spe 46766 Crew Resource Management for Offshore Teams: Lessons from Aviation."

Categories:
4.0 Standardization
4.2 Practices
4.4 Training Standards
5.0 Event Type
5.3 Aviation
5.14 Offshore

Flin, R. and G. Slaven (1996). "Personality and Emergency Command Ability." Disaster Prevention and Management: An International Journal **5**(1): 40-46.

Categories:
2.0 Command Center and Control
2.6 Training Requirements

Flin, R., K. Stewart, et al. (1996). "Emergency Decision Making the Offshore Oil and Gas Industry." Human Factors **38**(2).

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
5.0 Event Type
5.14 Offshore

Flin, R. H. and G. M. Slaven (1996). "Personality and Emergency Command Ability " Disaster Prevention and Management **5**(1): p. 40-46

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
2.0 Command Center and Control
2.3 Interpersonal Dynamics
5.0 Event Type
5.14 Offshore

---

3 Bibliography

Flin, R. H. S., Georgina M. (1992). "Emergency Command Responsibilities of Offshore Oil Installation Managers." Diaster Management **4**(4): 197-201.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
2.0 Command Center and Control
2.3 Interpersonal Dynamics
5.0 Event Type
5.14 Offshore

Fraher, A. L. (2005). Group Dynamics for High-Risk Teams: A 'Team Resource Management' (Trm) Primer, iUniverse Press.

Categories:
2.0 Command Center and Control
2.3 Interpersonal dynamics
1.0 Personnel and Human Behavior
1.3 Leadership

Fraher, A. L. (2005). "Team Resource Management (Trm): A Tavistock Approach to Leadership in High-Risk Environments Resonances of 9/11." Organisational and Social Dynamics **5**(2): 163-182.

Categories:
2.0 Command Center and Control
2.3 Interpersonal dynamics
1.0 Personnel and Human Behavior
1.3 Leadership

Frank, I. (2002). "Miracle of the Miners: The Quecreek Rescue from an Ed Perspective." Journal of Emergency Nursing **28**(6): 544-548.

Categories:
2.0 Command Center and Control
2.3 Interpersonal Dynamics
5.0 Event Type
5.11 Mine

Franseen, H. W. (1995). Hydropower Application of Confined Space Regulations, San Francisco, CA, USA, ASCE, New York, NY, USA.

Categories:
4.0 Standardization
4.4 Training Standards

Fuchs, E., W. Hermulheim, et al. (2004). "Restrukturierung Des Grubenrettungswesens Restructuring of the Mine Rescue Service." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **140**(10): 453-457.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
2.0 Command Center and Control
2.4 Personnel Qualification
3.0 Rescue Team and First Responder
3.3 Qualifications
5.0 Event Type
5.11 Mine

Fundemeyer, M. and J. Stoklossa (1985). "Preparing Mine Rescue Teams for Deployment under Tough Climatic Conditions." Glueckauf & Translation **121**(18): 417-420.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.11 Mine

Gallagher, T. and S. Storment (1994). "Confined Space Rescue, Part Iv: Respiratory and Retrieval Systems." Rescue **7**(6): p. 93-98.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.4 Specialized Duties of Team Members
5.0 Event Type
5.5 Confined Space

---

3 Bibliography

Gao, G., B. Yan, et al. (2006). An Accident Prevention and Emergency Rescue System for Expressway Tunnels, Pretoria, South Africa, Document Transformation Technologies cc., Irene, 0062, South Africa.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.19 Tunnel

Glen, S. and M. Pesaresi (1997). Search and Rescue. New York, Fawcett Crest.

Categories:
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members

Gochioco, L. M., R. Rodriguez, et al. (2008). "Employing the Underground Inseam Seismic Method to Detect Old Abandoned Mines and Improve Mine Safety." Leading Edge (Tulsa, OK) **27**(1): 88-97.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Goldstein, I. (2006). "Safety of High-Rise Buildings: Should Be up to the Mark!" Elevator World **54**(12): 61-66.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
2.0 Command Center and Control
    2.1 Communications
4.0 Standardization
    4.4 Training Standards
    4.2 Practices
5.0 Event Type
    5.10 Military

Goodell, J. (2002). Our Story : 77 Hours That Tested Our Friendship and Our Faith. New York, Hyperion.

Categories:
1.0 Personnel and Human Behavior
    1.2 Escape Behavior
5.0 Event Type
    5.11 Mine

Goodman, C. and D. Hogan (2007). "Urban Search and Rescue." Disaster Medicine.

Categories:
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods

Goodman, G. V. R. and F. N. Kissell (1988). Fault Tree Analysis of Miner Escape During Mine Fires, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Categories:
2.0 Command Center and Control
    2.2 Decision Making Process
5.0 Event Type
    5.11 Mine

---

3 Bibliography

Government Accountability Office (2008). Nrc's Oversight of Fire Protection at U. S. Commercial Nuclear Reactor Units Could Be Strengthened. Washington, DC, Government Accountability Office, . **GAO-08-747:** 43.

Categories:
4.0 Standardization
4.2 Practices
5.0 Event Type
5.7 Fire
5.13 Nuclear

Gowar, R. G. (1978). Developments in Fire Protection of Offshore Platforms.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.7 Fire
5.14 Offshore

Graham, N. and G. G. Eave (1995). "Emergency Control Rooms Structure and Procedures." Journal of the Mine Ventilation Society of South Africa **48**(4): 126-132.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.11 Mine

Gwynne, S., E. Galea, et al. (1999). "A Review of the Methodologies Used in Evacuation Modelling." Fire and Materials **23**(6): 383-388.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Haack, A. (1992). "Fire Protection in Traffic Tunnels - Initial Findings from Large-Scale Tests." Tunnelling and Underground Space Technology **7**(4): 363-375.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.19 Tunnel

Hall, L. (1982). "To Save the Pilot's Life--Soviet Air Rescue Service." Air University Review.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.3 Aviation

Harbst, J. and F. Madsen The Behaviour of Passengers in a Critical Situation on Board a Passenger Vessel or Ferry, Technical report, Danish Investment Foundation, Kopenhagen, 1996.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.9 Maritime

Harfield, G. and R. Watkinson (2002). Multi-Purpose Search and Rescue System, WO Patent WO/2002/081,301.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

---

3 Bibliography

Harrison, T., J. Gil-Garcia, et al. (2006). "Learning About Interoperability for Emergency Response: Geographic Information Technologies and the World Trade Center Crisis." Proceedings of the 39th Annual Hawaii International Conference on System Sciences-Volume 04.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Heightman, A. (1999). "Kansas Confined Space Rescue. A Small Department Utilizes Mutual Aid to Rescue a Child Trapped 16 Feet Below Ground." JEMS **24**(7): 50-1.

Categories:
2.0 Command Center and Control
2.3 Interpersonal dynamics
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

Helmreich, R., A. Merritt, et al. (1999). "The Evolution of Crew Resource Management Training in Commercial Aviation." The International Journal of Aviation Psychology **9**(1): 19-32.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.3 Aviation

Hermulheim, W. and G. Bresser (2006). "Neue Atemschutzgerate Fur Dsk-Grubenwehren (New Respirators for Dsk Mine Fire-Fighting Teams)." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **142**(4): 130-134.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.11 Mine

Hjertager, B. H., S. Hoiset, et al. (1998). "Properties of Simulated Gas Explosions of Interest to the Structural Design Process." Process Safety Progress **17**(4): p. 278-287.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.14 Offshore

Hogan, J. (2003). "Is Your Fire Department Prepared for a Well Rescue?" Water Well Journal **57**(7): 54.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.20 Water Well

Holdcraft, R. L. (1985). "Fire Protection Criteria for Caves." Fire Journal (Boston) **79**(3): 35-37.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.4 Cave

Hudson, S., J. C. Hempel, et al. (1988). Manual of U.S. Cave Rescue Techniques. Huntsville, Ala., National Cave Rescue Commission, National Speleological Society.

Categories:
4.0 Standardization
4.2 Practices
4.4 Training Standards
5.0 Event Type
5.4 Cave

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
2.0 Command Center and Control
2.5 Procedures
2.6 Training Requirements
5.0 Event Type
5.2 Avalanche
5.11 Mine

Huse, J. R. (1995). Safety in Offshore Arctic Field Development, Copenhagen, Den, ASME, New York, NY, USA.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.1 Arctic

Ibbetson, T. (2002). "Confined Space Rescue - When Communication Really Counts." Fire International(195): p. 15.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.5 Confined Space

Inoue, K., M. Yamamoto, et al. (2005). Design of Search Balls with Wide Field of View for Searching inside of Rubble, Kobe, Japan, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

International Maritime Organization (2006). Sar Convention : International Convention on Maritime Search and Rescue, 1979 : As Amended by Resolution Msc.70(69) and Msc.155(78). London, International Maritime Organization.

Categories:
4.0 Standardization
4.1 Language
4.2 Practices
4.3 Symbols
4.4 Training Standards
5.0 Event Type
5.9 Maritime

International Maritime Organization (2007). Gmdss Manual : Manual on the Global Maritime Distress and Safety System. London, IMO.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.9 Maritime

---

3 Bibliography

International Maritime Organization (2007). A Pocket Guide to Recovery Techniques. London, International Maritime Organization.

Categories:
4.0 Standardization
    4.2 Practices
5.0 Event Type
    5.9 Maritime

International Maritime Organization and International Civil Aviation Organization (1998). International Aeronautical and Maritime Search and Rescue Manual. London, Montreal, Quebec, International Maritime Organization and International Civil Aviation Organization.

Categories:
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
4.0 Standardization
    4.4 Training Standards
5.0 Event Type
    5.3 Aviation
    5.9 Maritime

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Categories:
4.0 Standardization
    4.1 Language
    4.2 Practices
    4.3 Symbols
    4.4 Training Standards
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
5.0 Event Type
    5.19 Tunnel

Jeffers, H. P. (2006). Burning Cold : The Cruiseship Prinsendam and the Greatest Sea Rescue of All Time. Grand Rapids, Mich., Zenith.

Categories:
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members
5.0 Event Type
5.9 Maritime

Jioras, R. J. (1991). Validation of Tunnel Rescue Incident Command System: A Case Study - Metro Rail Tunnel Fire, Los Angeles, Ca, July 13, 1990. Emmitsburg, MD, National Fire Academy.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
2.0 Command Center and Control
2.2 Decision Making Process
4.0 Standardization
4.2 Practices
5.0 Event Type
5.19 Tunnel

Jones, B. (1998). "New Technology Provides Effective Communications for Underground Rescue Operations." Coal International (Redhill, England) **246**(5): 171-174.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.11 Mine

Kampmann, B. and G. Bresser (1999). "Heat Stress and Flame Protective Clothing in Mine Rescue Brigadesmen: Inter- and Intraindividual Variation of Strain." Annals of Occupational Hygiene **43**(5): 357-365.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.11 Mine

Kass, L. M. (2006). "Early Mining Safety Heroes." Mining Engineering **58**(3): 46.

Categories:
5.0 Event Type
5.11 Mine
1.0 Personnel and Human Behavior
1.3 Leadership
1.1 Employee Culture

Kielblock, A. J., J. P. van Rensburg, et al. (1999). "Work Load Training: Enhanced Safety Standards for Rescue Brigades' Operations in the South African Mining Industry." Journal of the Mine Ventilation Society of South Africa **52**(2): 44-46.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
2.0 Command Center and Control
2.6 Training Requirements
5.0 Event Type
5.11 Mine

Kincaid, J. P., J. Donovan, et al. (2003). "Simulation Techniques for Training Emergency Response [1]." International Journal of Emergency Management **1**(3): 238-246.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
3.6 Training

King, R. L. and M. L. Bowser (1976). "Borehole Instrumentation for Emergency Mine Rescue Operations." Technical Progress Report - United States, Bureau of Mines(99): 14.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Kirk, D. (1991). "Offshore Emergencies." Emergency **23**(3): p. 34-37

Categories:
5.0 Event Type
5.14 Offshore

Kiyono, J., K. Toki, et al. (2001). "Evaluation of Safety on Evacuation Behavior from an Underground Space During an Earthquake." Proceedings of JSCE (Japan Society of Civil Engineers): 31-43.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Klein, G. A. (1989). Recognition-Primed Decisions. Advances in Man-Machine Systems Research. W. Rouse. Greenwich, CT, JAI Press, Inc. **5:** 47-92.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process

Klein, K. (2001). "Decision Trees Can Give Firm Roots to Rescue Policies." Fire Chief **45**: 30+.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process

Knapp, J. (2004). "Unusual Rescue Requires Unusual Solution." Fire Engineering **157**(9): 69-72.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology

Kovacs, T. (2002). "Model Triage and Dispatch Guidelines for Search and Rescue Coordinators and Communications Personnel." Risks in Mountain Rescue Operations. Mountain Rescue Association, ed. Poway, CA: 27–30.

Categories:
2.0 Command Center and Control
2.1 Communications
4.0 Standardization
4.4 Training Standards
5.0 Event Type
5.12 Mountain

Kral, S. (2002). "Teamwork, Technology Key in Rescuing Coal Miners." Mining Engineering **54**(9): 33-35.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.11 Mine

Kubicki, D. J. (1981). "Fire Protection and Rescue Planning for the Nasa Space Shuttle." Fire Journal (Boston) **75**(4): 34-40.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
3.5 Technology
5.0 Event Type
5.17 Space

Lee, H., T. Wang, et al. (2003). "Development of a New Confined Space Model." Annual Disaster Medical Volume **2**(1).

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.5 Confined Space

Lee, R. M. (1993). Death and Deliverance : The True Story of an Airplane Crash at the North Pole. Golden, Colo., Fulcrum Pub.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.3 Aviation
5.9 Maritime

Lewis, D. "Jan. 1996;"." Confined Space Rescue: Should You Ever Remove Respiratory Protection", Safety+ Health: 56-60.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Li, F., P. Han, et al. (2007). A Wireless Localization Method Used in Coal Mine, Harbin, China, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
2.0 Command Center and Control
2.1 Communications

---

3 Bibliography

Lindgren, I., Berggren, Peter, Jander, Hans, and Hirsch, Richard. (2004). Communication and Team Performance in Ba Teams - a Field Study of Breathing Apparatus Firefighters' Communication During Rescue Operations**:** 82 p.

Categories:
2.0 Command Center and Control
2.1 Communications

Liu, C., Y. Ai, et al. (2002). "The Technique Key and Realization of Fault Blocking of Mine Explosion-Proof Magnetic Starter." Proceedings in Mining Science and Safety Technology: 672-674.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Liu, H. and D. Yang (2004). Gis-Based Mine Ventilation Network and Safety Analysis, Anchorage, AK, United States, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ 08855-1331, United States.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine
5.19 Tunnel

Lofstedt, R. E. R., Ortwin (1997). "The Brent Spar Controversy: An Example of Risk Communication Gone Wrong." Risk Analysis **17**: 5.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.14 Offshore

Lois, J. (2003). Heroic Efforts : The Emotional Culture of Search and Rescue Volunteers. New York, New York University Press.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture

Maas, P. (1999). The Terrible Hours : The Man Behind the Greatest Submarine Rescue in History. New York, HarperCollins Publishers.

Categories:
1.0 Personnel and Human Behavior
    1.2 Escape Behavior
5.0 Event Type
    5.14 Offshore
    5.9 Maritime

MacInnes, H. (2005). International Mountain Rescue Handbook. London, Frances Lincoln.

Categories:
3.0 Rescue Team and First Responder
    3.1 Equipment
    3.2 Protocols and Methods
5.0 Event Type
    5.12 Mountain

Macintyre, A., J. Barbera, et al. (2006). "Surviving Collapsed Structure Entrapment after Earthquakes: A “Time-to-Rescue” Analysis." Prehospital and Disaster Medicine **21**(1): 4.

Categories:
2.0 Command Center and Control
    2.5 Procedures
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
5.0 Event Type
    5.5 Confined Space

Marrett, G. J. (2003). Cheating Death : Combat Air Rescues in Vietnam and Laos. Washington, D.C., Smithsonian Books.

Categories:
5.0 Event Type
5.3 Aviation

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
2.0 Command Center and Control
2.5 Procedures
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.9 Maritime

McCaffrey, B. J. (1984). Jet Diffusion Flame Suppression Using Water Sprays: An Interim Report. Washington, DC 56 p.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.7 Fire

McClincy, W. D. (2002). Instructional Methods in Emergency Services. New Jersey, Prentice Hall.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
4.0 Standardization
4.4 Training Standards

McClung, C. (2002). "Tunnel Rescue - a Systematic Approach " Fire & Rescue(July): 29-31.

Categories:
4.0 Standardization
4.2 Practices
5.0 Event Type
5.19 Tunnel

McCormack, J. and Fire Department Training Network (Firm) (2003). Firefighter Rescue & Rapid Intervention Teams : Saving One of Our Own. Indianapolis, IN, FD Training Network.

Categories:
4.0 Standardization
4.2 Practices
4.4 Training Standards
5.0 Event Type
5.7 Fire

Mckinney Jr, E., J. Barker, et al. (2005). "How Swift Starting Action Teams Get Off the Ground: What United Flight 232 and Airline Flight Crews Can Tell Us About Team Communication." Management Communication Quarterly **19**(2): 198.

Categories:
2.0 Command Center and Control
2.1 Communications

Mearns, K., R. Flin, et al. (2001). "Sharing'worlds of Risk'; Improving Communication with Crew Resource Management." Journal of Risk Research **4**(4): 377-392.

Categories:
2.0 Command Center and Control
2.1 Communications

Mehrotra, S., C. Butts, et al. (2004). "Project Rescue: Challenges in Responding to the Unexpected." Proceedings of SPIE **5304**: 179-192.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Merta, J., Rowan, Marielle (1988). "Survival Suits Must Save Lives." Emergency Preparedness Digest **15**: 3.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Mills, S. (2003). "Trench Rescue: The Basics." Fire Engineering **156**(12): 78-81.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.3 Qualifications
4.0 Standardization
4.4 Training Standards
5.0 Event Type
5.18 Trench

Mishima, D., T. Aoki, et al. (2006). "Development of a Pneumatically Controlled Expandable Arm for Rescue Searches in Tight Spaces." International Journal of Robotics Research **25**(1): 103-110.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology

Mitropoulos, P., G. Howell, et al. (2003). "Workers at the Edge; Hazard Recognition and Action." 11th International Group for Lean Construction Conference.

Categories:
4.0 Standardization
4.2 Practices

Modroo, J. J., G. R. Olhoeft, et al. (2004). Ground Penetrating Radar Location of Buried Avalanche Victims, Colorado School of Mines, 2004.**:** x, 62 leaves.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.2 Avalanche

Morgan, J. (1989). "Nuclear Power Stations: 'Other Risks' More of a Problem to the Fire Service." Fire & Rescue **82**.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
5.0 Event Type
5.7 Fire
5.13 Nuclear

Morrow, H. (2001). "Incident Command System." Internet Journal of Rescue and Disaster Medicine, The.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
5.0 Event Type
5.11 Mine

Morse, G. L. and R. L. Swift (1982). "Working Safely in Confined Spaces - Evaluating the Hazards." Plant Engineering (Barrington, Illinois) **36**(2): 139-142.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
2.0 Command Center and Control
2.1 Communications
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members
5.0 Event Type
5.11 Mine

Moxie Media Emergency Platform, Rig and Vessel Abandonment. New Orleans, LA Moxie Media, Inc. n.d.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
3.6 Training
5.0 Event Type
5.14 Offshore

Murphy, R., J. Casper, et al. (2000). "Assessment of the Nist Standard Test Bed for Urban Search and Rescue." NIST Workshop on Performance Metrics for Intelligent Systems: 14-16.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology

National Association for Search & Rescue (1995). Sartech Certification Criterion. NASAR.

Categories:
2.0 Command Center and Control
2.4 Personnel Qualification

National Fire Protection Association (2003). "NFPA 403: Standard for Aircraft Rescue and Fire Fighting Services at Airports."

Categories:
4.0 Standardization
4.4 Training Standard

National Fire Protection Association (2003). "NFPA 412: Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment."

Categories:
4.0 Standardization
4.4 Training Standard

National Fire Protection Association (2004). "NFPA 1670: Standard on Operations and Training for Technical Rescue Incidents."

Categories:
4.0 Standardization
4.4 Training Standard

---

3 Bibliography

National Fire Protection Association (2005). "NFPA 1936: Standard on Powered Rescue Tools."

Categories:
4.0 Standardization
    4.4 Training Standard

National Fire Protection Association (2007). "NFPA 414: Standard for Aircraft Rescue and Fire-Fighting Vehicles."

Categories:
4.0 Standardization
    4.4 Training Standard

National Fire Protection Association (2007). "NFPA 1951: Standard on Protective Ensembles for Technical Rescue Incidents."

Categories:
4.0 Standardization
    4.4 Training Standard

National Fire Protection Association (2008). "NFPA 402: Guide for Aircraft Rescue and Fire Fighting Operations."

Categories:
4.0 Standardization
    4.4 Training Standard

National Fire Protection Association (2008). NFPA 402: Guide for Aircraft Rescue and Fire Fighting Operations, 2008 Edition

Categories:
3.0 Rescue Team and First Responder
    3.6 Training
4.0 Standardization
    4.4 Training Standards
5.0 Event Type
    5.3 Aviation

National Transportation Safety Board (1996). Fire on Board the U. S. Modu Rowan Odessa, Gulf of Mexico, December 1, 1994. Washington, DC 5 p.

Categories:
4.0 Standardization
4.2 Practices
5.0 Event Type
5.7 Fire
5.14 Offshore

Naum, C. J. (2002). Basic Rescue Skills. Ottawa, Public Safety and Emergency Preparedness Canada.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
3.0 Rescue Team and First Responder
3.5 Technology

Noble, D. L. (2002). The Rescue of the Gale Runner : Death, Heroism, and the U.S. Coast Guard. Gainesville, University Press of Florida.

Categories:
5.0 Event Type
5.9 Maritime

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
1.3 Leadership
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.9 Maritime

O'Connell, J. (1993). "Above-Grade Tactics and Procedures for Search, Rescue, and Evacuation." Fire Engineering **146**: 61-61.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods

O'Connell, J. P. (2005). Emergency Rescue Shoring Techniques. Tulsa, Okla., PennWell Corp.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
1.3 Leadership
2.0 Command Center and Control
2.3 Interpersonal Dynamics
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members
5.0 Event Type
5.18 Trench

O'Connor, P. and R. Flin (2003). "Crew Resource Management Training for Offshore Oil Production Teams." Safety Science **41**(7): 591-609.

Categories:
2.0 Command Center and Control
2.6 Training Requirements
3.0 Rescue Team and First Responder
3.3 Qualifications
5.0 Event Type
5.14 Offshore

Olcer, A. and J. Majumder (2006). "A Case-Based Decision Support System for Flooding Crises Onboard Ships." Quality and Reliability Engineering International **22**(1): 59-78.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process

Operation Respond (2004). Oreis 6.0 Operation Respond Emergency Information System. Washington, D.C., Operation Respond Institute**:** 1 CD-ROM.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
3.0 Rescue Team and First Responder
3.5 Technology

Orasanu, J., Y. Tada, et al. (2005). Physiological Monitoring of Team and Task Stressors, Orlando, FL, United States, International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.2 Escape Behavior
2.0 Command Center and Control
2.3 Interpersonal dynamics
5.0 Event Type
5.17 Space

Osuka, K., R. Murphy, et al. (2002). "Usar Competitions for Physically Situated Robots." Robotics & Automation Magazine, IEEE **9**(3): 26-33.

Categories:
3.0 Rescue Team and First Responder
3.6 Training

---

3 Bibliography

Pasche, A., B. Holand, et al. (1991). Emergency Systems for Divers, Hague, Neth, Publ by Soc of Petroleum Engineers of AIME, Richardson, TX, USA.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.9 Maritime

Pate-Cornell, M. E. (1995). "Managing Fire Risk Onboard Offshore Platforms: Lessons from Piper Alpha and Probabilistic Assessment of Risk Reduction Measures." Fire Technology **31**(2): p. 99-119.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.14 Offshore

Paton, D. (2003). "Stress in Disaster Response: A Risk Management Approach." Disaster Prevention and Management: An International Journal **12**(3): 203-209.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Pg, T. (2006). "North Zone Training Manual Search and Rescue." Terminology.

Categories:
4.0 Standardization
4.4 Training Standards

Plum, J. (2003). Careers in Police Departments' Search and Rescue Units. New York, NY, Rosen Central.

Categories:
3.0 Rescue Team and First Responder
3.3 Qualifications
5.0 Event Type
5.21 9/11

Polglase, J. and J. LaRosa (1994). "Matter of Life and Death." Lighting Design and Application: LD & A **24**(12): 5.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.3 Qualifications

Pritchard, C. J. and D. R. Malicoat (1993). Mine Emergency Planning Aspects of Underground Barricade Chambers, Salt Lake City, UT, USA, Publ by SME, Littleton, CO, USA.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Pu, S. and S. Zlatanova (2005). Evacuation Route Calculation of Inner Buildings. Geo-Information for Disaster Management**:** 1143-1161.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.5 Technology

Puri, S. P. S. (1994). "Trapped in an Elevator During the World Trade Center Bombing: A Personal Account." Journal of Performance of Constructed Facilities **8**(4): 217-228.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
1.4 Local Community Interface

Quarantelli, E. L. "Sociology of Panic."

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior

Quarantelli, E. L. (1989). How Individuals and Groups React During Disasters: Planning and Managing Implications for Ems Delivery.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.2 Escape Behavior

Rae, B. (1990). "Piper Alpha-Restoring Communications." Disaster Management **3**(1): p. 8-10.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.11 Mine

Rekus, J. (Mar. 1996). "Confined Space Rescue Planning." Occupational Hazards.

Categories:
4.0 Standardization
    4.1 Language
    4.2 Practices
    4.4 Training Standards
5.0 Event Type
    5.5 Confined Space

Requires, N. (2004). "The Complexity of Team Training: What We Have Learned from Aviation and Its Applications to Medicine." Quality and Safety in Health Care **13**(1): i72-i79.

Categories:
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
    3.6 Training
5.0 Event Type
    5.3 Aviation

Rhea, R. (1997). "Organizing and Training Special Rescue Teams." Fire Engineering **150**(3): 5.

Categories:
2.0 Command Center and Control
    2.6 Training Requirements
3.0 Rescue Team and First Responder
    3.6 Training

Rixner, J. (2003). "Basement Fire Reinforces Basics." Fire Engineering **156**(6): 97-100.

Categories:
3.0 Rescue Team and First Responder
    3.1 Equipment
4.0 Standardization
    4.2 Practices

Rosen, J., E. Grigg, et al. (2002). "The Future of Command and Control for Disaster Response." Engineering in Medicine and Biology Magazine, IEEE **21**(5): 56-68.

Categories:
2.0 Command Center and Control
2.5 Procedures

Royston, A. and R. Stewart (1998). Emergency Rescue. Des Plaines, Ill., Heinemann Interactive Library.

Categories:
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members

Roza, G. (2003). Careers in the Coast Guard's Search and Rescue Units. New York, NY, Rosen Central.

Categories:
2.0 Command Center and Control
2.4 Personnel Qualification
5.0 Event Type
5.21 9/11

Ruegger, H., T. Schaub, et al. (1977). "Die Loesch- Und Rettungszuege Der Schweizerischen Bundesbahnen. Left Bracket Fire-Extinguishing and Rescue Trains of Swiss Federal Railways Right Bracket." Zeitschrift fuer Eisenbahnwesen und Verkehrstechnik - Glasers Annalen **101**(2): 57-61.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.16 Railroad

Rushbrook, F. (1979). Fire Aboard: The Problems of Prevention and Control in Ships, Port Installations and Offshore Structures. Glascow, Scotland Brown Son & Ferguson, Limited.

Categories:
2.0 Command Center and Control
    2.5 Procedures
5.0 Event Type
    5.7 Fire
    5.9 Maritime
    5.14 Offshore

Ryland, J. L. (1990). Commanding the Urban Heavy Search and Rescue Incident. Executive Fire Officer Paper. Emmitsburg, MD National Fire Academy.

Categories:
1.0 Personnel and Human Behavior
    1.3 Leadership
2.0 Command Center and Control
    2.2 Decision Making Process

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Categories:
2.0 Command Center and Control
    2.5 Procedures
3.0 Rescue Team and First Responder
    3.1 Equipment
    3.5 Technology
4.0 Standardization
    4.2 Practices
5.0 Event Type
    5.5 Confined Space

Sargent, C. N. (1988). "Tunneling Tenets: Performing Underground Rescue Operations Safely " Firehouse **13**(March): 50-52.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.19 Tunnel

Schaefer, B. (2003). "Developing Standard Operating Guidelines." Fire Engineering **156**(10): 24-32.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
4.0 Standardization
4.2 Practices

Schremmer, U. (2003). "Einsatz Von Wassernebel in Unterirdischen Verkehrsanlagen (the Use of Water Mist in Underground Traffic Structures)." VDI Berichte(1780): 25-34.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Scott, J. and J. Robertson (1993). Lost in the Himalayas : James Scott's 43-Day Ordeal. Port Melbourne, Vic., Lothian.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.12 Mountain

Selters, A. and NetLibrary Inc. (1999). Glacier Travel & Crevasse Rescue. Seattle, WA, The Mountaineers**:** 143 p.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.2 Protocols and Methods
5.0 Event Type
5.1 Arctic

Shaluf, I. M. and F. l.-R. Ahamadun (2008). "An Overview on the Offshore Emergency Response Planning in Malaysia." Disaster Prevention and Management **17**(1): p. 83-93.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
4.0 Standardization
4.2 Practices
5.0 Event Type
5.14 Offshore

Sharpe, J. (2006). "Rushing Down the Wrong Road." Rock Products **109**(4): 14.

Categories:
2.0 Command Center and Control
2.1 Communications
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Shelford, W. O. (1960). Subsunk; the Story of Submarine Escape. Garden City, N.Y., Doubleday.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.9 Maritime

---

3 Bibliography

Shetty, N. K., D. M. Deaves, et al. (1996). Unified Methodology for Fire Safety Assessment and Optimal Design, Florence, Italy, ASME, New York, NY, USA.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.14 Offshore

Shimshoni, J. (2005). "Evacuating High-Rise Buildings." Standardization News **33**(3): 22-25.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Siikonen, M.-L. and H. Hakonen (2003). "Efficient Evacuation Methods in Tall Buildings." Elevator World **51**(7): 78-83.

Categories:
2.0 Command Center and Control
2.5 Procedures

Singer, E. (2004). "Send in the Rescue Rats." New Scientist **183**(2466): 21.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Sjöberg, M., C. Wallenius, et al. (2006). "Leadership in Complex, Stressful Rescue Operations: A Qualitative Study." Disaster Prevention and Management **15**(4): 576-584.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership

Sniezek, J., D. Wilkins, et al. (2001). "Running Head: Advanced Training for Crisis Decision Making." Journal of Management Information Systems.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
3.0 Rescue Team and First Responder
3.6 Training

Sniezek, J. A. (2002). "Training for Crisis Decision-Making: Psychological Issues and Computer-Based Solutions." Journal of Management Information Systems **18**(4): 147-168.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process

Somers, S. (2004). "A Case for an Integrated Rescue Device in Turnouts." Fire Engineering **157**(6): 75-79.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Stanton, N. (1996). "Team Performance: Communication, Co-Ordination, Co-Operation and Control." Human Factors in Nuclear Safety.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.13 Nuclear

Strauss, S. J. (1996). "Efficacy of Self-Contained Self-Rescuers." Journal of the Mine Ventilation Society of South Africa **49**(3): 52-54.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
5.0 Event Type
5.11 Mine

Stull, J., M. B. Connor, et al. (1996). Protective Clothing and Equipment Performance Requirements for Fire Service Urban Search and Rescue Teams, San Francisco, CA, USA, ASTM, Conshohocken, PA, USA.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Su, J. (1998). On the Organization and Command of Township-Owned Coal Mine Serious and Great Accident Spot, Beijing, China, Sci Press.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.2 Decision Making Process
5.0 Event Type
5.11 Mine

Suruda, A. J., T. A. Pettit, et al. (1994). "Deadly Rescue: The Confined Space Hazard." Journal of Hazardous Materials **36**(1): 45-53.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5. 5 Confined Space

Swanick, J. T. (2005). "How Fast Is Your Fast Team?" Fire Engineering **158**(3): 14-22.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
3.3 Qualifications
3.6 Training

Tanaka, I. (1997). Emergency Management for Coastal Earthquake Disaster from the Viewpoint of the Sea, Honolulu, HI, USA, Int Soc of Offshore and Polar Engineerns (ISOPE), Golden, CO, USA.

Categories:
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.6 Earthquake
5.9 Maritime

Taylor, D. (2006). "Tread Carefully." Fire Prevention and Fire Engineers Journals(V).

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment

Thompson, W. (1994). "Sar/Media Communications." Canadian Emergency News **17**(4): p. 24-26.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.1 Communications

Thorne, R. (1996). "Reducing Rock Falls During Mine Rescue." Mining Engineering (Littleton, Colorado) **48**(12): 15-18.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology
5.0 Event Type
5.11 Mine

Thorvald, S. (1996). Building Collapse Rescue Engineering, Washington, DC, USA.

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Tilford, E. H. (1992). Search and Rescue in Southeast Asia. [Washington, D.C.], Center for Air Force History.

Categories:
5.0 Event Type
5.3 Aviation

Timko, R. J. and R. L. Derick (1988). Determining the Integrity of Escapeways During a Simulated Fire in an Underground Coal Mine, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.5 Technology
5.0 Event Type
5.11 Mine

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
4.0 Standardization
4.2 Practices
4.4 Training Standards
5.0 Event Type
5.7 Fire
5.9 Maritime
5.14 Offshore

Trainor, J. E. Searching for a System: Multi-Organizational Coordination in the September 11th World Trade Center Search and Rescue Response
Categories:
2.0 Command Center and Control
2.3 Interpersonal dynamics
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.21 9/11

Trotman, B. (1996). "Change in Direction for the New South Wales' Mines Rescue Service." Mining Technology **78**(900): 221-222.

Categories:
3.0 Rescue Team and First Responder
3.3 Qualifications
3.4 Specialized Duties of Team Members
3.6 Training
5.0 Event Type
5.11 Mine

Tyson, A. and M. Loomis (2006). Climbing Self-Rescue : Improvising Solutions for Serious Situations. Seattle, Mountaineers Books.

Categories:
1.0 Personnel and Human Behavior
    1.2 Escape Behavior
3.0 Rescue Team and First Responder
    3.6 Training
4.0 Standardization
    4.4 Training Standards

Tzeng, G.-H. and Y.-W. Chen (1999). "Optimal Location of Airport Fire Stations: A Fuzzy Multi-Objective Programming and Revised Genetic Algorithm Approach." Transportation Planning and Technology **23**(1): 37-55.

Categories:
3.0 Rescue Team and First Responder
    3.5 Technology
5.0 Event Type
    5.3 Aviation

U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
    1.2 Escape Behavior
3.0 Rescue Team and First Responder
    3.1 Equipment
5.0 Event Type
    5.7 Fire
    5.10 Military

U.S. Department of Labor (1999). Permit-Required Confined Spaces. Standard 1910.146.

Categories:
4.0 Standardization
- 4.1 Language
- 4.2 Practices
- 4.3 Symbols
- 4.4 Training Standards

U.S. House of Representatives (2002). *House Report 107-777: Maritime Transportation Security Act of 2002*. Sec. 109: Maritime Security Professional Training.

Categories:
3.0 Rescue Team and First Responder
- 3.6 Training

United States Bureau of Mines, Mountain Empire Community College / Division of Mining and Industrial Technology, et al. (1989). Carl T. Donaldson Exercise : Instructor's Copy. Lexington, Ky. / Big Stone Gap, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Division of Mining and Industrial Technology, Mountain Empire Community College.

Categories:
3.0 Rescue Team and First Responder
- 3.2 Protocols and Methods
- 3.6 Training

4.0 Standardization
- 4.4 Training standards

5.0 Event Type
- 5.11 Mine

United States Bureau of Mines, Southwest Virginia Community College / Miner Training Program, et al. (1989). Man in the Bin Exercise : Instructor's Copy. Lexington, Ky.; Richlands, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Miner Training Project, Southwest Virginia Community College.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
3.6 Training
4.0 Standardization
4.4 Training Standards
5.0 Event Type
5.11 Mine

United States Coast Guard On Scene. [Washington, D.C.], Dept. of Transportation**:** v.

Categories:
5.0 Event Type
5.9 Maritime

United States Coast Guard Sar Statistics. Washington, D.C., Coast Guard.

Categories:
5.0 Event Type
5.9 Maritime

United States Coast Guard (1975). Search and Rescue : Auxiliary Operational Specialty Course, Student Workbook. Washington, U.S. Dept. of Transportation, Coast Guard.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.9 Maritime

United States Coast Guard (1977). Boat Crew Training Guide. Washington, DC, Dept. of Transportation, Coast Guard.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.9 Maritime

United States Coast Guard (1979). Merchant Ship Search and Rescue Manual (Mersar). Washington, DC, Dept. of Transportation, Coast Guard.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.9 Maritime

United States Coast Guard (1982). Coast Guard Rescue and Survival Systems Manual. Washington, D.C., Dept. of Transportation, U.S. Coast Guard.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.9 Maritime

United States Coast Guard (1996). Auxiliary Specialty Course : Search and Rescue (Auxsar) : Instructor Guide. Washington, DC, U.S. Dept. of Transportation, U.S. Coast Guard.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.9 Maritime

United States Coast Guard (2002). U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (Nss) to the International Aeronautical and Maritime Search and Rescue Manual (Iamsar), U.S. Department of Transportation.

Categories:
4.0 Standardization
    4.4 Training Standards
5.0 Event Type
    5.9 Maritime

United States Coast Guard and United States Coast Guard Auxiliary (1977). Basic Instructor : Cornerstone Training Course : Student Workbook. Washington, Dept. of Transportation, Coast Guard.

Categories:
3.0 Rescue Team and First Responder
    3.6 Training
5.0 Event Type
    5.9 Maritime

United States Congress. House. Committee on Homeland Security. Subcommittee on Emergency Preparedness Science and Technology. (2007). Incident Command, Control, and Communications During Catastrophic Events. Committee on Homeland Security, Subcommittee on Emergency Preparedness Science and Technology. Washington, U.S. G.P.O.**:** iii, 49 p.

Categories:
2.0 Command Center and Control
    2.1 Communications
    2.2 Decision Making Process
    2.3 Interpersonal Dynamics
4.0 Standardization
    4.2 Practices

United States Dept. of the Air Force (1985). Search and Rescue : Survival Training. Washington, DC, Dept. of the Air Force.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.3 Aviation

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
2.0 Command Center and Control
2.1 Communications
3.0 Rescue Team and First Responder
3.5 Technology
4.0 Standardization
4.1 Language
4.2 Practices
4.3 Symbols

United States General Accounting Office and United States Coast Guard (2003). Coast Guard New Communication System to Support Search and Rescue Faces Challenges. Washington, D.C., U.S. General Accounting Office.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.9 Maritime
5.10 Military

United States Government Accountability Office (2006). United States Coast Guard Improvements Needed in Management and Oversight of Rescue System Acquisition : Report to Congressional Committees. Washington, D.C., U.S. Government Accountability Office**:** i, 54 p.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
2.0 Command Center and Control
2.5 Procedures
5.0 Event Type
5.9 Maritime

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership
2.0 Command Center and Control
2.2 Decision Making Process
2.5 Procedures
4.0 Standardization
4.2 Practices
5.0 Event Type
5.10 Military

United States Joint Chiefs of Staff. Special Operations Review Group (1980). Rescue Mission Report. Washington, D.C., Joint Chiefs of Staff**:** vi, 78 leaves.

Categories:
4.0 Standardization
4.2 Practices

United States National Transportation Safety Board (1981). Special Investigation Report : Search and Rescue Procedures and Arming of Emergency Locator Transmitter : Aircraft Accident near Michigan City, Indiana, December 7, 1980. Washington, DC, National Transportation Safety Board.

Categories:
2.0 Command Center and Control
    2.5 Procedures
5.0 Event Type
    5.3 Aviation

United States. Congress. House. Committee on Transportation and Infrastructure. Subcommittee on Coast Guard and Maritime Transportation. (2000). Coast Guard's Search and Rescue Mission : Hearing before the Subcommittee on Coast Guard and Maritime Transportation of the Committee on Transportation and Infrastructure, House of Representatives, One Hundred Sixth Congress, First Session, November 3, 1999. Washington, U.S. G.P.O. : [U.S. G.P.O., Supt. of Docs., Congressional Sales Office, distributor].

Categories:
4.0 Standardization
    4.2 Practices
5.0 Event Type
    5.9 Maritime

United States. Congress. Senate. Committee on Appropriations. Subcommittee on Departments of Labor Health and Human Services Education and Related Agencies. (2003). Mine Disaster at Quecreek : Hearing before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Seventh Congress, Second Session, Special Hearing, October 21, 2002, Johnstown, Pa. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O. [Congressional Sales Office].

Categories:
1.0 Personnel and Human Behavior
    1.3 Leadership
3.0 Rescue Team and First Responder
    3.2 Protocols and Methods
5.0 Event Type
    5.11 Mine

---

3 Bibliography

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Categories:

4.0 Standardization
- 4.1 Language
- 4.2 Practices
- 4.3 Symbols
- 4.4 Training Standards

5.0 Event Type
- 5.9 Maritime

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Categories:

1.0 Personnel and Human Behavior
- 1.1 Employee Culture
- 1.3 Leadership
- 1.4 Local Community Interface

3.0 Rescue Team and First Responder
- 3.2 Protocols and Methods
- 3.4 Specialized Duties of Team Members
- 3.6 Training

5.0 Event Type
- 5.8 Hurricane
- 5.9 Maritime
- 5.10 Military

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2007). Hurricane Katrina : Urban Search and Rescue in a Catastrophe : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, Second Session, January 30, 2006. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
3.0 Rescue Team and First Responder
    3.6 Training
5.0 Event Type
    5.8 Hurricane

Vaught, C., M. J. Brnich, et al. (2004). An Oral History Analysis of Mine Emergency Response. Pittsburgh, PA; Cincinnati, OH, U.S. Dept. of Health and Human Services.

Categories:
1.0 Personnel and Human Behavior
    1.1 Employee Culture
    1.2 Escape Behavior
5.0 Event Type
    5.11 Mine

Veasey, D. A. and Wiley InterScience (Online service) (2006). Confined Space Entry and Emergency Response. Hoboken, N.J., John Wiley & Sons**:** xxi, 486 p.

Categories:
3.0 Rescue Team and First Responder
    3.4 Specialized Duties of Team Members
    3.6 Training
5.0 Event Type
    5.5 Confined Space
    5.7 Fire

---

3 Bibliography

Virginia Dept. of Fire Programs (2003). Mayday, Firefighter Down! : Student Manual. Richmond, VA, Virginia Dept. of Fire Programs.

Categories:
2.0 Command Center and Control
    2.5 Procedures
3.0 Rescue Team and First Responder
    3.6 Training
    3.2 Protocols and Methods
5.0 Event Type
    5.3 Aviation

Virginia. Dept. of Fire Programs. (2002). Heavy and Tactical Rescue : Vehicle Extrication : Pilot Program : Student Guide. Richmond, Va., Virginia Dept. of Fire Programs.

Categories:
3.0 Rescue Team and First Responder
    3.1 Equipment

Vogel, M. and H. P. Rast (2000). "Alptransit-Safety in Construction as a Challenge: Health and Safety Aspects in Very Deep Tunnel Construction." Tunnelling and Underground Space Technology **15**(4): 481-484.

Categories:
4.0 Standardization
    4.2 Practices
5.0 Event Type
    5.19 Tunnel

---

von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.2 Decision Making Process
2.3 Interpersonal Dynamics
3.0 Rescue Team and First Responder
3.4 Specialized Duties of Team Members
5.0 Event Type
5.11 Mine

Wachtendorf, T. Improvising 9/11: Organizational Improvisation Following the World Trade Center Disaster.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface
2.0 Command Center and Control
2.2 Decision Making Process
5.0 Event Type
5.21 9/11

Wagner, M. J. (1999). "Smoke Location System Boosts Tunnel Rescue." Fire International **23**(September): 33-34

Categories:
3.0 Rescue Team and First Responder
3.5 Technology

Wallace, I. G. (1992). Assessment of Evacuation, Escape and Rescue Provisions on Offshore Installations, Manchester, Engl, Publ by Inst of Chemical Engineers, Rugby, Engl.

Categories:
2.0 Command Center and Control
2.5 Procedures
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.14 Offshore

Wallenius, C. (2001). "Why Do People Sometimes Fail When Adapting to Danger? A Theoretical Discussion from a Psychological Perspective." International Journal of Mass Emergencies and Disasters **19**(2): 145-180.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.2 Escape Behavior

Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
2.0 Command Center and Control
2.1 Communications
2.2 Decision Making Process
2.3 Interpersonal Dynamics

Whitby, C. (2004). "Basic Essentials of Rit." Fire Engineering **157**(2): 30-32.

Categories:
3.0 Rescue Team and First Responder
3.1 Equipment
3.6 Training

Whitcomb, D. D. (1998). The Rescue of Bat 21. Annapolis, Md., Naval Institute Press.

Categories:
1.0 Personnel and Human Behavior
1.2 Escape Behavior
5.0 Event Type
5.3 Aviation

Whitcomb, D. D. (2006). Combat Search and Rescue in Desert Storm. Maxwell Air Force Base, Ala., Air University Press.

Categories:
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.10 Military

Wilk, S. (2006). "Public Safety: Elevator Safety: What to Do If Someone Is Trapped." Elevator World **54**(9): 129-132.

Categories:
1.0 Personnel and Human Behavior
1.4 Local Community Interface

William, J., H. Stambaugh, et al. (2003). Rapid Intervention Teams and How to Avoid Needing Them Special Report. Technical report series USFA-TR-123. [Emmitsburg, Md.], Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center**:** [54] p.

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
3.0 Rescue Team and First Responder
3.2 Protocols and Methods
5.0 Event Type
5.7 Fire

Williams, C. (1987). "Taking an Offshore Breather: Respiratory Equipment for Use on Rigs and Platforms." Fire **80**(990): p. 35-36.

Categories:
2.0 Command Center and Control
2.1 Communications
5.0 Event Type
5.14 Offshore

Williams, P. M. Rescue Leadership. Altadena, Calif.

Categories:
1.0 Personnel and Human Behavior
1.3 Leadership

Woodfield, S. (2006). "Central Control." Fire Prevention and Fire Engineers Journals(APR).

Categories:
2.0 Command Center and Control
2.2 Decision Making Process
2.3 Interpersonal Dynamics

Wright, R. (2003). "A Rescuer's Guide to Rapid Confined-Space Entry." Advanced Rescue Technology **6**(2): 13+.

Categories:
3.0 Rescue Team and First Responder
3.6 Training
5.0 Event Type
5.5 Confined Space

Wyoming Aeronautics Commission., Wyoming., et al. (1976). Wyoming Aircraft Search and Rescue. Cheyenne, Wyo., Wyoming Aeronautics Commission.

Categories:
5.0 Event Type
5.3 Aviation

Yeomans, K. (2004). Dead Men Tapping : The End of the Heather Lynne Ii. Camden, Me., International Marine/McGraw-Hill.

Categories:
1.0 Personnel and Human Behavior
1.1 Employee Culture
1.4 Local Community Interface
5.0 Event Type
5.9 Maritime

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4 Subject Bibliographies

The subject bibliographies list all references from the extensive literature search. These references include refereed journal papers, technical reports, books, trade magazines and government documents.

The subject bibliography is broken down into categories and subcategories. If applicable references have been tagged to multiple categories / subcategories; hence many references may appear in more than one subject bibliography.

The best way to use the subject bibliographies is to select the appropriate main category then the subsequent subcategory and then go through the references listed for that subcategory. Most of the references have an abstract and if the document is available online either the URL or a copy of the original document is provided.

The subjective bibliography is arranged as per the following structure (number of documents in braces):

1 Personnel and Human Behavior (73)
- 1.1 Employee Culture (24)
- 1.2 Escape Behavior (35)
- 1.3 Leadership (18)
- 1.4 Local Community Interface (12)

2 Command Center and Control (93)
- 2.1 Communications (22)
- 2.2 Decision Making Process (22)
- 2.3 Interpersonal Dynamics (16)
- 2.4 Personnel Qualification (5)
- 2.5 Procedures (27)
- 2.6 Training Requirements (15)

3 Rescue Team and First Responder (162)
- 3.1 Equipment (49)
- 3.2 Protocols and Methods (39)
- 3.3 Qualifications (8)
- 3.4 Specialized Duties of Team Members (12)
- 3.5 Technology (61)
- 3.6 Training (43)

4 Standardization (63)
- 4.1 Language (8)
- 4.2 Practices (39)
- 4.3 Symbols (7)
- 4.4 Training Standards (37)

5 Event Type (179)
- 5.1 Arctic (2)
- 5.2 Avalanche (3)
- 5.3 Aviation (19)
- 5.4 Cave (2)
- 5.5 Confined Space (11)
- 5.6 Earthquake (1)
- 5.7 Fire (17)
- 5.8 Hurricane (2)
- 5.9 Maritime (33)
- 5.10 Military (6)
- 5.11 Mine (42)
- 5.12 Mountain (3)
- 5.13 Nuclear (4)
- 5.14 Offshore (33)
- 5.15 Quarrying (2)
- 5.16 Railroad (2)
- 5.17 Space (3)
- 5.18 Trench (2)
- 5.19 Tunnel (15)
- 5.20 Water Well (1)
- 5.21 9/11 (4)

1.1 Employee Culture (24)

"Piper Alpha - a Damning Report on Safety Measures." (1991). Fire International **15**(126): p. 14+.

Summary: n/a

Anon (2000). "Mine Health and Safety Council Award Scheme - Recognising High Standards of Health and Safety." Journal of the Mine Ventilation Society of South Africa **53**(4): 165-166.

Summary: The Mine Health and Safety Council (MHSC) award scheme heralds a new era in the South African mining history. The main aim of the new system is to provide recognition for significant achievements made in mine health and safety. A tripartite working group, which includes representatives from government, industry and labor, identified all the awards in the new scheme.

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Carlisle, T. D., T. B. Kyte, et al. (2007). Rail Crew Resource Management (Crm): Survey of Teams in the Railroad Operating Environment and Identification of Available Crm Training Methods.

Summary: This report summarizes the work undertaken by the Texas Transportation Institute to document the common teams or crews that are present within the rail industry and to evaluate the existing crew resource management (CRM) training methods used in other industries for their applicability to those railroad teams. Several railroads were visited in order to identify railroad crews, and an extensive literature search was performed to classify the broad variety of CRM training methods available. Facilities of five different railroad types were visited to gain a cross-sectional picture of the teams in the rail industry. These railroads included an eastern Class I railroad, a western Class I railroad, a shortline railroad, an urban commuter railroad, and an inter-city passenger railroad. Methods of CRM training from the commercial airline industry, the military, the medical field, the offshore oil production industry, and the nuclear power industry as well as existing railroad CRM training courses were examined concerning their application to the existing teams found during the site visits. Recommendations regarding the appropriate training methods for each railroad team are then made.

Crook, J. (1989). "The Aftermath of Piper Alpha." Fire Prevention(225): p. 28-32.

Summary: July 6, 1988, was the date of the offshore oil industry explosion which killed 167 people. This incident raised serious questions about oil platform safety. The author, a technical writer, looks at how the findings of the long running public inquiry have affected design and safety procedures.

Drabek, T. E. (1981). Managing Multiorganizational Emergency Responses : Emergent Search and Rescue Networks in Natural Disaster and Remote Area Settings. Boulder, CO, Institute of Behavioral Science, University of Colorado.

Summary: n/a

Ersland, S., Sund, A., and Weisaeth, Lars. (1989). "The Stress Upon Rescuers Involved in an Oil Rig Disaster " Acta Psychiatrica Scandinavica **80**: 12.

Summary: Table of Contents: 1. Emergency Personnel 2. Offshore Installations 3. Post raumatic Stress Disorder 4. Rescue Operations 5. Stress

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Fleming, M., R. H. Flin, et al. (1998). "Risk Perceptions of Offshore Workers on Uk Oil and Gas." Risk Analysis **18**(1): p. 103-110.

Summary: n/a

Fuchs, E., W. Hermulheim, et al. (2004). "Restrukturierung Des Grubenrettungswesens Restructuring of the Mine Rescue Service." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **140**(10): 453-457.

Summary: About 1,200 voluntary mine rescue workers are currently on stand-by for underground deployment with respirators in the Ruhr, Saar and Ibbenburen coalfields. The minimum requirement of mine rescue workers for a major incident is 600 men for three physically separated coalfields and is still safely covered in the medium term. The concentration of specific qualifications (packing and drilling operations with respirators, inertisation) in the voluntary central mine rescue station DSK Ruhr continues to be practical and is being maintained; by contrast the continuous stand-by service of the central mine rescue station was disbanded on 31 December 2003 in the course of the deployment profile modified in recent years. The professional mine and works fire brigade in Friedrichsthal, Saar including the stand-by service is being maintained with its previous strength essentially on the basis of the existing specifications by regulations or service contracts. A subsequent solution for the period after closure of the Warndt/Luisenthal site of the Saar colliery is being investigated with regard to feasibility in a project with participation of the mining authorities, the Saar colliery and the main mine rescue service station. The main mine rescue stations in Herne and Friedrichsthal have significantly intensified their cooperation in the course of mutual simplification of the technical fields.

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Summary: n/a

Kass, L. M. (2006). "Early Mining Safety Heroes." Mining Engineering **58**(3): 46.

Summary: Addressing the increasing deaths resulting from various mining accidents, the Congress in 1910 created the U.S. Bureau of Mines. Its first director, Joseph A. Holmes dedicated his life to improving the safety and health of coal miners by training miners in safe mining methods, forming local mine rescue teams, providing breathing devices for mine rescuers, and investigating the causes of mine fatalities and conducting research to eliminate safety hazards. It was also under Holmes' leadership that the "Three Bureau Heroes" came to be known. The three Bureau rescuers who gave their lives in the line of duty included: Joseph Evans at the Price-Pancoast Mine fire, Throop, PA, 7 April 1911; John Ferrel at the Cherry Valley Mine fire, Cherry Valley, PA. 19 January 1912; and Edward Evans, at Rock Springs, WY, 30 September 1913. The decrease in mine disasters and the increased efficiency of the rescue work, as now conducted by the Bureau of Mines, are fitting tributes to the memory of Joseph Evans, John Ferrel and Edward Evans. Holmes died in 1915, but his early leadership and vision remained with the Bureau.

Kielblock, A. J., J. P. van Rensburg, et al. (1999). "Work Load Training: Enhanced Safety Standards for Rescue Brigades' Operations in the South African Mining Industry." Journal of the Mine Ventilation Society of South Africa **52**(2): 44-46.

Summary: As South African mines reach ever-increasing depths, the corresponding increase in temperature due to the geothermal gradient and auto-compression, heightens the risk of heat-related disorders to underground workers, as well as the early onset of fatigue. This is particularly important when rescue teams are deployed in sealed (unventilated) areas during fire fighting and other emergencies. The approximately 970 volunteer rescue brigadesman serving the South African mining industry are largely drawn from full-time occupations from mid-management. This implies that by the nature of their daily jobs they are unaccustomed to the extreme physical demands required during rescue and fire fighting operations. The combination of high work rates in harsh environmental conditions, coupled with very high motivational levels, therefore poses a threat to the health and safety of these workers. This paper examines the physiological protection of rescue bridagesmen with specific reference to the scientific development of work load tests.

Lois, J. (2003). Heroic Efforts : The Emotional Culture of Search and Rescue Volunteers. New York, New York University Press.

Summary: n/a

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin.

Orasanu, J., Y. Tada, et al. (2005). Physiological Monitoring of Team and Task Stressors, Orlando, FL, United States, International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States.

Summary: Sending astronauts into space, especially on long-durations missions (e.g. three-year missions to Mars), entails enormous risk. Threats include both physical dangers of radiation, bone loss and other consequences of weightlessness, and also those arising from interpersonal problems associated with extended life in a high-risk isolated and confined environment. Before undertaking long-duration missions, NASA seeks to develop technologies to monitor indicators of potentially debilitating stress at both the individual and team level so that countermeasures can be introduced to prevent further deterioration. Doing so requires a better understanding of indicators of team health and performance. To that end, a study of team problem solving in a simulation environment was undertaken to explore effects of team and task stress. Groups of four males (25-45 yrs) engaged in six dynamic computer-based Antarctic search and rescue missions over four days. Both task and team Stressors were manipulated. Physiological responses (ECG, respiration rate and amplitude, SCL, EMG, and PPG); communication (voice and email); individual personality and subjective team dynamics responses were collected and related to task performance. Initial analyses found that physiological measures can be used to identify transient stress, predict performance, and reflect subjective workload. Muscle tension and respiration were the most robust predictors. Not only the level of arousal but its variability during engagement in the task is important to consider. In general, less variability was found to be associated with higher levels of performance. Individuals scoring high on specific personality characteristics responded differently to task stress.

Quarantelli, E. L. (1989). How Individuals and Groups React During Disasters: Planning and Managing Implications for Ems Delivery.

Summary: n/a

U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Summary: Provides the Incident Commander with an understanding of the FFPE protection and the associated risks if worn while performing rescue operations at the scene of a terrorist incident involving military chemical warfare agents.

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2007). Hurricane Katrina : Urban Search and Rescue in a Catastrophe : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, Second Session, January 30, 2006. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Vaught, C., M. J. Brnich, et al. (2004). An Oral History Analysis of Mine Emergency Response. Pittsburgh, PA; Cincinnati, OH, U.S. Dept. of Health and Human Services.

Summary: n/a

Wallenius, C. (2001). "Why Do People Sometimes Fail When Adapting to Danger? A Theoretical Discussion from a Psychological Perspective." International Journal of Mass Emergencies and Disasters **19**(2): 145-180.

Summary: During life-threatening danger, people may react in ways that decrease their chances of surviving or coping with the event. Several empirically demonstrated reactions have a potentially maladaptive effect on performance, due to limitations in our cognitive and emotional processing capacity or the activation of obsolete adaptation mechanisms. The possible psychological explanations for this are discussed in terms of assumptions derived from three major psychological paradigms: Darwinian, Freudian, and cognitive psychology. These theoretical models all illustrate useful concepts and assumptions, which do not logically exclude one another, necessary to understand more thoroughly how psychological adaptation occurs in danger situations. However, no theory alone explains the empirical findings, and the various theories should be integrated into a model that includes different levels of psychological function, from consciously controlled processes to emotional and automatic process.

Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

Summary: The death of 13 men in the Mann Gulch fire disaster, made famous in Norman Maclean's Young Men and Fire, is analyzed as the interactive disintegration of role structure and sensemaking in a minimal organization. Four potential sources of resilience that make groups less vulnerable to disruptions of sensemaking are proposed to forestall disintegration, including improvisation, virtual role systems, the attitude of wisdom, and norms of respectful interaction. The analysis is then embedded in the organizational literature to show that we need to reexamine our thinking about temporary systems, structuration, nondisclosive intimacy, intergroup dynamics, and team building.

Yeomans, K. (2004). Dead Men Tapping : The End of the Heather Lynne Ii. Camden, Me., International Marine/McGraw-Hill.

Summary: A 1996 collision off the Massachusetts coast between a barge-pulling tugboat and the fishing boat Heather Lynn II resulted in the latter overturning and trapping all three crewmen, who tapped on the ship's hull to let nearby fishermen know they were alive. When the Coast Guard showed up too late to help the crew, questions were asked and lawsuits filed. Tracking the 2000 lawsuit, Yeomans, herself a writer, fisherman and boat captain, jumps back and forth between courtroom statements and the events of the fateful day. Connecting the testimony of each participant-the tugboat captain, the salvager, local fishermen and Coast Guard personnel-and a recap of their day with her clean prose and knowledgeable insight, Yeomans brings the tragic day to life on the page. Helping to put this sad tale in the right context and provide the reader with a historical perspective, Yeomans intersperses similar tales of boat-to-boat collisions and rescue missions where the Coast Guard's actions and protocol were questioned. While the story is compelling, this book doesn't truly pull at one's heart-strings like the best of ocean adventure books have, because Yeomans never really puts the reader in the shoes of the three lost fishermen. Still, filled with examples of maritime law and the unwritten laws of the sea and seafarers, this book provides an intriguing glimpse into the lives of the men and women who are employed in one of America's most dangerous professions.

1.2 Escape Behavior (35)

"The Bottom Line - You Can't Walk from a Platform." (1992). Fire International **16**(133): p. 30-31.

Summary: n/a

Aguirre, B. E. "Planning, Warning, Evacuation, and Search and Rescue: A Review of the Social Science Research Literature."

Summary: The focus of this review is on planning, warnings, evacuations, and search and rescue activities that are designed to minimize the deleterious effects of disasters on populations. The review discusses the points of consensus among specialists in these disaster-related activities, and it illustrates them with my own research in Puerto Rico and Mexico. The review disccusses present-day lack of interest in planning for disasters and the determinants of public response to warnings. A third section presents the prevailing definition of evacuation, types of evacuation and a list of its determinants, as well as the two major extant conceptual frameworks of evacuation. The fourth and final section of this review presents what is known about search and rescue activities in disasters, to include the importance of volunteers and emergent group activities, the importance of the timing of rescue, and the policy implications of these patterns.

Aguirre, B. E., D. E. Wenger, et al. (1995). "The Social Organization of Search and Rescue : Evidence from the Guadalajara Gasoline Explosion." International Journal of Mass Emergencies and Disasters **13**(1): 67-92.

Summary: This research uses information from the Guadalajara gasoline explosion of 22 April, 1992, to show the importance of social organization in search and rescue activities. Information is obtained from forty three victims that had been buried alive by the explosion throughout the impacted area, and twenty two volunteers who had participated in the direct rescue phase. They reported on their own experience during SAR and the experience of victims and rescuers near them. Most of the people that were rescued alive in the aftermath of the tragedy were rescued by these volunteers. Volunteers' social identities in peer groups, extended families, the neighborhood, and the Catholic Church structured their search and rescue activities. Chances of people surviving the blast were directly proportional to the presence among the searchers of a person or persons who cared for the victim and who knew the victim's likely location. The behavior of the victims was marked by the continuation of preexisting motivational, normative, and value orientations. Victims acted cooperatively during entrapment. Most of the victims that were rescued alive were rescued during the first two hours immediately after the explosion. The article concludes with the implication of the study for collective behavior and disaster research and planning.

Bercha, F. G. (2001). Escape, Evacuation, and Rescue Research Project, Bercha Engineering Limited.

Summary: n/a

Bercha, F. G., E. Radloff, et al. (2003). Development of Canadian Performance-Based Eer Standards, Honolulu, HI, United States, International Society of Offshore and Polar Engineers.

Summary: The Canadian government, through the federal Transportation Development Centre (TDC), in 1999 initiated a program to develop performance-based escape, evacuation, and rescue (EER) standards for offshore installations in Canadian waters. Performance-based standards (PBS) set expected activity, task, and process achievement levels and goals, rather than prescribing equipment quantities, types, dimensions, and other specifications. This paper describes the standards, their development program and the associated research projects needed to fill relevant data gaps.

Boer, L. (2003). "Behavior of Drivers During Tunnel Evacuation." (Re) claiming the Underground Space: Proceedings of the ITA World Tunnelling Congress 2003, 12-17 April 2003, Amsterdam, The Netherlands.

Summary: n/a

Boulougouris, E. K. and A. Papanikolaou (2002). Modeling and Simulation of the Evacuation Process of Passenger Ships. Proc. 10th Int. Congress of the International Maritime Association of the Mediterranean (IMAM 2002). Crete.

Summary: The need to safely evacuate within very short time a large number of people from a confined space, such as the superstructure of large passenger ships, is a difficult task of great practical interest, as documented in recent discussions at the Marine Safety Committee of the International Maritime Organisation (MSC-IMO).

This paper describes the methodology utilized by the code EVDEMON (EVacuation DEmonstration & MOdeliNg), currently under development at SDL-NTUA, for the simulation of the evacuation process onboard passenger ships and presents typical results of application to the evacuation of a modern Ro-Ro passenger ferry. The code is understood as a design tool assisting the designer in the early design stage as to the consideration of proper arrangements for enabling a timely and safe evacuation. The designer is asked to care of optimal measures in terms of internal arrangements to allow for the fast evacuation without bottlenecks, when the ship is in danger. Given the uncertainty of human behavior under stress and the restrictions of a possible mathematical modeling thereof, only multiple simulations of different evacuation scenarios may give the naval architect an indication about the potential outcome in such an event, so that bottlenecks can be identified and removed to the extent possible. At a later development stage, namely after the validation phase, simulation codes, like the presented one, might be used as evidence for the approval of evacuation plans by relevant authorities, as documented by MSC-IMO (MSC Circ. 909/ 1999).

Brumley, A. and L. Koss (1998). "The Need for Statistics on the Behavior of Passengers During the Evacuation of High Speed Craft." Proceedings of FAST **97**.

Summary: n/a

Bryan, J. (1999). "Human Behaviour in Fire: The Development and Maturity of a Scholarly Study Area." Fire Mater **23**(249): 253.

Summary: This article presents a selected literature review of the critical studies with an analysis of the development of the study area concerned with the behaviour of the occupants during a fire occurrence. Although, the primary emphasis is on the developments in this study area within the United States from the early 1900s until 1998, the literature cited is of world wide origin. The influence of the performance code concept on the human behaviour in fire research with the resulting emphasis on the evacuation models is examined. Cautions are expressed relative to the design, validation and application of the evacuation models. Concerns are expressed relative to the application of the evacuation models to the simulation of the documented behaviour of occupants in fire incidents.

Clark, L. (2002). "Panic: Myth or Reality." Contexts **1**(4): 21-26.

Summary: Images of group panic and collective chaos are ubiquitous in Hollywood movies, mainstream media and the rhetoric of politicians. But, contrary to these popular portrayals, group panic is relatively rare. In disasters people are often models of civility and cooperation.

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de Gelder, B., J. Snyder, et al. (2004). "Fear Fosters Flight: A Mechanism for Fear Contagion When Perceiving Emotion Expressed by a Whole Body." Proceedings of the National Academy of Sciences **101**(47): 16701.

Summary: n/a

Entin, E., C. Kerrigan, et al. "Development of a Search and Rescue Simulation to Study the Effects of Prolonged Isolation on Team Decision Making."

Summary: n/a

Ersland, S., Sund, A., and Weisaeth, Lars. (1989). "The Stress Upon Rescuers Involved in an Oil Rig Disaster " Acta Psychiatrica Scandinavica **80**: 12.

Summary: Table of Contents: 1. Emergency Personnel 2. Offshore Installations 3. Post raumatic Stress Disorder 4. Rescue Operations 5. Stress

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Fahy, R. F. (2002). "Tools for the Simulation of Human Behavior." Fire Protection Engineering **101**(47): 16701-16706.

Summary: n/a

Goodell, J. (2002). Our Story : 77 Hours That Tested Our Friendship and Our Faith. New York, Hyperion.

Summary: The story of the nine Pennsylvania coal miners who were trapped underground for more than three days is a blessedly unsentimental and true-to-life account of a horrifying situation and a triumphant escape.

Harbst, J. and F. Madsen The Behaviour of Passengers in a Critical Situation on Board a Passenger Vessel or Ferry, Technical report, Danish Investment Foundation, Kopenhagen, 1996.

Summary: n/a

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Summary: On 23 May 1983, an avalanche occurred at the Revenue-Virginius Mine. Six mine personnel and two contract diamond drillers were trapped when the avalanche covered and blocked the portal, the only access into the mine. Fortunately, all eight persons were rescued. Surveying the damage, issues that have contributed to the disaster emerged. By blocking the snow slide chute, the snow weight was allowed to accumulate until the fences failed and it all came at once. If the snow would have been allowed to run in smaller amounts throughout the winter, no damage would have occurred. The original ventilation system was installed in line with the snow slide by people who were not aware of or did not recognize the hazard. If a detailed map with the individual sets mapped could have been used, it would have been easier to, quicker and safer to dig horizontally than vertically. All unused equipment or facilities should be removed or neutralized. Furthermore, vehicles should not be parked and personnel should bot be allowed to walk in zones of danger.

Kiyono, J., K. Toki, et al. (2001). "Evaluation of Safety on Evacuation Behavior from an Underground Space During an Earthquake." Proceedings of JSCE (Japan Society of Civil Engineers): 31-43.

Summary: n/a

Lee, R. M. (1993). Death and Deliverance : The True Story of an Airplane Crash at the North Pole. Golden, Colo., Fulcrum Pub.

Summary: n/a

Maas, P. (1999). The Terrible Hours : The Man Behind the Greatest Submarine Rescue in History. New York, HarperCollins Publishers.

Summary: On the eve of World War II, America's newest submarine plunged out of control to the ocean bottom during a test dive. Miraculously, thirty-three crew members remained alive.

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Summary: The MERD program is a simulation of mine emergency situations, which seeks to improve the responsiveness of mine personnel during fires, explosions, and related mine accidents. It provides participants the opportunity to experience the associated emotions, stress, and problems and explore possible solutions. The training shows the need for proper planning and contingency measures should an emergency situation occur. It also delineates the tasks of various agencies involved in rescue operations Evaluations of the MERD program over the years indicate a satisfactory performance mark. Participants have attested to the importance of the program in stressing the role of effective communication and proper organization.

Naum, C. J. (2002). Basic Rescue Skills. Ottawa, Public Safety and Emergency Preparedness Canada.

Summary: n/a

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Summary: n/a

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Summary: The experience of a Trench Rescue team while rescuing 21-year-old construction worker who was caught in a trench collapse and nearly lost his life, is presented. When the team arrived on-scene, the victim was in a 12-foot trench buried up to his chest. The victim was finally strapped to backboard and put into a rescue basket. The team felt that on several occasions when things started to get out of control, everybody was reminded of their respective in-charge operations. In many situations, a trench rescue could be augmented by the use of a vacuum cleaning truck. The use of the incident command system, as much personnel to the scene as possible, plan for getting the victim out of trench once he is freed, are all essential for a successful operation.

Orasanu, J., Y. Tada, et al. (2005). Physiological Monitoring of Team and Task Stressors, Orlando, FL, United States, International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States.

Summary: Sending astronauts into space, especially on long-durations missions (e.g. three-year missions to Mars), entails enormous risk. Threats include both physical dangers of radiation, bone loss and other consequences of weightlessness, and also those arising from interpersonal problems associated with extended life in a high-risk isolated and confined environment. Before undertaking long-duration missions, NASA seeks to develop technologies to monitor indicators of potentially debilitating stress at both the individual and team level so that countermeasures can be introduced to prevent further deterioration. Doing so requires a better understanding of indicators of team health and performance. To that end, a study of team problem solving in a simulation environment was undertaken to explore effects of team and task stress. Groups of four males (25-45 yrs) engaged in six dynamic computer-based Antarctic search and rescue missions over four days. Both task and team Stressors were manipulated. Physiological responses (ECG, respiration rate and amplitude, SCL, EMG, and PPG); communication (voice and email); individual personality and subjective team dynamics responses were collected and related to task performance. Initial analyses found that physiological measures can be used to identify transient stress, predict performance, and reflect subjective workload. Muscle tension and respiration were the most robust predictors. Not only the level of arousal but its variability during engagement in the task is important to consider. In general, less variability was found to be associated with higher levels of performance. Individuals scoring high on specific personality characteristics responded differently to task stress.

Paton, D. (2003). "Stress in Disaster Response: A Risk Management Approach." Disaster Prevention and Management: An International Journal **12**(3): 203-209.

Summary: n/a

Pu, S. and S. Zlatanova (2005). Evacuation Route Calculation of Inner Buildings. Geo-Information for Disaster Management**:** 1143-1161.

Summary: Disastrous accidents (fire, chemical releases, earthquake, terrorist attacks, etc) in large public and residential buildings (discotheques, cafes, trade and industrial buildings) usually result in tragic consequences for people and environments. Such accidents have clearly showed that need for reliable systems supporting rescue operations is urgently appealing. Amongst all, giving appropriate information to the ordinary people in/around the affected area considering the disaster developments (available exists, assessable corridors, etc.) and the human factors (age, gender, disability) are of critical importance for the success of the rescue operation.

Quarantelli, E. L. "Sociology of Panic."

Summary: The term "panic" is widely used in everyday speech as well as in the literature of different professional areas and scientific disciplines. This article confines itself primarily to discussing how sociologists, historically and currently, view the phenomena. The justification for such a focus is that the concept has long been used in the discipline especially in the sociological subspeciality of collective behavior, and much of the relevant empirical work has been done by sociologists studying behavior in natural and technological disasters.

Early approaches to panic were vague in defining the phenomena. However, most formulations view panic as either extreme and groundless fear, or flight behavior. Both phenomena are supposedly widespread in crisis situations. Present day discussions about panic also revolve around whether or not the behavior is irrational, and whether it is highly contagious or not. Three major empirical studies that have heavily influenced present day sociological views about panic are presented. Two of the studies particularly challenge widespread ideas in the literature about the phenomena, showing for example that panic flight is very rare, and has few of the characteristics typically attributed to the behavior, even in situations where it might be expected.

There are two questions that will loom even larger in the future. One is why despite the research evidence, the idea of "panic" captures the popular imagination and continues to be evoked by scholars of human behavior. A second basic question is whether there is still any scientific justification for the continuing use of the concept in any technical sense in the collective behavior area.

Quarantelli, E. L. (1989). How Individuals and Groups React During Disasters: Planning and Managing Implications for Ems Delivery.

Summary: n/a

Scott, J. and J. Robertson (1993). Lost in the Himalayas : James Scott's 43-Day Ordeal. Port Melbourne, Vic., Lothian.

Summary: n/a

Tyson, A. and M. Loomis (2006). Climbing Self-Rescue : Improvising Solutions for Serious Situations. Seattle, Mountaineers Books.

Summary: Table of Contents available via http://www.loc.gov/catdir/toc/ecip064/2005035066.html

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U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Summary: Provides the Incident Commander with an understanding of the FFPE protection and the associated risks if worn while performing rescue operations at the scene of a terrorist incident involving military chemical warfare agents.

Vaught, C., M. J. Brnich, et al. (2004). An Oral History Analysis of Mine Emergency Response. Pittsburgh, PA; Cincinnati, OH, U.S. Dept. of Health and Human Services.

Summary: n/a

Wallenius, C. (2001). "Why Do People Sometimes Fail When Adapting to Danger? A Theoretical Discussion from a Psychological Perspective." International Journal of Mass Emergencies and Disasters **19**(2): 145-180.

Summary: During life-threatening danger, people may react in ways that decrease their chances of surviving or coping with the event. Several empirically demonstrated reactions have a potentially maladaptive effect on performance, due to limitations in our cognitive and emotional processing capacity or the activation of obsolete adaptation mechanisms. The possible psychological explanations for this are discussed in terms of assumptions derived from three major psychological paradigms: Darwinian, Freudian, and cognitive psychology. These theoretical models all illustrate useful concepts and assumptions, which do not logically exclude one another, necessary to understand more thoroughly how psychological adaptation occurs in danger situations. However, no theory alone explains the empirical findings, and the various theories should be integrated into a model that includes different levels of psychological function, from consciously controlled processes to emotional and automatic process.

Whitcomb, D. D. (1998). The Rescue of Bat 21. Annapolis, Md., Naval Institute Press.

Summary: "When his electronic warfare plane, call sign Bat 21, was shot down on 2 April 1972, fifty-three-year-old Air Force navigator Iceal "Gene" Hambleton parachuted into the middle of a North Vietnamese invasion force and set off the biggest and most controversial air rescue effort of the Vietnam War. Now, after twenty-five years of official secrecy, the story of that dangerous and costly rescue is revealed for the first time by a decorated Air Force pilot and Vietnam veteran."--BOOK JACKET. "Involving personnel from all services, including the Coast Guard, the unorthodox rescue operation claimed the lives of eleven soldiers and airmen, destroyed or damaged several aircraft, and put hundreds of airmen, a secret commando unit, and a South Vietnamese infantry division at risk. It also examines the thorny debates arising from an operation that balanced one man's life against mounting U.S. and South Vietnamese casualties and material losses, the operation's impact on one of the most critical battles of the war, and the role played by search and rescue as America disengaged from that war."--BOOK JACKET.

1.3 Leadership (18)

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Flin, R. H. and G. M. Slaven (1996). "Personality and Emergency Command Ability " Disaster Prevention and Management **5**(1): p. 40-46

Summary: n/a

Flin, R. H. S., Georgina M. (1992). "Emergency Command Responsibilities of Offshore Oil Installation Managers." Diaster Management **4**(4): 197-201.

Summary: n/a

Fraher, A. L. (2005). Group Dynamics for High-Risk Teams: A 'Team Resource Management' (Trm) Primer, iUniverse Press.

Summary: This brief, readable book is designed to introduce a new team-building model called Team Resource Management (TRM) and serves as a guide for experiential learning events based on the Tavistock tradition. Using examples from popular culture and industry case studies, this Primer deepens understanding of group behavior by exploring the application of concepts such as leadership, management, authority, role, task, boundaries and teamwork in high-risk teams.

Although all organizations have complex dynamics that influence performance, high-risk teams have unique characteristics. Yet, little research has been conducted about how high-risk groups manage teams under stress. This book fills this gap, exploring how professionals in high-risk fields can increase awareness of the dynamics of authority relations, the act of authorizing, and the interdependent nature of leadership, while learning how to manage anxiety in stressful situations.

Fraher, A. L. (2005). "Team Resource Management (Trm): A Tavistock Approach to Leadership in High-Risk Environments Resonances of 9/11." Organisational and Social Dynamics **5**(2): 163-182.

Summary: The purpose of this article is to build upon the study of *organizational disaster* by analysing essential elements of a new team training model called Team Resource Management (TRM). Reviewing the history and methods of Crew Resource Management (CRM), a popular aviation training programme that has spread to other high-risk, high-hazard industries, the article considers its roots in American sensitivity training and identifies a need for a Tavistockbased approach to team training. The article argues that effective leadership training for teams operating in high-risk environments depends on developing events that can foster an examination of authority issues, illuminating both overt and covert group processes that can impede decision-making, and proposes proposes seven guideposts to assist in programme development.

Jioras, R. J. (1991). Validation of Tunnel Rescue Incident Command System: A Case Study - Metro Rail Tunnel Fire, Los Angeles, Ca, July 13, 1990. Emmitsburg, MD, National Fire Academy.

Summary: In 1981, the City of Los Angeles began design of a transit system to address traffic congestion. For 50 years, all mass transit within the City traveled on the surface streets. The new design brought back travel in a subway system. For the Fire Department, a subway system presented emergency and firefighting problems not encountered for ½ a century. Waiting for such a project to become operational before becoming involved was courting disaster. By requiring Fire Department involvement from the design phase of the "Metro Rail" project, fire/life safety systems were designed into the project and operational procedures were developed. As design moved into construction, the Los Angeles Fire Department developed and trained on the "new" Tunnel Rescue I.C. System. Although the concept in practice, the system had never been validated at a real incident. On July 13, 1990, a fire occurred in a metro rail tunnel under construction. The incident allowed for the implementation of the tunnel rescue I.C.S. and as was an accurate test of the operational effectiveness and the resource needs of the system. The incident also was a testimony to the ability of the fire service to preplan for unique situations, as well as demonstrating the effectiveness of a flexible I.C.S. by integrating a situation specific sub-system. In addition to the operational aspects of the tunnel rescue I.C.S., this study demonstrates that the Fire Service must not allow technology to overcome it, but must constantly be moving into the future through planning, training and foresight.

Kass, L. M. (2006). "Early Mining Safety Heroes." Mining Engineering **58**(3): 46.

Summary: Addressing the increasing deaths resulting from various mining accidents, the Congress in 1910 created the U.S. Bureau of Mines. Its first director, Joseph A. Holmes dedicated his life to improving the safety and health of coal miners by training miners in safe mining methods, forming local mine rescue teams, providing breathing devices for mine rescuers, and investigating the causes of mine fatalities and conducting research to eliminate safety hazards. It was also under Holmes' leadership that the "Three Bureau Heroes" came to be known. The three Bureau rescuers who gave their lives in the line of duty included: Joseph Evans at the Price-Pancoast Mine fire, Throop, PA, 7 April 1911; John Ferrel at the Cherry Valley Mine fire, Cherry Valley, PA. 19 January 1912; and Edward Evans, at Rock Springs, WY, 30 September 1913. The decrease in mine disasters and the increased efficiency of the rescue work, as now conducted by the Bureau of Mines, are fitting tributes to the memory of Joseph Evans, John Ferrel and Edward Evans. Holmes died in 1915, but his early leadership and vision remained with the Bureau.

Morrow, H. (2001). "Incident Command System." Internet Journal of Rescue and Disaster Medicine, The.

Summary: The case report "Lassing Mining Accident" reviews a multi-agency response to a multiple casualty incident in which many problems developed due to the lack of any pre-disaster mutual aid agreements which would have aided in coordinating the response.

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Summary: n/a

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Summary: The experience of a Trench Rescue team while rescuing 21-year-old construction worker who was caught in a trench collapse and nearly lost his life, is presented. When the team arrived on-scene, the victim was in a 12-foot trench buried up to his chest. The victim was finally strapped to backboard and put into a rescue basket. The team felt that on several occasions when things started to get out of control, everybody was reminded of their respective in-charge operations. In many situations, a trench rescue could be augmented by the use of a vacuum cleaning truck. The use of the incident command system, as much personnel to the scene as possible, plan for getting the victim out of trench once he is freed, are all essential for a successful operation.

Puri, S. P. S. (1994). "Trapped in an Elevator During the World Trade Center Bombing: A Personal Account." Journal of Performance of Constructed Facilities **8**(4): 217-228.

Summary: On February 26, 1993, a bomb explosion rocked the World Trade Center complex in New York City - killing six, injuring over one thousand people, casting tens of thousands into a life-threatening situation, and causing hundreds of millions of dollars in damage. This paper is a personal account of what happened to eight people who, unaware of the catastrophe, found themselves trapped in a smoke-filled express elevator for over three hours. The elevator was located in One World Trade Center, one of the two 110-story-tall towers in the complex. The paper describes the circumstances that brought the eight people together, the emergence of a leader and the efforts he marshaled to assure survival of the group in the hostile environment, and the events following the rescue, and provides a follow-up of how the explosion affected the lives of some occupants in the following days. The account emphasizes the human-interest aspects of the event and is not meant to be an objective or a technical report.

Ryland, J. L. (1990). Commanding the Urban Heavy Search and Rescue Incident. Executive Fire Officer Paper. Emmitsburg, MD National Fire Academy.

Summary: The history and traditions of the fire service have placed this faction of emergency service in the responsible position of being requested by our admiring public for any and all situations and/or circumstances. This situation has evolved to the point where fire service resources are being called upon to respond and mitigate major incidents consisting of structural collapse, trench rescues, cave-ins, confined space and tunnel rescues, and transportation collisions involving mass transit (bus, train, and airplanes). High level strategic planning and comprehensive technical training programs in the fire service have seemed to maintain the pace equal to the demand for services. Development of command guidelines and the training of fire service chief officers who are responsible for the emergency scene management of specialized incidents has not been developed or evolved at the rate which has kept abreast with incident demand or the technical advancements of equipment and applicable training programs. Although there were limited specific documents to research relating to the development of command guidelines, sufficient documents were available which dealt with high level strategic disaster planning, technical urban search and rescue, and incident command concepts. Researching the documents allowed me to synthesize information into specific checklists for the Incident Commander, and the Command and General Staff positions of the Incident Command System.

Sjöberg, M., C. Wallenius, et al. (2006). "Leadership in Complex, Stressful Rescue Operations: A Qualitative Study." Disaster Prevention and Management **15**(4): 576-584.

Summary: Purpose - To develop a theoretical understanding of leadership in stressful, complex rescue operations.
Design/methodology/approach - A grounded theory approach was used. Twenty rescue operation commanders from four complex rescue operations in Sweden were interviewed.
Findings - A model was developed which suggests that leadership in stressful, complex rescue operations can be understood as a causal process consisting of three broad time-related categories. The pre-operation everyday working conditions affect the leadership during rescue operations, which in turn affects the post-operation everyday working conditions, etc. Everyday working conditions include training and exercises, previous mission experiences, personal knowledge of co-actors, and organisational climate. The leadership during a complex rescue operation is affected by the leader's appraisal of the balance between what is at stake, human lives in particular, and the manageability of the situation. Patterns of stress reactions among rescue commanders and their leadership behaviour and managerial routines, were identified. Three problem areas were noted: role shifts during long-lasting operations, staff work, and practical routines. The post-operation conditions include the leader's evaluation of the outcome, organisational climate, and post-event stress reactions. Research limitations/implication - Small sample, lack of representativeness, and lack of illumination of possible gender-related aspects.
Practical implications - The model may be valuable in training and exercises with rescue operation commanders.
Originality/value - A new integrative, theoretical process model of leadership in complex, stressful rescue operations.

United States Government Accountability Office (2006). United States Coast Guard Improvements Needed in Management and Oversight of Rescue System Acquisition : Report to Congressional Committees. Washington, D.C., U.S. Government Accountability Office**:** i, 54 p.

Summary: n/a

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Summary: n/a

United States. Congress. Senate. Committee on Appropriations. Subcommittee on Departments of Labor Health and Human Services Education and Related Agencies. (2003). Mine Disaster at Quecreek : Hearing before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Seventh Congress, Second Session, Special Hearing, October 21, 2002, Johnstown, Pa. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O. [Congressional Sales Office].

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Williams, P. M. Rescue Leadership. Altadena, Calif.

Summary: n/a

1.4 Local Community Interface (12)

Aguirre, B. E. "Planning, Warning, Evacuation, and Search and Rescue: A Review of the Social Science Research Literature."

Summary: The focus of this review is on planning, warnings, evacuations, and search and rescue activities that are designed to minimize the deleterious effects of disasters on populations. The review discusses the points of consensus among specialists in these disaster-related activities, and it illustrates them with my own research in Puerto Rico and Mexico. The review disccusses present-day lack of interest in planning for disasters and the determinants of public response to warnings. A third section presents the prevailing definition of evacuation, types of evacuation and a list of its determinants, as well as the two major extant conceptual frameworks of evacuation. The fourth and final section of this review presents what is known about search and rescue activities in disasters, to include the importance of volunteers and emergent group activities, the importance of the timing of rescue, and the policy implications of these patterns.

Aguirre, B. E., D. E. Wenger, et al. (1995). "The Social Organization of Search and Rescue : Evidence from the Guadalajara Gasoline Explosion." International Journal of Mass Emergencies and Disasters **13**(1): 67-92.

Summary: This research uses information from the Guadalajara gasoline explosion of 22 April, 1992, to show the importance of social organization in search and rescue activities. Information is obtained from forty three victims that had been buried alive by the explosion throughout the impacted area, and twenty two volunteers who had participated in the direct rescue phase. They reported on their own experience during SAR and the experience of victims and rescuers near them. Most of the people that were rescued alive in the aftermath of the tragedy were rescued by these volunteers. Volunteers' social identities in peer groups, extended families, the neighborhood, and the Catholic Church structured their search and rescue activities. Chances of people surviving the blast were directly proportional to the presence among the searchers of a person or persons who cared for the victim and who knew the victim's likely location. The behavior of the victims was marked by the continuation of preexisting motivational, normative, and value orientations. Victims acted cooperatively during entrapment. Most of the victims that were rescued alive were rescued during the first two hours immediately after the explosion. The article concludes with the implication of the study for collective behavior and disaster research and planning.

Blakely, R. D. (1992). "Briefing Families in a Search and Rescue Operation: A Personal Perspective." Emergency Preparedness Digest **19**(4): p. 15-18.

Summary: n/a

Morgan, J. (1989). "Nuclear Power Stations: 'Other Risks' More of a Problem to the Fire Service." Fire & Rescue **82**.

Summary: n/a

Puri, S. P. S. (1994). "Trapped in an Elevator During the World Trade Center Bombing: A Personal Account." Journal of Performance of Constructed Facilities **8**(4): 217-228.

Summary: On February 26, 1993, a bomb explosion rocked the World Trade Center complex in New York City - killing six, injuring over one thousand people, casting tens of thousands into a life-threatening situation, and causing hundreds of millions of dollars in damage. This paper is a personal account of what happened to eight people who, unaware of the catastrophe, found themselves trapped in a smoke-filled express elevator for over three hours. The elevator was located in One World Trade Center, one of the two 110-story-tall towers in the complex. The paper describes the circumstances that brought the eight people together, the emergence of a leader and the efforts he marshaled to assure survival of the group in the hostile environment, and the events following the rescue, and provides a follow-up of how the explosion affected the lives of some occupants in the following days. The account emphasizes the human-interest aspects of the event and is not meant to be an objective or a technical report.

Su, J. (1998). On the Organization and Command of Township-Owned Coal Mine Serious and Great Accident Spot, Beijing, China, Sci Press.

Summary: This thesis raises the three following key steps of an accident rescuing, directed against the safe production and an accident characters of township-owned mines. 1) decision of a right rescuing group. 2) drawing up a scientific rescuing program. 3) organizing to rescue strictly. At the same time, the thesis expounds the three following points. 1) giving full play to expert group's function. 2) asking for help from state -owned coal mines. 3) keeping a good order on the spot. A township-owned coal mine is a field, in which a lot of accidents often take place. There is a very low rescuing successful rate of serious and great accidents for the lack of rescuing and avoiding-accident abilities, material safeguard, and rescuing experience etc, when an accident happens, economical loss will get more serious and more people will be dead. Because of the inefficient on-the-spot-command and the delay of the rescuing time, the key of a township-owned coal mine serious and great accident rescue lies in the on-the-spot-command. Some suggestions about it are given here according to some experiences and lessons in our county.

Thompson, W. (1994). "Sar/Media Communications." Canadian Emergency News **17**(4): p. 24-26.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

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von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

Summary: In the last few decades in the German coal mining industry, the number of accidents and resulting rescue operations involving the mine emergency teams has fallen. Research and development work and operational measures to guard against dangers, i. e. to prevent, monitor, recognize, control and eliminate risks are gaining in importance. The aim of this paper is to outline the duties of the advance party leader and of the deployment group in the 'first hour' of a mining accident, to show the interrelationship between the decisions and measures taken and to give an idea of the important results and insights gained over the last few years.

Wachtendorf, T. Improvising 9/11: Organizational Improvisation Following the World Trade Center Disaster.

Summary: Using the response to World Trade Center disaster as a case study, this research focuses on the interplay between organizational persistence and collective behavior emergence at the multi-organizational level. It explores the ways in which organizations engage in collective sense-making and improvised action under time constraints in ambiguous and turbulent environments. Analyses draw upon literature in disaster sociology; organizational theory; structuration theory; and jazz and theatre improvisation models. Findings are based on two months of systematic observation at key response locations in New York City following the attacks, in-depth interviews with decisionmakers and responders, and an extensive analysis of documents. Research suggests that organizations engage in collective sense-making when faced with uncertainty and the need to act under time constraints. In doing so, they draw upon plans and experience and take cues from one another and the broader social environment to define emerging needs.

Through this process, organizations determine whether they will maintain organizational continuity, shift to contingency plans, or instead engage in one of three forms of improvisation: 1) reproductive; 2) adaptive; or 3) creative. Reproductive improvisation is exemplified in this study by the reestablishment of the New York City Emergency Operations Center after the original facility was destroyed. Adaptive improvisation is illustrated by an examination of the credentialing and badge identification system.

Creative improvisation is discussed within the context of the activities surrounding the complex remains recovery and debris removal operation that emerged at the Fresh Kills Landfill site. Each improvisational form results from combinations of facilitators and impediments, such as a shared vision, the stability of other response elements, pressures to maintain existing systems, the diversity of response repertoires, the unanticipated consequences of previous improvisational activity, the relaxation of norms that would otherwise constrain organizational action, and the ability to interpret social cues. Although the sociological literature often uses the concept of improvisation broadly to describe unplanned-for novel actions, a closer examination points to variations in forms, objectives, and outcomes of improvisation. The study concludes with a discussion of the typology's implications for disaster policy and for understanding improvised collective action in both crises and non-disaster environments.

Wilk, S. (2006). "Public Safety: Elevator Safety: What to Do If Someone Is Trapped." Elevator World **54**(9): 129-132.

Summary: Elevator shutdowns occur due to one of three reasons such as loss of building power, passenger misuse or abuse, or electrical or mechanical failure. When entrapped, elevator passengers need to follow important steps to ensure safety and these include: staying in the elevator, do not worry about air and being in the dark, be calm and patient, communicate with people outside of the elevator, move away from the doors in case they are opened by rescue personnel and sit on the floor. For building managers and owners, cases of elevator entrapment related to loss of power can be prevented if a generator is in place to provide standby power for the elevator, an elevator emergency return unit (ERU) is installed and proper evacuation procedures are implemented.

Yeomans, K. (2004). Dead Men Tapping : The End of the Heather Lynne Ii. Camden, Me., International Marine/McGraw-Hill.

Summary: A 1996 collision off the Massachusetts coast between a barge-pulling tugboat and the fishing boat Heather Lynn II resulted in the latter overturning and trapping all three crewmen, who tapped on the ship's hull to let nearby fishermen know they were alive. When the Coast Guard showed up too late to help the crew, questions were asked and lawsuits filed. Tracking the 2000 lawsuit, Yeomans, herself a writer, fisherman and boat captain, jumps back and forth between courtroom statements and the events of the fateful day. Connecting the testimony of each participant-the tugboat captain, the salvager, local fishermen and Coast Guard personnel-and a recap of their day with her clean prose and knowledgeable insight, Yeomans brings the tragic day to life on the page. Helping to put this sad tale in the right context and provide the reader with a historical perspective, Yeomans intersperses similar tales of boat-to-boat collisions and rescue missions where the Coast Guard's actions and protocol were questioned. While the story is compelling, this book doesn't truly pull at one's heart-strings like the best of ocean adventure books have, because Yeomans never really puts the reader in the shoes of the three lost fishermen. Still, filled with examples of maritime law and the unwritten laws of the sea and seafarers, this book provides an intriguing glimpse into the lives of the men and women who are employed in one of America's most dangerous professions.

2.1 Communications (22)

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Blakely, R. D. (1992). "Briefing Families in a Search and Rescue Operation: A Personal Perspective." Emergency Preparedness Digest **19**(4): p. 15-18.

Summary: n/a

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Summary: n/a

Graham, N. and G. G. Eave (1995). "Emergency Control Rooms Structure and Procedures." Journal of the Mine Ventilation Society of South Africa **48**(4): 126-132.

Summary: A well designed and efficient surface control centre is the key to success in controlling an emergency operation. The control room is the nerve centre during a crisis. An important component is the creation of an efficient communication network, whereby relevant information is gathered and analysed. From this analysis a strategy will emerge, for translation into action plans. The execution of planned action by clear and comprehensive briefing of rescue teams and other personnel will greatly enhance operational efficiency and limit loss. This paper is intended as a quick reference for inclusion into the mine emergency procedure manual.

Ibbetson, T. (2002). "Confined Space Rescue - When Communication Really Counts." Fire International(195): p. 15.

Summary: n/a

Jones, B. (1998). "New Technology Provides Effective Communications for Underground Rescue Operations." Coal International (Redhill, England) **246**(5): 171-174.

Summary: This feature describes the introduction of a new underground communication system designed for underground rescue operations. Known as the 'm-Comm' system, it employs a light-weight guide wire which can be payed out over considerable distances by the rescue team. A member of the team simply needs to clip on a handset to the wire to talk.

Kovacs, T. (2002). "Model Triage and Dispatch Guidelines for Search and Rescue Coordinators and Communications Personnel." Risks in Mountain Rescue Operations. Mountain Rescue Association, ed. Poway, CA: 27–30.

Summary: n/a

Li, F., P. Han, et al. (2007). A Wireless Localization Method Used in Coal Mine, Harbin, China, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Summary: The working condition in coal mine is atrocious, once miners are stranded in coal mine when accident happened, how to find the location of the miners rapidly is the crux of rescue. This paper puts forward a wireless localization method used in coal mine which aims at the actual condition of coal mine, uses beacons and object nodes, measures the distance with the method of RF propagating time, with the precondition of comparing and analyzing the existing classic algorithm of measuring distance and localization. It discusses various factors that influence the precision of measuring distance and localization, calculates and provides the value of precision of measuring distance and localization based on node hardware.

Lindgren, I., Berggren, Peter, Jander, Hans, and Hirsch, Richard. (2004). Communication and Team Performance in Ba Teams - a Field Study of Breathing Apparatus Firefighters' Communication During Rescue Operations**:** 82 p.

Summary: The lack of guiding principles for the communication during breathing apparatus rescue operations is seen as a problem by many firefighters. There is a wish to obtain further heuristics for the communication, but there is no agreement concerning what successful communication is and how it should be achieved. This research aimed through field studies to see how the BA firefighters and the BA leader communicate with each other. It also aimed to investigate if some answers to what defines 'good communication' during BA rescue operations could be found. Through a qualitative analysis of the communication patterns of two pairs of BA firefighters the impact on the communication made by common ground establishment, team knowledge and similar phenomena, such as experience of working together, has been investigated. The results illustrate communicative problems which can occur during a rescue operation and shed light on the gravity of an agreement on what information should be mediated by the BA firefighters. It is also seen how experience of working together can be suggested to help the firefighters to communicate efficiently. [STAR#: 148650]

Lofstedt, R. E. R., Ortwin (1997). "The Brent Spar Controversy: An Example of Risk Communication Gone Wrong." Risk Analysis **17**: 5.

Summary: Brent Spar was an oil storage buoy which was no longer used, therefore, it was sunk in the U. K. offshore waters. This action caused an international uproar. It became an international environmental crisis.

Mckinney Jr, E., J. Barker, et al. (2005). "How Swift Starting Action Teams Get Off the Ground: What United Flight 232 and Airline Flight Crews Can Tell Us About Team Communication." Management Communication Quarterly **19**(2): 198.

Summary: n/a

Mearns, K., R. Flin, et al. (2001). "Sharing'worlds of Risk'; Improving Communication with Crew Resource Management." Journal of Risk Research **4**(4): 377-392.

Summary: n/a

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Summary: The MERD program is a simulation of mine emergency situations, which seeks to improve the responsiveness of mine personnel during fires, explosions, and related mine accidents. It provides participants the opportunity to experience the associated emotions, stress, and problems and explore possible solutions. The training shows the need for proper planning and contingency measures should an emergency situation occur. It also delineates the tasks of various agencies involved in rescue operations Evaluations of the MERD program over the years indicate a satisfactory performance mark. Participants have attested to the importance of the program in stressing the role of effective communication and proper organization.

Rae, B. (1990). "Piper Alpha-Restoring Communications." Disaster Management **3**(1): p. 8-10.

Summary: n/a

Sharpe, J. (2006). "Rushing Down the Wrong Road." Rock Products **109**(4): 14.

Summary: Lawmakers such as West Virginia Gov. Joe Manchin III(D) has made regulatory requirements for coal mines, giving the mining companies just 90 days to come into compliance. Influenced by the tragedies at Sago and Alma, initial efforts are focused on communication systems, trackers, rescue chambers, self-contained self-rescuers, and rescue teams. One of MSHA's research priorities is developing an analytical method to distinguish deadly asbestos fibers from their non-asbestos counterparts. The agency also wants to rekindle an effort to examine technologies for minimizing blind spots on mobile vehicles.

Stanton, N. (1996). "Team Performance: Communication, Co-Ordination, Co-Operation and Control." Human Factors in Nuclear Safety.

Summary: n/a

Thompson, W. (1994). "Sar/Media Communications." Canadian Emergency News **17**(4): p. 24-26.

Summary: n/a

United States Congress. House. Committee on Homeland Security. Subcommittee on Emergency Preparedness Science and Technology. (2007). Incident Command, Control, and Communications During Catastrophic Events. Committee on Homeland Security, Subcommittee on Emergency Preparedness Science and Technology. Washington, U.S. G.P.O.**:** iii, 49 p.

Summary: n/a

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

United States General Accounting Office and United States Coast Guard (2003). Coast Guard New Communication System to Support Search and Rescue Faces Challenges. Washington, D.C., U.S. General Accounting Office.

Summary: n/a

Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

Summary: The death of 13 men in the Mann Gulch fire disaster, made famous in Norman Maclean's Young Men and Fire, is analyzed as the interactive disintegration of role structure and sensemaking in a minimal organization. Four potential sources of resilience that make groups less vulnerable to disruptions of sensemaking are proposed to forestall disintegration, including improvisation, virtual role systems, the attitude of wisdom, and norms of respectful interaction. The analysis is then embedded in the organizational literature to show that we need to reexamine our thinking about temporary systems, structuration, nondisclosive intimacy, intergroup dynamics, and team building.

Williams, C. (1987). "Taking an Offshore Breather: Respiratory Equipment for Use on Rigs and Platforms." Fire **80**(990): p. 35-36.

Summary: n/a

2.2 Decision Making Process (22)

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Cottam, H. a. S., Nigel. (1998). "Knowledge Acquisition for Search and Rescue Planning " International Journal of Human-Computer Studies **48**: 24.

Summary: n/a

Entin, E., C. Kerrigan, et al. "Development of a Search and Rescue Simulation to Study the Effects of Prolonged Isolation on Team Decision Making."

Summary: n/a

Flin, R., K. Stewart, et al. (1996). "Emergency Decision Making the Offshore Oil and Gas Industry." Human Factors **38**(2).

Summary: n/a

Goodman, G. V. R. and F. N. Kissell (1988). Fault Tree Analysis of Miner Escape During Mine Fires, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Summary: This paper discusses the use of fault tree analysis for evaluating escapeway reliability. A fault tree is developed using standard logic formulations. It is later evaluated using commercially available software. The computer model uses Boolean reduction to obtain the minimal cut sets and minimal path sets of the tree. A brief analysis is also conducted to determine the occurrence probability of the TOP event. This study shows that fault tree analysis is a viable means of analyzing escapeway reliability. The cut and path sets reveal those event sequences leading to fatalities. The probability of the TOP event shows the frequency of occurrence for fatalities in an underground mine fire. The usefulness of this value, however, is limited by the accuracy of the data for the initiating events. For mining events, the data is difficult to estimate precisely.

Hjertager, B. H., S. Hoiset, et al. (1998). "Properties of Simulated Gas Explosions of Interest to the Structural Design Process." Process Safety Progress **17**(4): p. 278-287.

Summary: The article describes the EXSIM gas explosion simulation software.

Jioras, R. J. (1991). Validation of Tunnel Rescue Incident Command System: A Case Study - Metro Rail Tunnel Fire, Los Angeles, Ca, July 13, 1990. Emmitsburg, MD, National Fire Academy.

Summary: In 1981, the City of Los Angeles began design of a transit system to address traffic congestion. For 50 years, all mass transit within the City traveled on the surface streets. The new design brought back travel in a subway system. For the Fire Department, a subway system presented emergency and firefighting problems not encountered for ½ a century. Waiting for such a project to become operational before becoming involved was courting disaster. By requiring Fire Department involvement from the design phase of the "Metro Rail" project, fire/life safety systems were designed into the project and operational procedures were developed. As design moved into construction, the Los Angeles Fire Department developed and trained on the "new" Tunnel Rescue I.C. System. Although the concept in practice, the system had never been validated at a real incident. On July 13, 1990, a fire occurred in a metro rail tunnel under construction. The incident allowed for the implementation of the tunnel rescue I.C.S. and as was an accurate test of the operational effectiveness and the resource needs of the system. The incident also was a testimony to the ability of the fire service to preplan for unique situations, as well as demonstrating the effectiveness of a flexible I.C.S. by integrating a situation specific sub-system. In addition to the operational aspects of the tunnel rescue I.C.S., this study demonstrates that the Fire Service must not allow technology to overcome it, but must constantly be moving into the future through planning, training and foresight.

Klein, G. A. (1989). Recognition-Primed Decisions. Advances in Man-Machine Systems Research. W. Rouse. Greenwich, CT, JAI Press, Inc. **5:** 47-92.

Summary: n/a

Klein, K. (2001). "Decision Trees Can Give Firm Roots to Rescue Policies." Fire Chief **45**: 30+.

Summary: n/a

Olcer, A. and J. Majumder (2006). "A Case-Based Decision Support System for Flooding Crises Onboard Ships." Quality and Reliability Engineering International **22**(1): 59-78.

Summary: n/a

Operation Respond (2004). Oreis 6.0 Operation Respond Emergency Information System. Washington, D.C., Operation Respond Institute**:** 1 CD-ROM.

Summary: OREIS [TM] is a software tool that provides on-scene fire, police and EMS responders with vital information for dealing with rescue, response and counter-terrorism operations on or around railroads and highways, including those involving hazardous materials. OREIS [TM] connects first responders to the databases of participating railroad and trucking companies to provide hazardous materials content information for tank cars, trailers and containers that have been involved in an incident or accident. The connection is established through the Internet and supplies emergency information and guidance in a real-time environment. The system will identify dangerous goods contents of an affected railcar or tank truck, and provide advice for handling that substance.

Ryland, J. L. (1990). Commanding the Urban Heavy Search and Rescue Incident. Executive Fire Officer Paper. Emmitsburg, MD National Fire Academy.

Summary: The history and traditions of the fire service have placed this faction of emergency service in the responsible position of being requested by our admiring public for any and all situations and/or circumstances. This situation has evolved to the point where fire service resources are being called upon to respond and mitigate major incidents consisting of structural collapse, trench rescues, cave-ins, confined space and tunnel rescues, and transportation collisions involving mass transit (bus, train, and airplanes). High level strategic planning and comprehensive technical training programs in the fire service have seemed to maintain the pace equal to the demand for services. Development of command guidelines and the training of fire service chief officers who are responsible for the emergency scene management of specialized incidents has not been developed or evolved at the rate which has kept abreast with incident demand or the technical advancements of equipment and applicable training programs. Although there were limited specific documents to research relating to the development of command guidelines, sufficient documents were available which dealt with high level strategic disaster planning, technical urban search and rescue, and incident command concepts. Researching the documents allowed me to synthesize information into specific checklists for the Incident Commander, and the Command and General Staff positions of the Incident Command System.

Sniezek, J., D. Wilkins, et al. (2001). "Running Head: Advanced Training for Crisis Decision Making." Journal of Management Information Systems.

Summary: n/a

Sniezek, J. A. (2002). "Training for Crisis Decision-Making: Psychological Issues and Computer-Based Solutions." Journal of Management Information Systems **18**(4): 147-168.

Summary: n/a

Su, J. (1998). On the Organization and Command of Township-Owned Coal Mine Serious and Great Accident Spot, Beijing, China, Sci Press.

Summary: This thesis raises the three following key steps of an accident rescuing, directed against the safe production and an accident characters of township-owned mines. 1) decision of a right rescuing group. 2) drawing up a scientific rescuing program. 3) organizing to rescue strictly. At the same time, the thesis expounds the three following points. 1) giving full play to expert group's function. 2) asking for help from state -owned coal mines. 3) keeping a good order on the spot. A township-owned coal mine is a field, in which a lot of accidents often take place. There is a very low rescuing successful rate of serious and great accidents for the lack of rescuing and avoiding-accident abilities, material safeguard, and rescuing experience etc, when an accident happens, economical loss will get more serious and more people will be dead. Because of the inefficient on-the-spot-command and the delay of the rescuing time, the key of a township-owned coal mine serious and great accident rescue lies in the on-the-spot-command. Some suggestions about it are given here according to some experiences and lessons in our county.

United States Congress. House. Committee on Homeland Security. Subcommittee on Emergency Preparedness Science and Technology. (2007). Incident Command, Control, and Communications During Catastrophic Events. Committee on Homeland Security, Subcommittee on Emergency Preparedness Science and Technology. Washington, U.S. G.P.O.**:** iii, 49 p.

Summary: n/a

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Summary: n/a

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von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

Summary: In the last few decades in the German coal mining industry, the number of accidents and resulting rescue operations involving the mine emergency teams has fallen. Research and development work and operational measures to guard against dangers, i. e. to prevent, monitor, recognize, control and eliminate risks are gaining in importance. The aim of this paper is to outline the duties of the advance party leader and of the deployment group in the 'first hour' of a mining accident, to show the interrelationship between the decisions and measures taken and to give an idea of the important results and insights gained over the last few years.

Wachtendorf, T. Improvising 9/11: Organizational Improvisation Following the World Trade Center Disaster.

Summary: Using the response to World Trade Center disaster as a case study, this research focuses on the interplay between organizational persistence and collective behavior emergence at the multi-organizational level. It explores the ways in which organizations engage in collective sense-making and improvised action under time constraints in ambiguous and turbulent environments. Analyses draw upon literature in disaster sociology; organizational theory; structuration theory; and jazz and theatre improvisation models. Findings are based on two months of systematic observation at key response locations in New York City following the attacks, in-depth interviews with decisionmakers and responders, and an extensive analysis of documents. Research suggests that organizations engage in collective sense-making when faced with uncertainty and the need to act under time constraints. In doing so, they draw upon plans and experience and take cues from one another and the broader social environment to define emerging needs.

Through this process, organizations determine whether they will maintain organizational continuity, shift to contingency plans, or instead engage in one of three forms of improvisation: 1) reproductive; 2) adaptive; or 3) creative. Reproductive improvisation is exemplified in this study by the reestablishment of the New York City Emergency Operations Center after the original facility was destroyed. Adaptive improvisation is illustrated by an examination of the credentialing and badge identification system.

Creative improvisation is discussed within the context of the activities surrounding the complex remains recovery and debris removal operation that emerged at the Fresh Kills Landfill site. Each improvisational form results from combinations of facilitators and impediments, such as a shared vision, the stability of other response elements, pressures to maintain existing systems, the diversity of response repertoires, the unanticipated consequences of previous improvisational activity, the relaxation of norms that would otherwise constrain organizational action, and the ability to interpret social cues. Although the sociological literature often uses the concept of improvisation broadly to describe unplanned-for novel actions, a closer examination points to variations in forms, objectives, and outcomes of improvisation. The study concludes with a discussion of the typology's implications for disaster policy and for understanding improvised collective action in both crises and non-disaster environments.

Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

Summary: The death of 13 men in the Mann Gulch fire disaster, made famous in Norman Maclean's Young Men and Fire, is analyzed as the interactive disintegration of role structure and sensemaking in a minimal organization. Four potential sources of resilience that make groups less vulnerable to disruptions of sensemaking are proposed to forestall disintegration, including improvisation, virtual role systems, the attitude of wisdom, and norms of respectful interaction. The analysis is then embedded in the organizational literature to show that we need to reexamine our thinking about temporary systems, structuration, nondisclosive intimacy, intergroup dynamics, and team building.

William, J., H. Stambaugh, et al. (2003). Rapid Intervention Teams and How to Avoid Needing Them Special Report. Technical report series USFA-TR-123. [Emmitsburg, Md.], Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center**:** [54] p.

Summary: n/a

Woodfield, S. (2006). "Central Control." Fire Prevention and Fire Engineers Journals(APR).

Summary: The interim Fire and Rescue Service National Co-ordination Centre plays a vital role with the increase in the scale and range of accidents. It is providing a New Dimension program, which is funding the provision of specialist equipment and training need to respond major catastrophic incidents. the program consists of six distinct but linked projects, managed in a partnership between the Chiefe Fire Officers Association and the Office of the Deputy Prime Minister (ODPM). There are four operational capabilities and two enabling capabilities that reflect the requirements of the fire and rescue service in the 21st century. The command and control capability is designed to manage and co-ordinate people, policies, and procedures.

2.3 Interpersonal Dynamics (16)

Aguirre, B. E., D. E. Wenger, et al. (1995). "The Social Organization of Search and Rescue : Evidence from the Guadalajara Gasoline Explosion." International Journal of Mass Emergencies and Disasters **13**(1): 67-92.

Summary: This research uses information from the Guadalajara gasoline explosion of 22 April, 1992, to show the importance of social organization in search and rescue activities. Information is obtained from forty three victims that had been buried alive by the explosion throughout the impacted area, and twenty two volunteers who had participated in the direct rescue phase. They reported on their own experience during SAR and the experience of victims and rescuers near them. Most of the people that were rescued alive in the aftermath of the tragedy were rescued by these volunteers. Volunteers' social identities in peer groups, extended families, the neighborhood, and the Catholic Church structured their search and rescue activities. Chances of people surviving the blast were directly proportional to the presence among the searchers of a person or persons who cared for the victim and who knew the victim's likely location. The behavior of the victims was marked by the continuation of preexisting motivational, normative, and value orientations. Victims acted cooperatively during entrapment. Most of the victims that were rescued alive were rescued during the first two hours immediately after the explosion. The article concludes with the implication of the study for collective behavior and disaster research and planning.

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Ersland, S., Sund, A., and Weisaeth, Lars. (1989). "The Stress Upon Rescuers Involved in an Oil Rig Disaster " Acta Psychiatrica Scandinavica **80**: 12.

Summary: Table of Contents: 1. Emergency Personnel 2. Offshore Installations 3. Post raumatic Stress Disorder 4. Rescue Operations 5. Stress

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Flin, R. H. and G. M. Slaven (1996). "Personality and Emergency Command Ability " Disaster Prevention and Management **5**(1): p. 40-46

Summary: n/a

Flin, R. H. S., Georgina M. (1992). "Emergency Command Responsibilities of Offshore Oil Installation Managers." Diaster Management **4**(4): 197-201.

Summary: n/a

Fraher, A. L. (2005). Group Dynamics for High-Risk Teams: A 'Team Resource Management' (Trm) Primer, iUniverse Press.

Summary: This brief, readable book is designed to introduce a new team-building model called Team Resource Management (TRM) and serves as a guide for experiential learning events based on the Tavistock tradition. Using examples from popular culture and industry case studies, this Primer deepens understanding of group behavior by exploring the application of concepts such as leadership, management, authority, role, task, boundaries and teamwork in high-risk teams.

Although all organizations have complex dynamics that influence performance, high-risk teams have unique characteristics. Yet, little research has been conducted about how high-risk groups manage teams under stress. This book fills this gap, exploring how professionals in high-risk fields can increase awareness of the dynamics of authority relations, the act of authorizing, and the interdependent nature of leadership, while learning how to manage anxiety in stressful situations.

Fraher, A. L. (2005). "Team Resource Management (Trm): A Tavistock Approach to Leadership in High-Risk Environments Resonances of 9/11." Organisational and Social Dynamics **5**(2): 163-182.

Summary: The purpose of this article is to build upon the study of *organizational disaster* by analysing essential elements of a new team training model called Team Resource Management (TRM). Reviewing the history and methods of Crew Resource Management (CRM), a popular aviation training programme that has spread to other high-risk, high-hazard industries, the article considers its roots in American sensitivity training and identifies a need for a Tavistockbased approach to team training. The article argues that effective leadership training for teams operating in high-risk environments depends on developing events that can foster an examination of authority issues, illuminating both overt and covert group processes that can impede decision-making, and proposes proposes seven guideposts to assist in programme development.

Frank, I. (2002). "Miracle of the Miners: The Quecreek Rescue from an Ed Perspective." Journal of Emergency Nursing **28**(6): 544-548.

Summary: n/a

Heightman, A. (1999). "Kansas Confined Space Rescue. A Small Department Utilizes Mutual Aid to Rescue a Child Trapped 16 Feet Below Ground." JEMS **24**(7): 50-1.

Summary: n/a

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Summary: The experience of a Trench Rescue team while rescuing 21-year-old construction worker who was caught in a trench collapse and nearly lost his life, is presented. When the team arrived on-scene, the victim was in a 12-foot trench buried up to his chest. The victim was finally strapped to backboard and put into a rescue basket. The team felt that on several occasions when things started to get out of control, everybody was reminded of their respective in-charge operations. In many situations, a trench rescue could be augmented by the use of a vacuum cleaning truck. The use of the incident command system, as much personnel to the scene as possible, plan for getting the victim out of trench once he is freed, are all essential for a successful operation.

Orasanu, J., Y. Tada, et al. (2005). Physiological Monitoring of Team and Task Stressors, Orlando, FL, United States, International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States.

Summary: Sending astronauts into space, especially on long-durations missions (e.g. three-year missions to Mars), entails enormous risk. Threats include both physical dangers of radiation, bone loss and other consequences of weightlessness, and also those arising from interpersonal problems associated with extended life in a high-risk isolated and confined environment. Before undertaking long-duration missions, NASA seeks to develop technologies to monitor indicators of potentially debilitating stress at both the individual and team level so that countermeasures can be introduced to prevent further deterioration. Doing so requires a better understanding of indicators of team health and performance. To that end, a study of team problem solving in a simulation environment was undertaken to explore effects of team and task stress. Groups of four males (25-45 yrs) engaged in six dynamic computer-based Antarctic search and rescue missions over four days. Both task and team Stressors were manipulated. Physiological responses (ECG, respiration rate and amplitude, SCL, EMG, and PPG); communication (voice and email); individual personality and subjective team dynamics responses were collected and related to task performance. Initial analyses found that physiological measures can be used to identify transient stress, predict performance, and reflect subjective workload. Muscle tension and respiration were the most robust predictors. Not only the level of arousal but its variability during engagement in the task is important to consider. In general, less variability was found to be associated with higher levels of performance. Individuals scoring high on specific personality characteristics responded differently to task stress.

Trainor, J. E. Searching for a System: Multi-Organizational Coordination in the September 11th World Trade Center Search and Rescue Response

Summary: The objective of this study is to examine the inter-organizational effectiveness of the Incident Command System (ICS) in the *formal* Search and Rescue (SAR) response to the September 11th attacks on the World Trade Center. In order to accomplish this, a network analytic database of interactions, created at the Disaster Research Center, was gleaned from sources such as federal and local situation reports, newspapers, and a variety of other official and public sources. Using these sources as a conceptual whole, this research effort has produced a snapshot of the social organization of the response system in a network analytic form. In addition to that database, this paper also uses a series of notes and personal accounts resulting from over two months of rapid-response field research conducted by members of the DRC during an extensive project examining the response to the September 11th World Trade Center attacks. As a third source of data, this study also draws on a series of in-depth interviews conducted with key response personnel and a focus group discussion conducted with a search and rescue team that was part of the response. The combined use of network analytic tools informed by a qualitative understanding of the nature of interactions provides a better understanding of the implications of ICS organization on *Formal* Response Systems. The study findings suggest that ICS is not a universally applicable organizational form, but does have value in some response areas. Potential Implications of the application of ICS organization and actual problems responders encountered during the 911 SAR response are also discussed.

United States Congress. House. Committee on Homeland Security. Subcommittee on Emergency Preparedness Science and Technology. (2007). Incident Command, Control, and Communications During Catastrophic Events. Committee on Homeland Security, Subcommittee on Emergency Preparedness Science and Technology. Washington, U.S. G.P.O.**:** iii, 49 p.

Summary: n/a

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von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

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Weick, K. E. (1993). "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." Administrative Science Quarterly **38**(4): 628-652.

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Woodfield, S. (2006). "Central Control." Fire Prevention and Fire Engineers Journals(APR).

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2.4 Personnel Qualification (5)

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Summary: As South African mines penetrate greater depths and new mining methods are developed, Mines Rescue Services also have to adapt in order to render a professional, cost-effective fire fighting, rescue and recovery service to the South African mining industry. This overview will address the structure, training and equipment of Mines Rescue Services as well as fire statistics.

Flin, R. (1995). "Crew Resource Management for Teams in the Offshore Oil Industry." Journal of European Industrial Training **19**(9): 23-27.

Summary: n/a

Fuchs, E., W. Hermulheim, et al. (2004). "Restrukturierung Des Grubenrettungswesens Restructuring of the Mine Rescue Service." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **140**(10): 453-457.

Summary: About 1,200 voluntary mine rescue workers are currently on stand-by for underground deployment with respirators in the Ruhr, Saar and Ibbenburen coalfields. The minimum requirement of mine rescue workers for a major incident is 600 men for three physically separated coalfields and is still safely covered in the medium term. The concentration of specific qualifications (packing and drilling operations with respirators, inertisation) in the voluntary central mine rescue station DSK Ruhr continues to be practical and is being maintained; by contrast the continuous stand-by service of the central mine rescue station was disbanded on 31 December 2003 in the course of the deployment profile modified in recent years. The professional mine and works fire brigade in Friedrichsthal, Saar including the stand-by service is being maintained with its previous strength essentially on the basis of the existing specifications by regulations or service contracts. A subsequent solution for the period after closure of the Warndt/Luisenthal site of the Saar colliery is being investigated with regard to feasibility in a project with participation of the mining authorities, the Saar colliery and the main mine rescue service station. The main mine rescue stations in Herne and Friedrichsthal have significantly intensified their cooperation in the course of mutual simplification of the technical fields.

National Association for Search & Rescue (1995). Sartech Certification Criterion. NASAR.

Summary: n/a

Roza, G. (2003). Careers in the Coast Guard's Search and Rescue Units. New York, NY, Rosen Central.

Summary: n/a

2.5 Procedures (27)

Amyotte, P. R. and A. M. Oehmen (2002). "Application of a Loss Causation Model to the Westray Mine Explosion." Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers, Part B **80**(1): 55-59.

Summary: On 9 May 1992 an underground explosion destroyed the Westray coal mine located in Plymouth, Nova Scotia, Canada. Twenty-six miners were killed. This paper attempts to resolve the multiple layers of accident causation by systematic application of a loss causation model. Immediate and basic causes having their origin in lack of management control are identified. The analysis helps to identify the lessons to be learned from this disaster, the two most important of which are the need for a rigorous loss management system and an appropriate attitude toward industrial safety.

Ashmore, F. S. (1987). "Only the Best for Off-Shore Protection but It May Not Fit the Job Elsewhere." Fire **80**(990): 31.

Summary: n/a

Barney, G. (1998). "Safety Rescue of Persons Trapped in a Lift Car." Elevator World **46**(3): 110.

Summary: Clause 7 of the CEN/TC10/WG5 draft of `Maintenance instructions for Lifts and Escalators' which reads `The owner of the lift installation can authorize persons trained by the maintenance company to rescue passengers in case of emergency' is contentious. Moreover, the document is concerned with maintenance instructions which is an area of contention itself. Thus, it is recommended to just remove the rescue reference from this document, if they are thought sufficiently important and to produce another document on safe working in lifts and escalators.

Basham, P. W. and R. A. Page (1985). Earthquake Hazards in the Offshore Environment. Washington, DC 74 p.

Summary: n/a

Daley, M. (2004). "Trench Collapse Response for Initial-Alarm Companies." Fire Engineering **157**(10): 107-112.

Summary: The specific actions that first-in companies should take to help ensure a successful rescue in case of trench collapse are discussed. First-in companies at a trench collapse with a trapped victim can help prepare the scene for the arrival of technical rescue team. All personnel working around the trench area must be cleared, and all equipment working on-scene should be shut down and locked out to minimize vibration around the collapse. Advanced life support resources and law enforcement should be called to the scene in addition to the technical rescue team.

Gowar, R. G. (1978). Developments in Fire Protection of Offshore Platforms.

Summary: n/a

Harfield, G. and R. Watkinson (2002). Multi-Purpose Search and Rescue System, WO Patent WO/2002/081,301.

Summary: There is disclosed a modular multi-purpose search rescue system comprising a board member (1), a viewing window (19) and a crook member (24). The board member (1) is adapted for passage over or flotation on ice or water or the like, and the crook member (24) may be fitted with various tools, including paddles, remote sensing equipment, cutting tools and others. Various control lines (42) may be provided, as may an elastomeric blanket for securing a casualty to the board member. Also disclosed is a boat (29) made up of at least one board member.

Holdcraft, R. L. (1985). "Fire Protection Criteria for Caves." Fire Journal (Boston) **79**(3): 35-37.

Summary: Caves present some rather challenging fire protection problems. Because they do not have the natural venting available to most above-ground structures, the rapid build-up of a large fire could quickly produce temperatures and smoke levels that occupants and fire fighters would find intolerable. Fire protection, venting, and evacuation and rescue plans are discussed.

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Summary: On 23 May 1983, an avalanche occurred at the Revenue-Virginius Mine. Six mine personnel and two contract diamond drillers were trapped when the avalanche covered and blocked the portal, the only access into the mine. Fortunately, all eight persons were rescued. Surveying the damage, issues that have contributed to the disaster emerged. By blocking the snow slide chute, the snow weight was allowed to accumulate until the fences failed and it all came at once. If the snow would have been allowed to run in smaller amounts throughout the winter, no damage would have occurred. The original ventilation system was installed in line with the snow slide by people who were not aware of or did not recognize the hazard. If a detailed map with the individual sets mapped could have been used, it would have been easier to, quicker and safer to dig horizontally than vertically. All unused equipment or facilities should be removed or neutralized. Furthermore, vehicles should not be parked and personnel should bot be allowed to walk in zones of danger.

Macintyre, A., J. Barbera, et al. (2006). "Surviving Collapsed Structure Entrapment after Earthquakes: A “Time-to-Rescue” Analysis." Prehospital and Disaster Medicine **21**(1): 4.

Summary: Massive earthquakes often cause structures to collapse, trapping victims under dense rubble for long periods of time. Commonly, this spurs resource intensive, dangerous, and frustrating attempts to find and extricate live victims. The search and rescue phase usually is maintained for many days beyond the last “save,” potentially diverting critical attention and resources away from the pressing needs of non-trapped survivors and the devastated community. This recurring phenomenon is driven by the often-unanswered question “Can anyone still be alive under there?” The maximum survival time in entrapment is an important issue for responders, yet little formal research has been conducted on this issue. Knowing the maximum survival time in entrapment helps responders: (1) decide whether or not they should continue to assign limited resources to search and rescue activities; (2) assess the safety risks versus the benefits; (3) determine when search and rescue activities no longer are indicated; and (4) time and pace the important transition to community recovery efforts.

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin. Copyright 2006, Society of Petroleum Engineers.

McClincy, W. D. (2002). Instructional Methods in Emergency Services. New Jersey, Prentice Hall.

Summary: n/a

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Summary: n/a

Pu, S. and S. Zlatanova (2005). Evacuation Route Calculation of Inner Buildings. Geo-Information for Disaster Management**:** 1143-1161.

Summary: Disastrous accidents (fire, chemical releases, earthquake, terrorist attacks, etc) in large public and residential buildings (discotheques, cafes, trade and industrial buildings) usually result in tragic consequences for people and environments. Such accidents have clearly showed that need for reliable systems supporting rescue operations is urgently appealing. Amongst all, giving appropriate information to the ordinary people in/around the affected area considering the disaster developments (available exists, assessable corridors, etc.) and the human factors (age, gender, disability) are of critical importance for the success of the rescue operation.

Rosen, J., E. Grigg, et al. (2002). "The Future of Command and Control for Disaster Response." Engineering in Medicine and Biology Magazine, IEEE **21**(5): 56-68.

Summary: We have developed a bioresponse system concept to respond to large-scale medical disasters, including overwhelming, contagious bioagent events such as smallpox, plague, and influenza. This system, called Cybercare, aims to substantially increase the surge capacity of the healthcare system by allowing healthcare systems throughout the country to link together to provide specialists and other resources to augment those available at a disaster site. Key to the concept of Cybercare is the notion of a robust, distributed command and control system that will enable rapid and sustained responses to large-scale medical disasters. The Cybercare information infrastructure can also be utilized to support training and analysis of response procedures as well as a wide range of medical and disaster applications that occur on a frequent basis, such as home healthcare monitoring and rural and remote medical treatment. The purposes of this article are to: 1) define the problem set addressed by the Cybercare concept, 2) provide the reader with a fundamental knowledge of command and control and an emerging paradigm shift in command structure for the medical and disaster management domain, 3) define technologies that can be used to create a command and control system, and 4) illustrate how the technologies can be integrated into a disaster response system using the command and control paradigm

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Rushbrook, F. (1979). Fire Aboard: The Problems of Prevention and Control in Ships, Port Installations and Offshore Structures. Glascow, Scotland Brown Son & Ferguson, Limited.

Summary: n/a

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Summary: Written by veteran rescuer Chase Sargent, this book is a comprehensive, single-source guide to such subject areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation, retrieval systems, backup teams, and operational procedures. Effective methods of training and regulations governing operations in confined spaces also are discussed at length.

Siikonen, M.-L. and H. Hakonen (2003). "Efficient Evacuation Methods in Tall Buildings." Elevator World **51**(7): 78-83.

Summary: The speed with which people can be rescused from a building can be crucial in saving lives in many emergency situations. In this article, evacuation studies have been made for an ideal situation where no smoke effects or fire, and no damage to the building is considered. This is analogous to a situation where another site near the building is on fire, there is a bomb threat in the building, or a biological, chemical or nuclear threat in the surroundings. In cases such as these, the "safest" rescue method for the occupants is the fastest method. Elevator simulations were carried out using the KONE Building Traffic Simulator (BTS), and egress models were used to compute evacuation times by stairs. As a result, the most efficient methods of evacuating different types of buildings of various heights and sizes are suggested.

Swanick, J. T. (2005). "How Fast Is Your Fast Team?" Fire Engineering **158**(3): 14-22.

Summary: The necessity of crew firefighters on-scene to immediately assist a firefighter who may be in distress during a fire hazard, to satisfy the two-in/two-out requirement, is discussed. These firefighters may be referred as FAST, a rapid intervention team (RIT), a rapid intervention crew (RIC) , or a Go Team. The FAST will be dispatched prior to the arrival of all units, responding and arriving on-scene early in the incident. The FAST firefighters should also be properly prepared to enter the structure and they should have personal protective equipment and a flshlight. The team should always retain two firefighters who will be immediately available to begin a rescue.

Tanaka, I. (1997). Emergency Management for Coastal Earthquake Disaster from the Viewpoint of the Sea, Honolulu, HI, USA, Int Soc of Offshore and Polar Engineerns (ISOPE), Golden, CO, USA.

Summary: The Southern Hyogo-Prefecture Earthquake occurred in Japan on January 17, 1995 with the magnitude 7.2 in the Richter scale brought a great deal of disastrous damages over Kobe-Osaka area, which was thus named `Hanshin-Awaji Earthquake Disaster'. The Kansai Society of Naval Architects, Japan, KSNAJ, organized a committee to investigate various aspects of the disasters and to propose methods of crisis and risk management for such a coastal earthquake disasters, especially from the viewpoint from the sea. The items to be investigated are the rescue activity by means of ships, marine transportation, harbor damages, activities by various organizations, risk management planning in coastal city, etc. The present article is an overview of the discussions and proposals on these items.

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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United States Coast Guard (1982). Coast Guard Rescue and Survival Systems Manual. Washington, D.C., Dept. of Transportation, U.S. Coast Guard.

Summary: n/a

United States Government Accountability Office (2006). United States Coast Guard Improvements Needed in Management and Oversight of Rescue System Acquisition : Report to Congressional Committees. Washington, D.C., U.S. Government Accountability Office**:** i, 54 p.

Summary: n/a

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Summary: n/a

United States National Transportation Safety Board (1981). Special Investigation Report : Search and Rescue Procedures and Arming of Emergency Locator Transmitter : Aircraft Accident near Michigan City, Indiana, December 7, 1980. Washington, DC, National Transportation Safety Board.

Summary: n/a

Virginia Dept. of Fire Programs (2003). Mayday, Firefighter Down! : Student Manual. Richmond, VA, Virginia Dept. of Fire Programs.

Summary: n/a

Wallace, I. G. (1992). Assessment of Evacuation, Escape and Rescue Provisions on Offshore Installations, Manchester, Engl, Publ by Inst of Chemical Engineers, Rugby, Engl.

Summary: A methodology for carrying out an Evacuation, Escape and Rescue Assessment is described followed by a review of the factors which should be considered and the options available for upgrading the facilities if the assessment indicates that the success rate is not acceptable.

2.6 Training Requirements (15)

Amyotte, P. R. and A. M. Oehmen (2002). "Application of a Loss Causation Model to the Westray Mine Explosion." Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers, Part B **80**(1): 55-59.

Summary: On 9 May 1992 an underground explosion destroyed the Westray coal mine located in Plymouth, Nova Scotia, Canada. Twenty-six miners were killed. This paper attempts to resolve the multiple layers of accident causation by systematic application of a loss causation model. Immediate and basic causes having their origin in lack of management control are identified. The analysis helps to identify the lessons to be learned from this disaster, the two most important of which are the need for a rigorous loss management system and an appropriate attitude toward industrial safety.

Batley, L. (1998). "Canadian Training for Confined Spaces." Fire International(163).

Summary: To manage the risks associated with working in confined spaces, a Confined Space Hazard Assessment and Control Program should be developed and implemented. A Confined Space Hazard Assessment and Control Program, specific for the work being conducted, should be written for work in each and every confined space.

Boyle, P. and E. J. Smith (2000). Emergency Planning Using the Hse's Evacuation, Escape and Rescue (Eer) Hazop Technique, Manchester, UK, Institute of Chemical Engineers, Rugby, Engl.

Summary: The Health and Safety Executive (HSE) commissioned the development of a technique (EER HAZOP) for analyzing Evacuation, Escape and Rescue from offshore installations. DNV has used this technique on several installations and considers the concept could be suitable for onshore process plant. For representative accident scenarios, each stage of emergency response is considered, e.g. detection, initial command and control of the emergency, evacuation (if required), etc. Guidewords are then used to analyze what can go wrong in each stage. The technique ensures that emergency response is analyzed in a structured manner and response arrangements are based on a documented, traceable process. With increased attention on emergency planning resulting from COMAH legislation, the use of such a systematic method would provide a valuable complement to emergency exercises for onshore facilities. The approach enables the specific features of the facility and its command structure to be assessed removing generic and possibly unrealistic assumptions.

Cooper, D. (2005). Fundamentals of Search and Rescue, Jones & Bartlett Publishers.

Summary: n/a

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Summary: As South African mines penetrate greater depths and new mining methods are developed, Mines Rescue Services also have to adapt in order to render a professional, cost-effective fire fighting, rescue and recovery service to the South African mining industry. This overview will address the structure, training and equipment of Mines Rescue Services as well as fire statistics.

Flin, R. and G. Slaven (1996). "Personality and Emergency Command Ability." Disaster Prevention and Management: An International Journal **5**(1): 40-46.

Summary: n/a

Hogan, J. (2003). "Is Your Fire Department Prepared for a Well Rescue?" Water Well Journal **57**(7): 54.

Summary: The importance of pre-rescue planning of fire departments in well rescue is discussed. The local fire departments must be aware of well drilling operations, so as to preplan for any emergencies. The fire departments generally do not have the required equipments, budgets and methodologies to prevent any accidents during the well drilling.

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Summary: On 23 May 1983, an avalanche occurred at the Revenue-Virginius Mine. Six mine personnel and two contract diamond drillers were trapped when the avalanche covered and blocked the portal, the only access into the mine. Fortunately, all eight persons were rescued. Surveying the damage, issues that have contributed to the disaster emerged. By blocking the snow slide chute, the snow weight was allowed to accumulate until the fences failed and it all came at once. If the snow would have been allowed to run in smaller amounts throughout the winter, no damage would have occurred. The original ventilation system was installed in line with the snow slide by people who were not aware of or did not recognize the hazard. If a detailed map with the individual sets mapped could have been used, it would have been easier to, quicker and safer to dig horizontally than vertically. All unused equipment or facilities should be removed or neutralized. Furthermore, vehicles should not be parked and personnel should bot be allowed to walk in zones of danger.

Kampmann, B. and G. Bresser (1999). "Heat Stress and Flame Protective Clothing in Mine Rescue Brigadesmen: Inter- and Intraindividual Variation of Strain." Annals of Occupational Hygiene **43**(5): 357-365.

Summary: A climatic exposure was conducted for the 52 rescue brigadesmen of a mine while they wore flame protective clothing. We looked for individual parameters allowing prediction of tolerated exposure times in the climate tested. Of all individual parameters, only body temperature at the end of the Stoklossa heat tolerance test and physical fitness showed significant influence on the tolerated exposure time, although not very strongly. Age, body mass, and Body Mass Index showed no significant influence on the tolerated exposure time. It was found during a longitudinal study that the tolerance time within the climate for four subjects showed considerable variations, and so it was decided neither to take the result of the heat tolerance test as admittance criterion for the mine rescue service nor to perform a ranking of brigadesmen with respect to heat tolerance by this test.

Kielblock, A. J., J. P. van Rensburg, et al. (1999). "Work Load Training: Enhanced Safety Standards for Rescue Brigades' Operations in the South African Mining Industry." Journal of the Mine Ventilation Society of South Africa **52**(2): 44-46.

Summary: As South African mines reach ever-increasing depths, the corresponding increase in temperature due to the geothermal gradient and auto-compression, heightens the risk of heat-related disorders to underground workers, as well as the early onset of fatigue. This is particularly important when rescue teams are deployed in sealed (unventilated) areas during fire fighting and other emergencies. The approximately 970 volunteer rescue brigadesman serving the South African mining industry are largely drawn from full-time occupations from mid-management. This implies that by the nature of their daily jobs they are unaccustomed to the extreme physical demands required during rescue and fire fighting operations. The combination of high work rates in harsh environmental conditions, coupled with very high motivational levels, therefore poses a threat to the health and safety of these workers. This paper examines the physiological protection of rescue bridagesmen with specific reference to the scientific development of work load tests.

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin.

Mills, S. (2003). "Trench Rescue: The Basics." Fire Engineering **156**(12): 78-81.

Summary: The difficulties in trench rescue, not typical response for many fire departments, are discussed. The risk for emergency personnel responding to a trench accident is very high. The Occupational Safety and Health Administration (OSHA) specifies that employees working in excavations should be protected from potential cave-ins by a protective system. NFPA 1006, Standard for Rescue Technician Professional Qualifications, contains provisions for the rapid, nonentry rescue of victims. Rest and rehabilitation are essential for rescuers to reduce rescuer fatigue and prevent injuries in trench rescue operations. The incident management system and accountability system in the trench rescue operation will ensure the availability of sufficient personnel.

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Summary: The MERD program is a simulation of mine emergency situations, which seeks to improve the responsiveness of mine personnel during fires, explosions, and related mine accidents. It provides participants the opportunity to experience the associated emotions, stress, and problems and explore possible solutions. The training shows the need for proper planning and contingency measures should an emergency situation occur. It also delineates the tasks of various agencies involved in rescue operations Evaluations of the MERD program over the years indicate a satisfactory performance mark. Participants have attested to the importance of the program in stressing the role of effective communication and proper organization.

O'Connor, P. and R. Flin (2003). "Crew Resource Management Training for Offshore Oil Production Teams." Safety Science **41**(7): 591-609.

Summary: n/a

Rhea, R. (1997). "Organizing and Training Special Rescue Teams." Fire Engineering **150**(3): 5.

Summary: Organizing effective training programs for rescue teams begins well before the first text is opened or the first lesson plan is developed. For end results favorable from the instructor's as well as the student's perspectives, planning must begin with the actual development of the team. The development issues from which the skeleton of a training program will evolve includes: (1) identifying rescue target hazards; (2) determining the need for a special team; (3) identifying response alternatives; and (4) selecting the mode of response.

3.1 Equipment (49)

Anon (2003). "Safety Guide Aims to Reduce Death Toll." Mining, Quarrying and Recycling **32**(1): 24.

Summary: The safety guidelines for the quarrying industry of Ireland to reduce the death toll are discussed. These guidelines covers the duties and responsibilities of quarry operators and contractors and outlines the contents of the safety statements. Vehicles, fixed plant, falls from a height and working at the quarry face have emerged as the main causes of fatal accidents.

Blitch, J. (2002). "Robot Intelligence for Tunneling and Confined Space Search and Rescue." NIST Special Publication: 309.

Summary: n/a

Blitch, J. G., R. R. Murphy, et al. (1996). Knobsar : An Expert System Prototype for Robot Assisted Urban Search and Rescue, Colorado School of Mines, 1996.**:** viii, 145 leaves.

Summary: n/a

Both, W. (1983). Some Guidelines on Self-Rescue, Rescue and Fire Protection Techniques for Use in the Drivage of Auxiliary-Ventilated Roadways with Full-Face Coal-Cutting Machines, Sheffield, Engl.

Summary: The paper describes measures of fire prevention, explosion protection and control, improvement of ventilation and monitoring for safety purposes and the use of air measuring instruments and fire detectors. It also deals with the preparations for fire control, including preparations for neutralization with nitrogen and preparations for warning and evacuating the workers. Furthermore, it examines the preparations for possible action by the mine fire brigade in recovering a heading temporarily abandoned. The paper indicates some medium-term objectives with a view to the improvement of safety in drivages with full-face coal cutters; some of these objectives have already been attained; in other cases some further development is required.

Bourgoyne, A. T. and M. R. Chauvin (1988). An Experimental Study of Suppression of Obstructed Gas Well Blowout Fires Using Water Sprays. Gaithersburg, MD 52 p.

Summary: n/a

Brake, R. (2000). "Integrated Strategy for Emergency Egress from an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **53**(2): 53-61.

Summary: The fact that major fires are rare events in underground metal mines means there is often little on-site experience in dealing with these situations. Elaborate strategies that rely on a high degree of training at all levels to be effective are likely to fail, especially with the trend in Australia towards smaller mines and `fly-in fly-out' operations. A robust strategy is required. The key items in such a strategy are: early detection and warning of personnel, personal belt-worn oxygen-generating self-rescuers, high integrity escape routes and self-contained refuge stations, simple procedures, reliable personnel `tagging' systems and sufficient, trained search and rescue and fire fighting personnel and equipment.

Brake, R. and G. Bates (2001). "Criteria for the Design of Emergency Refuge Stations for an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **54**(2): 5-13.

Summary: Design strategies for emergency refuge stations (ERS) in underground metal mines were discussed. The set up of relocatable refuge stations backed up by cribrooms was proposed to provide multiple options for a person to escape from fire. The minimum number and placement of ERS was standardized. The provision of compressed breathing air from cylinders using individual face masks or from cached self-contained self-rescuers was reported to be unsuitable. An ideal system to keep toxic fumes out of the ERS by putting ERS under positive pressure with respect to external environment was proposed.

Bresser, G., B. Kampmann, et al. (1994). "Entwicklung Und Erprobung Neuer Filterselbstretter (New Filter Self-Rescuers)." Glueckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **130**(10): 716-719.

Summary: Following a unanimous vote by the mining companies, the mines inspectorates, the technical bodies and the employees' organisations a new filter self-rescuer was developed for the German coal mining industry. Feasibility studies confirmed the technical realisability of the required improvements in respiratory physiology. The DMT Institute for Rescue, Fire and Explosion Protection is coordinating and monitoring the project and in particular is conducting the tests on the prototypes above and below ground. Meanwhile a first prototype series has been manufactured and tested. The clear reduction of the breathing resistance and temperature of the inhaled air, but also the improved method of wearing the new filter self-rescuer during breathing and the easier method of fitting are a safety advantage.

Casper, J. and R. R. Murphy (2003). "Human-Robot Interactions During the Robot-Assisted Urban Search and Rescue Response at the World Trade Center." Systems, Man, and Cybernetics, Part B, IEEE Transactions on **33**(3): 367-385.

Summary: The World Trade Center (WTC) rescue response provided an unfortunate opportunity to study the human-robot interactions (HRI) during a real unstaged rescue for the first time. A post-hoc analysis was performed on the data collected during the response, which resulted in 17 findings on the impact of the environment and conditions on the HRI: the skills displayed and needed by robots and humans, the details of the Urban Search and Rescue (USAR) task, the social informatics in the USAR domain, and what information is communicated at what time. The results of this work impact the field of robotics by providing a case study for HRI in USAR drawn from an unstaged USAR effort. Eleven recommendations are made based on the findings that impact the robotics, computer science, engineering, psychology, and rescue fields. These recommendations call for group organization and user confidence studies, more research into perceptual and assistive interfaces, and formal models of the state of the robot, state of the world, and information as to what has been observed.

Covert, K. (2000). U.S. Air Force Special Forces : Pararescue. Mankato, Minn., Capstone Books.

Summary: An introduction to the United States Air Force pararescue units whose mission is to help Air Force members whose aircraft have crashed, including the development of the units and the equipment they use.

Crossland, P., A. Furnell, et al. (2005). Modelling and Assessment of an Offshore Rescue Vessel, Halkidiki, Greece, American Society of Mechanical Engineers, New York, NY 10016-5990, United States.

Summary: BP Exploration has developed a new concept in providing safety cover for personnel working on offshore installations. The concept involves the use of a new design of rigid inflatable boat, which can be deployed in emergencies to recover casualties from the water, sustain their life and then return them to a surgical facility for primary care. This paper describes the innovative trials run by QinetiQ in order to simulate elements of the vessel and to build a more complete picture of its usability and operational capability. The team has taken a total systems multi-disciplinary approach to the solution, encompassing offshore engineering, surgical expertise and ergonomics. The trials encompass the retrieval of casualties from a wave tank onto an afterdeck mock-up, their treatment under conditions of motion in a large displacement motion simulator and the flow of casualties within a mock-up of the vessel. The paper describes how the data gathered from these trials was then integrated to allow an appreciation of likely casualty handling capability of the vessel. Copyright © 2005 by ASME.

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Summary: As South African mines penetrate greater depths and new mining methods are developed, Mines Rescue Services also have to adapt in order to render a professional, cost-effective fire fighting, rescue and recovery service to the South African mining industry. This overview will address the structure, training and equipment of Mines Rescue Services as well as fire statistics.

Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. **Preliminary Report**.

Summary: n/a

Echternacht, J. E. (1981). Gaseous Fire Protection Extinguishing Agents for Offshore. Boston, MA 8 p.

Summary: n/a

Evans, D. D. (1984). Control of Blowout Fires with Water Sprays. Washington, DC 95 p.

Summary: In: Technology Assessment and Research Program for Offshore Minerals Operations. OCS Report MMS 84-0001. United States Dept. of the Interior Minerals Management Service, 1984.

Ferguson, S. and E. LaChapelle (2003). The Abcs of Avalanche Safety, Mountaineers Books.

Summary: n/a

Fiscor, S. (2004). "Minexpo 2004 Preview." Engineering and Mining Journal **205**(8): 16-18.

Summary: The preview of MINExpo 2004, the exposition held every four years in Las vegas by the National Mining Association, is given. The display will include ultra-haul trucks, super-sized dozers, drill bits, and mine modeling. MINExpo is one of the programs in the department of commerce's international buyer program. The concurrent technical brainstorming sessions will be the specific feature of the MINExpo 2004.

Gallagher, T. and S. Storment (1994). "Confined Space Rescue, Part Iv: Respiratory and Retrieval Systems." Rescue **7**(6): p. 93-98.

Summary: Extrication devices; lighting; energy hazard controls and personal protective equipment.

Hermulheim, W. and G. Bresser (2006). "Neue Atemschutzgerate Fur Dsk-Grubenwehren (New Respirators for Dsk Mine Fire-Fighting Teams)." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **142**(4): 130-134.

Summary: The supply of spare parts for the well-known Drager BG 174 respirator for mine fire-fighting teams will terminate in a few years. Hence the mine fire-fighting teams of the DSK coal mines still in production after the end of the current decade must be re-equipped with a new type of respirator. Two different variants will come into consideration with inclusion of new types of equipment from Drager and MSA-Auer. The development of the new respirators has been monitored by the DSK Centres for Mine Rescue Services since the early 1990s and is an example of successful cooperation between manufacturers and users.

Huse, J. R. (1995). Safety in Offshore Arctic Field Development, Copenhagen, Den, ASME, New York, NY, USA.

Summary: Operations in Arctic environment represents a challenge with regard to safety and do call for innovations and planning of safety from the initial phase of project development. The paper discusses safety aspects and their implications on the field design. The increased importance of maintaining the integrity of the installation and a safe refuge is discussed. A need for further developments of evacuation and rescue means is identified. Fire protection will have to be ensured with less use of large quantities of water. Alternative systems as well as extended use of passive means are discussed. Outdoor operations will have to be restricted to the minimum and the impact on equipment and system design is addressed. A short review of Rules and Regulations is included.

Kampmann, B. and G. Bresser (1999). "Heat Stress and Flame Protective Clothing in Mine Rescue Brigadesmen: Inter- and Intraindividual Variation of Strain." Annals of Occupational Hygiene **43**(5): 357-365.

Summary: A climatic exposure was conducted for the 52 rescue brigadesmen of a mine while they wore flame protective clothing. We looked for individual parameters allowing prediction of tolerated exposure times in the climate tested. Of all individual parameters, only body temperature at the end of the Stoklossa heat tolerance test and physical fitness showed significant influence on the tolerated exposure time, although not very strongly. Age, body mass, and Body Mass Index showed no significant influence on the tolerated exposure time. It was found during a longitudinal study that the tolerance time within the climate for four subjects showed considerable variations, and so it was decided neither to take the result of the heat tolerance test as admittance criterion for the mine rescue service nor to perform a ranking of brigadesmen with respect to heat tolerance by this test.

Knapp, J. (2004). "Unusual Rescue Requires Unusual Solution." Fire Engineering **157**(9): 69-72.

Summary: The development of new recycling machine and its use in fire protection is discussed. The machine is typical customer use machine and can be find in any supermarket recycling center. This particular model represents about 50 percent of all can recycling machines in the northeastern United States other models are significantly different in design. The new recycling machines are much more heavily designed because of the tight spaces and the design of the machine.

Kral, S. (2002). "Teamwork, Technology Key in Rescuing Coal Miners." Mining Engineering **54**(9): 33-35.

Summary: The dramatic rescue of nine Pennsylvania coal miners trapped nearly 90 m (300 ft) underground for 77 hours probably would not have happened without the high technology equipment and improved mine rescue training techniques available today. By now, most everyone has heard the story of the accident that occurred at the Quecreek Mine near Somerset, PA. At about 9 pm on Wednesday, July 24, the miners were drilling coal in the room-and-pillar mine. Their drilling accidentally punched through to the adjacent, abandoned Saxman Mine. Old mine maps of the Saxman Mine led Black Wolf Coal, Quecreek's owners, to believe they were between 60 to 90 m (200 to 300 m) away from the abandoned mine. Those maps proved to be inaccurate.

Lewis, D. "Jan. 1996;"." Confined Space Rescue: Should You Ever Remove Respiratory Protection", Safety+ Health: 56-60.

Summary: n/a

MacInnes, H. (2005). International Mountain Rescue Handbook. London, Frances Lincoln.

Summary: This illustrated guide to mountain rescue techniques has become the standard handbook for mountain rescue teams throughout the world. It covers all aspects of equipment, rescue dogs, snow structure, avalanche search, technical rescue techniques, radio and location equipment, winches, helicopters and many other vital elements of modern search and rescue. It is the most advanced book on mountain rescue available today. Book jacket.

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin.

McCaffrey, B. J. (1984). Jet Diffusion Flame Suppression Using Water Sprays: An Interim Report. Washington, DC 56 p.

Summary: n/a

Merta, J., Rowan, Marielle (1988). "Survival Suits Must Save Lives." Emergency Preparedness Digest **15**: 3.

Summary: n/a

Mishima, D., T. Aoki, et al. (2006). "Development of a Pneumatically Controlled Expandable Arm for Rescue Searches in Tight Spaces." International Journal of Robotics Research **25**(1): 103-110.

Summary: There is a strong demand for efficient rescue techniques and devices in preparation for large-scale earthquakes. In this study we aim to develop a robot that focuses on the efficient search for survivors. We think that efficient rescue operation is achieved when many people can work using the rescue tools at the same time. Therefore, we believe that rescue tools are more important than expensive and specialized robots. In this paper we report on the pneumatic-drive expandable arm "Slime Scope", which has a search device, such as a CCD camera, at the end of the pneumatically controlled expandable arm. This can drive stably in environments that have much debris, no electric power, and no wireless communication. © 2006 SAGE Publications.

Modroo, J. J., G. R. Olhoeft, et al. (2004). Ground Penetrating Radar Location of Buried Avalanche Victims, Colorado School of Mines, 2004.**:** x, 62 leaves.

Summary: n/a

Morse, G. L. and R. L. Swift (1982). "Working Safely in Confined Spaces - Evaluating the Hazards." Plant Engineering (Barrington, Illinois) **36**(2): 139-142.

Summary: The cardinal rule for any systematic approach to entering and working in confined spaces safely is to assume a hazard exists. A space should never be entered until tests for all possible gases, vapors, and deficiencies have been conducted. The rule also applies to anyone entering an untested space to rescue a fellow worker. The hazards encountered in confined spaces fall into three categories: oxygen deficiency, combustibility, and toxicity. This article discusses causes and types of these hazards, as well as testing instruments for detecting and evaluating hazardous conditions.

Murphy, R., J. Casper, et al. (2000). "Assessment of the Nist Standard Test Bed for Urban Search and Rescue." NIST Workshop on Performance Metrics for Intelligent Systems: 14-16.

Summary: The USF team in the 2000 AAAI Mobile Robot Competition had the most extensive experience with the NIST Standard Test Bed for USAR. Based on those experiences, the team reports on the utility of the test bed, and makes over 20 specific recommendations on both scoring competitions and on future improvements to the test bed.

O'Connell, J. P. (2005). Emergency Rescue Shoring Techniques. Tulsa, Okla., PennWell Corp.

Summary: n/a

Pasche, A., B. Holand, et al. (1991). Emergency Systems for Divers, Hague, Neth, Publ by Soc of Petroleum Engineers of AIME, Richardson, TX, USA.

Summary: Accidents during operational diving have on some occasions resulted in situations where the divers have been left in the diving bell or welding habitat at the sea bottom for several hours. In some of these situations, there have been casualties due to hypothermia. As a result, the diving industry and authorities have required that emergency equipment be developed and installed in the diving systems. The early emergency systems consisted of passive insulation systems and a lung powered CO2-scrubber/respiratory heat exchanger. From tests as well as actual emergency situations, it has been pointed out that certain improvements are required. The systems should include some means of preventing urine-wetting of the insulation system. In addition, the divers are reluctant to undress their regular diving suit as they are concerned that they would later be unable to put it on again during the rescue operation. The aim of the reported project has been to develop and test a new emergency system. New elements are a urine collection system and an evacuation system which could be used as a hot water suit and prevent the necessity of changing suits. The evacuation suit was tested during a simulated dive to 450 metres and fulfilled the requirements for prevention of cold water shock. The passive insulation system and the lung powered CO2-scrubber/rebreather have further been improved ergonomically and with regards to thermal properties.

Polglase, J. and J. LaRosa (1994). "Matter of Life and Death." Lighting Design and Application: LD & A **24**(12): 5.

Summary: The emergency lighting industry has changed greatly in recent years. New technologies and more advanced products that provide more reliable emergency lighting than ever before propelled some of those changes. Particularly, newer smart emergency lighting units are capable of centralized testing and providing users with information never before possible. Nowadays, there is too much at stake to not consider the most advanced products and system available. Taking advantage of technological advancements and choosing the finest that the emergency lighting has to offer may cost end users more initially-but far less over the long term. Intelligent emergency lighting equipment can reduce maintenance cost and increase reliability and efficiency. Most important, it can save your life.

Rixner, J. (2003). "Basement Fire Reinforces Basics." Fire Engineering **156**(6): 97-100.

Summary: On December 7, 2002, A three-alarm building fire in Richmond, Virginia, reinforced basic firefighting lessons for seasoned veterans and taught new firefighters lessons in courage and endurance. At 0422 hours, a caller reported trashcans on fire at the rear of the building at 320 West Grace Street and fire extending into the basement. The alarm was transmitted at 0422.51 hours, sending Quint Companies 6,5,12,1,18; Rescue Company 2; and Battalion Fire Chief 1. The lessons learned from the operations includes: trash fires next to buildings sometimes set the building on fire, rescue companies and other support apparatus must be careful not to block the street in front of the fire building and check pipe chases and shafts with thermal imaging cameras.

Ruegger, H., T. Schaub, et al. (1977). "Die Loesch- Und Rettungszuege Der Schweizerischen Bundesbahnen. Left Bracket Fire-Extinguishing and Rescue Trains of Swiss Federal Railways Right Bracket." Zeitschrift fuer Eisenbahnwesen und Verkehrstechnik - Glasers Annalen **101**(2): 57-61.

Summary: In 1976, Swiss Federal Railways have placed into service ten fire-extinguishing and rescue trains. The trains are equipped for operation in tunnels, under smoke and heat, for fire fighting with water, foam and powder. The breathing equipment of the rescue car is designed to supply 60 persons with air for more than three hours. The vehicles and the equipment are described.

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Summary: Written by veteran rescuer Chase Sargent, this book is a comprehensive, single-source guide to such subject areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation, retrieval systems, backup teams, and operational procedures. Effective methods of training and regulations governing operations in confined spaces also are discussed at length.

Schremmer, U. (2003). "Einsatz Von Wassernebel in Unterirdischen Verkehrsanlagen (the Use of Water Mist in Underground Traffic Structures)." VDI Berichte(1780): 25-34.

Summary: Using water mist extinguishing systems to create escape and rescue conditions that are tolerable for people in the event of a fire is a potentially important element of a total fire protection concept. This presentation briefly describes some practical solutions for protecting people and building structures against the effects of fire. These solutions, which have already undergone fire and extinguishing tests, are discussed in relation to the following technical objectives for the equipment: fire extinguishing, fire control, and binding of heat and smoke gases. Development trends that are already beginning to emerge are also examined.

Selters, A. and NetLibrary Inc. (1999). Glacier Travel & Crevasse Rescue. Seattle, WA, The Mountaineers**:** 143 p.

Summary: n/a

Shelford, W. O. (1960). Subsunk; the Story of Submarine Escape. Garden City, N.Y., Doubleday.

Summary: n/a

Somers, S. (2004). "A Case for an Integrated Rescue Device in Turnouts." Fire Engineering **157**(6): 75-79.

Summary: The installation of an integrated rescue device by Phoenix (AZ) Fire Department (DPT) in their firefighters turnout coats, is discussed. The device is intended to drag or pull an incapacitated firefighter from a hazardous environment or out of a building. An integrated rescue device is sewn into the firefighter's personal protective jacket. Such a system eliminates the time consuming, and problematic steps of finding a rescue loop or webing, secure it around a fallen firefighter, and pulling off the firefighter's protective clothing.

Strauss, S. J. (1996). "Efficacy of Self-Contained Self-Rescuers." Journal of the Mine Ventilation Society of South Africa **49**(3): 52-54.

Summary: The deployment of the compressed oxygen type self rescuers, OCENCO M20, at Koffiefontein Mine demonstrated self-rescuer performances that remained generally unaffected, with no trend indicative of deteriorating function being observed to be of practical significance. No build-up of CO2 was evident and no dusting was experienced. Moreover, the distances reached were most satisfactory, with the underground travel distances to alternative independent fresh air supplies in the event of a fire or disaster to be well within the reach of the distances achieved. However, tiredness and disorientation of the wearer of Self Contained Self Rescuers (SCSR) is expected to be a common phenomena due to the restricted airflow.

Stull, J., M. B. Connor, et al. (1996). Protective Clothing and Equipment Performance Requirements for Fire Service Urban Search and Rescue Teams, San Francisco, CA, USA, ASTM, Conshohocken, PA, USA.

Summary: The protective clothing and equipment needs for emergency responders engaged in urban search and rescue activities were investigated. These activities involve areas of emergency rescue not undertaken as part of other traditionally defined response efforts such as fire fighting, hazardous materials response, and emergency medical services, and include, building collapses, trench cave-ins, flooding, and contaminated water diving. These incidents pose a variety of physical hazards, but also include fire contact, chemical exposure, prolonged exposure to adverse weather, contact with biological contaminants, and drowning. An Emergency Responder User Requirements Committee (ERURC) was formed to assist in the assessment of urban search and rescue protective clothing/equipment needs. The ERURC included representatives of the Fire Service and other groups experienced in urban search and rescue missions. Input from the ERURC, together with information obtained in industry surveys, was used to clearly define urban search and rescue missions, identify the needs of each mission, determine clothing and equipment to meet those needs, and propose generic performance requirements for clothing and equipment items. From these efforts, urban search and rescue protective ensembles were defined for three areas: (1) technical rescue, (2) swift water rescue, and (3) contaminated water diving. Similar protection needs and ensemble clothing/equipment needs were grouped. Specific design and performance requirements were defined for the clothing and equipment items in each ensemble.

Taylor, D. (2006). "Tread Carefully." Fire Prevention and Fire Engineers Journals(V).

Summary: The importance of the personal protective equipment to be provided to fire and rescue crews is described. A firefighter needs protection from head to toe for a number of varied applications, with footwear a key area that requires close attention. Boots that comply with the standards will have through rigorous testing to ensure they are completely fit for purpose. The steel toecap must withstand 200J of impact and is essential to protect the toe region from direct impact or compression in hazardous environment. The rubber boot offers a flame retardance and resistance to radiant heat, to protect the lower leg from direct contact with flames and heat that could potentially cause burn injuries. Reflective strips on the boots can be advantageous when working in low-visibility environments, and anti-bacterial lining is available to ensure high standards of hygiene. It is required to provide safety equipment that is fit for purpose and minimizes the risk of being injured.

Timko, R. J. and R. L. Derick (1988). Determining the Integrity of Escapeways During a Simulated Fire in an Underground Coal Mine, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Summary: The Bureau of Mines evaluated the integrity of escapeways in a three entry underground coal mine. A center conveyor belt entry (secondary escapeway), was flanked by an intake (primary escapeway) and a return entry. Diesel equipment was used throughout the mine for material and personnel haulage. A carbon monoxide monitoring system, tied to a data recording computer on the surface, was deployed throughout the belt entry and at selected sites in the intake and return entries. Previously, the company had a fire of unknown origin in another mine, which prompted an interest in the performance of their escapeways. An initial qualitative evaluation was performed by burning approximately 14 kg of coal at the mouth of the intake entry. The first test was followed by a similar burn at the mouth of the belt entry. These initial trials showed a high quantity of leakage between entries. In several follow-up evaluations, simulated fires, using a tracer gas, were set in the intake and belt entries. The results of tests showed that permanent stoppings could not guarantee isolated, contaminant-free escapeways.

U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Summary: Provides the Incident Commander with an understanding of the FFPE protection and the associated risks if worn while performing rescue operations at the scene of a terrorist incident involving military chemical warfare agents.

Virginia. Dept. of Fire Programs. (2002). Heavy and Tactical Rescue : Vehicle Extrication : Pilot Program : Student Guide. Richmond, Va., Virginia Dept. of Fire Programs.

Summary: n/a

Whitby, C. (2004). "Basic Essentials of Rit." Fire Engineering **157**(2): 30-32.

Summary: The responsibilities of the rapid intervention team (RIT) also knowns as FAST (firefighter assistance and search team) and the type of training needed for each are discussed. The elimination or reduction of hazards that may trap a firefighter or hinder escape are studied. The personnel training in victim removal and rescue techniques is emphasized. The standard equipment assignment for each RIT/FAST member at a residential structure fire is also elaborated.

3.2 Protocols and Methods (39)

Abi-Zeid, I. a. D., Bernard. (2003). "Using a Geographic Decision Support System to Plan Search and Rescue Operations." International Journal of Emergency Management **1**: 16.

Summary: n/a

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

Axelsson, M., J. Jenvald, et al. (2001). "Monitoring and Analysis of Command Post Communication in Rescue Operations." Safety Science **39**: 9.

Summary: n/a

Barbera, J. and A. Macintyre (1996). "Urban Search and Rescue." Emergency Medicine Clinics of North America **14**(2): 399-412.

Summary: n/a

Barney, G. (1998). "Safety Rescue of Persons Trapped in a Lift Car." Elevator World **46**(3): 110.

Summary: Clause 7 of the CEN/TC10/WG5 draft of `Maintenance instructions for Lifts and Escalators' which reads `The owner of the lift installation can authorize persons trained by the maintenance company to rescue passengers in case of emergency' is contentious. Moreover, the document is concerned with maintenance instructions which is an area of contention itself. Thus, it is recommended to just remove the rescue reference from this document, if they are thought sufficiently important and to produce another document on safe working in lifts and escalators.

Collins, L. (2004). "Close Call in Trench/Excavation Rescue." Fire Engineering **157**(9): 51-62.

Summary: The ocasional failure of measures and laws indended to protect workers in trenches and excavation is discussed. An Incident Action Plan (IAP) was included for extra precautions to ensure maximum personnel safety and redundant safety to avoid collapse in the trenches. The IAP was a rescue plan developed by USAR captains having the strategy to stabilize the excavation to prevent collapse onto resuers and to create a series of safe zones leading to the victim's location. The rescue plan included several contingencies in case of unexpected events such as secondary collapse causing entrapment of firefighters, rupture of water mains and other utilities.

Cone, D. (2000). "Rescue from the Rubble: Urban Search & Rescue." Prehospital Emergency Care **4**(4): 352-357.

Summary: n/a

Cooper, G., M. White, et al. (1980). "Resource Management on the Flightdeck: Proceedings of a Nasa." Industry Workshop.

Summary: n/a

FEMA (2000). Urban Search and Rescue (Us&R) Incident Support Team (Ist) Operations Manual. FEMA.

Summary: n/a

Goodman, C. and D. Hogan (2007). "Urban Search and Rescue." Disaster Medicine.

Summary: n/a

Hall, L. (1982). "To Save the Pilot's Life--Soviet Air Rescue Service." Air University Review.

Summary: n/a

Harfield, G. and R. Watkinson (2002). Multi-Purpose Search and Rescue System, WO Patent WO/2002/081,301.

Summary: There is disclosed a modular multi-purpose search rescue system comprising a board member (1), a viewing window (19) and a crook member (24). The board member (1) is adapted for passage over or flotation on ice or water or the like, and the crook member (24) may be fitted with various tools, including paddles, remote sensing equipment, cutting tools and others. Various control lines (42) may be provided, as may an elastomeric blanket for securing a casualty to the board member. Also disclosed is a boat (29) made up of at least one board member.

Heightman, A. (1999). "Kansas Confined Space Rescue. A Small Department Utilizes Mutual Aid to Rescue a Child Trapped 16 Feet Below Ground." JEMS **24**(7): 50-1.

Summary: n/a

International Maritime Organization and International Civil Aviation Organization (1998). International Aeronautical and Maritime Search and Rescue Manual. London, Montreal, Quebec, International Maritime Organization and International Civil Aviation Organization.

Summary: n/a

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary: Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

Kubicki, D. J. (1981). "Fire Protection and Rescue Planning for the Nasa Space Shuttle." Fire Journal (Boston) **75**(4): 34-40.

Summary: This article gives an overview of the planning, identifies and explains specific fire protection features and systems, and relates general fire proection engineering concepts to the firesafety strategies of the space program.

Lee, H., T. Wang, et al. (2003). "Development of a New Confined Space Model." Annual Disaster Medical Volume **2**(1).

Summary: n/a

MacInnes, H. (2005). International Mountain Rescue Handbook. London, Frances Lincoln.

Summary: This illustrated guide to mountain rescue techniques has become the standard handbook for mountain rescue teams throughout the world. It covers all aspects of equipment, rescue dogs, snow structure, avalanche search, technical rescue techniques, radio and location equipment, winches, helicopters and many other vital elements of modern search and rescue. It is the most advanced book on mountain rescue available today. Book jacket.

Macintyre, A., J. Barbera, et al. (2006). "Surviving Collapsed Structure Entrapment after Earthquakes: A "Time-to-Rescue" Analysis." Prehospital and Disaster Medicine **21**(1): 4.

Summary: Massive earthquakes often cause structures to collapse, trapping victims under dense rubble for long periods of time. Commonly, this spurs resource intensive, dangerous, and frustrating attempts to find and extricate live victims. The search and rescue phase usually is maintained for many days beyond the last "save," potentially diverting critical attention and resources away from the pressing needs of non-trapped survivors and the devastated community. This recurring phenomenon is driven by the often-unanswered question "Can anyone still be alive under there?" The maximum survival time in entrapment is an important issue for responders, yet little formal research has been conducted on this issue. Knowing the maximum survival time in entrapment helps responders: (1) decide whether or not they should continue to assign limited resources to search and rescue activities; (2) assess the safety risks versus the benefits; (3) determine when search and rescue activities no longer are indicated; and (4) time and pace the important transition to community recovery efforts.

McClincy, W. D. (2002). Instructional Methods in Emergency Services. New Jersey, Prentice Hall.

Summary: n/a

Moxie Media Emergency Platform, Rig and Vessel Abandonment. New Orleans, LA Moxie Media, Inc. n.d.

Summary: n/a

O'Connell, J. (1993). "Above-Grade Tactics and Procedures for Search, Rescue, and Evacuation." Fire Engineering **146**: 61-61.

Summary: n/a

Requires, N. (2004). "The Complexity of Team Training: What We Have Learned from Aviation and Its Applications to Medicine." Quality and Safety in Health Care **13**(1): i72-i79.

Summary: n/a

Schaefer, B. (2003). "Developing Standard Operating Guidelines." Fire Engineering **156**(10): 24-32.

Summary: A discussion on developing standard operating guidelines (SOG) for the rapid intervention team (RIT) is presented. The ultimate goal is to develop a guideline that will work for all departments in the county. It is reported that the purpose of the RIT is to provide rapid rescue for structural firefighting crews operating at an emergency scene.

Selters, A. and NetLibrary Inc. (1999). Glacier Travel & Crevasse Rescue. Seattle, WA, The Mountaineers**:** 143 p.

Summary: n/a

Shaluf, I. M. and F. l.-R. Ahamadun (2008). "An Overview on the Offshore Emergency Response Planning in Malaysia." Disaster Prevention and Management **17**(1): p. 83-93.

Summary: n/a

Swanick, J. T. (2005). "How Fast Is Your Fast Team?" Fire Engineering **158**(3): 14-22.

Summary: The necessity of crew firefighters on-scene to immediately assist a firefighter who may be in distress during a fire hazard, to satisfy the two-in/two-out requirement, is discussed. These firefighters may be referred as FAST, a rapid intervention team (RIT), a rapid intervention crew (RIC) , or a Go Team. The FAST will be dispatched prior to the arrival of all units, responding and arriving on-scene early in the incident. The FAST firefighters should also be properly prepared to enter the structure and they should have personal protective equipment and a flshlight. The team should always retain two firefighters who will be immediately available to begin a rescue.

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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Trainor, J. E. Searching for a System: Multi-Organizational Coordination in the September 11th World Trade Center Search and Rescue Response

Summary: The objective of this study is to examine the inter-organizational effectiveness of the Incident Command System (ICS) in the *formal* Search and Rescue (SAR) response to the September 11th attacks on the World Trade Center. In order to accomplish this, a network analytic database of interactions, created at the Disaster Research Center, was gleaned from sources such as federal and local situation reports, newspapers, and a variety of other official and public sources. Using these sources as a conceptual whole, this research effort has produced a snapshot of the social organization of the response system in a network analytic form. In addition to that database, this paper also uses a series of notes and personal accounts resulting from over two months of rapid-response field research conducted by members of the DRC during an extensive project examining the response to the September 11th World Trade Center attacks. As a third source of data, this study also draws on a series of in-depth interviews conducted with key response personnel and a focus group discussion conducted with a search and rescue team that was part of the response. The combined use of network analytic tools informed by a qualitative understanding of the nature of interactions provides a better understanding of the implications of ICS organization on *Formal* Response Systems. The study findings suggest that ICS is not a universally applicable organizational form, but does have value in some response areas. Potential Implications of the application of ICS organization and actual problems responders encountered during the 911 SAR response are also discussed.

United States Bureau of Mines, Mountain Empire Community College / Division of Mining and Industrial Technology, et al. (1989). Carl T. Donaldson Exercise : Instructor's Copy. Lexington, Ky. / Big Stone Gap, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Division of Mining and Industrial Technology, Mountain Empire Community College.

Summary: n/a

United States Bureau of Mines, Southwest Virginia Community College / Miner Training Program, et al. (1989). Man in the Bin Exercise : Instructor's Copy. Lexington, Ky.; Richlands, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Miner Training Project, Southwest Virginia Community College.

Summary: n/a

United States Coast Guard (1975). Search and Rescue : Auxiliary Operational Specialty Course, Student Workbook. Washington, U.S. Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1982). Coast Guard Rescue and Survival Systems Manual. Washington, D.C., Dept. of Transportation, U.S. Coast Guard.

Summary: n/a

United States. Congress. Senate. Committee on Appropriations. Subcommittee on Departments of Labor Health and Human Services Education and Related Agencies. (2003). Mine Disaster at Quecreek : Hearing before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Seventh Congress, Second Session, Special Hearing, October 21, 2002, Johnstown, Pa. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O. [Congressional Sales Office].

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Virginia Dept. of Fire Programs (2003). Mayday, Firefighter Down! : Student Manual. Richmond, VA, Virginia Dept. of Fire Programs.

Summary: n/a

Wallace, I. G. (1992). Assessment of Evacuation, Escape and Rescue Provisions on Offshore Installations, Manchester, Engl, Publ by Inst of Chemical Engineers, Rugby, Engl.

Summary: A methodology for carrying out an Evacuation, Escape and Rescue Assessment is described followed by a review of the factors which should be considered and the options available for upgrading the facilities if the assessment indicates that the success rate is not acceptable.

Whitcomb, D. D. (2006). Combat Search and Rescue in Desert Storm. Maxwell Air Force Base, Ala., Air University Press.

Summary: n/a

William, J., H. Stambaugh, et al. (2003). Rapid Intervention Teams and How to Avoid Needing Them Special Report. Technical report series USFA-TR-123. [Emmitsburg, Md.], Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center**:** [54] p.

Summary: n/a

3.3 Qualifications (8)

Cottam, H. a. S., Nigel. (1998). "Knowledge Acquisition for Search and Rescue Planning " International Journal of Human-Computer Studies **48**: 24.

Summary: n/a

Fuchs, E., W. Hermulheim, et al. (2004). "Restrukturierung Des Grubenrettungswesens Restructuring of the Mine Rescue Service." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **140**(10): 453-457.

Summary: About 1,200 voluntary mine rescue workers are currently on stand-by for underground deployment with respirators in the Ruhr, Saar and Ibbenburen coalfields. The minimum requirement of mine rescue workers for a major incident is 600 men for three physically separated coalfields and is still safely covered in the medium term. The concentration of specific qualifications (packing and drilling operations with respirators, inertisation) in the voluntary central mine rescue station DSK Ruhr continues to be practical and is being maintained; by contrast the continuous stand-by service of the central mine rescue station was disbanded on 31 December 2003 in the course of the deployment profile modified in recent years. The professional mine and works fire brigade in Friedrichsthal, Saar including the stand-by service is being maintained with its previous strength essentially on the basis of the existing specifications by regulations or service contracts. A subsequent solution for the period after closure of the Warndt/Luisenthal site of the Saar colliery is being investigated with regard to feasibility in a project with participation of the mining authorities, the Saar colliery and the main mine rescue service station. The main mine rescue stations in Herne and Friedrichsthal have significantly intensified their cooperation in the course of mutual simplification of the technical fields.

Mills, S. (2003). "Trench Rescue: The Basics." Fire Engineering **156**(12): 78-81.

Summary: The difficulties in trench rescue, not typical response for many fire departments, are discussed. The risk for emergency personnel responding to a trench accident is very high. The Occupational Safety and Health Administration (OSHA) specifies that employees working in excavations should be protected from potential cave-ins by a protective system. NFPA 1006, Standard for Rescue Technician Professional Qualifications, contains provisions for the rapid, nonentry rescue of victims. Rest and rehabilitation are essential for rescuers to reduce rescuer fatigue and prevent injuries in trench rescue operations. The incident management system and accountability system in the trench rescue operation will ensure the availability of sufficient personnel.

O'Connor, P. and R. Flin (2003). "Crew Resource Management Training for Offshore Oil Production Teams." Safety Science **41**(7): 591-609.

Summary: n/a

Plum, J. (2003). Careers in Police Departments' Search and Rescue Units. New York, NY, Rosen Central.

Summary: Discusses the history of search and rescue work by police departments, requirements of becoming a police officer, and the roles various police departments played during and after the events of September 11, 2001.

Polglase, J. and J. LaRosa (1994). "Matter of Life and Death." Lighting Design and Application: LD & A **24**(12): 5.

Summary: The emergency lighting industry has changed greatly in recent years. New technologies and more advanced products that provide more reliable emergency lighting than ever before propelled some of those changes. Particularly, newer smart emergency lighting units are capable of centralized testing and providing users with information never before possible. Nowadays, there is too much at stake to not consider the most advanced products and system available. Taking advantage of technological advancements and choosing the finest that the emergency lighting has to offer may cost end users more initially-but far less over the long term. Intelligent emergency lighting equipment can reduce maintenance cost and increase reliability and efficiency. Most important, it can save your life.

Swanick, J. T. (2005). "How Fast Is Your Fast Team?" Fire Engineering **158**(3): 14-22.

Summary: The necessity of crew firefighters on-scene to immediately assist a firefighter who may be in distress during a fire hazard, to satisfy the two-in/two-out requirement, is discussed. These firefighters may be referred as FAST, a rapid intervention team (RIT), a rapid intervention crew (RIC) , or a Go Team. The FAST will be dispatched prior to the arrival of all units, responding and arriving on-scene early in the incident. The FAST firefighters should also be properly prepared to enter the structure and they should have personal protective equipment and a flshlight. The team should always retain two firefighters who will be immediately available to begin a rescue.

Trotman, B. (1996). "Change in Direction for the New South Wales' Mines Rescue Service." Mining Technology **78**(900): 221-222.

Summary: This paper will overview the formation of the Mines Rescue Service in New South Wales (NSW), its current role and capabilities, and strategies being developed to enhance its emergency response, mine rescue training, specialist safety and technical services to the Australian coal industry.

3.4 Specialized Duties of Team Members (12)

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. **Preliminary Report**.

Summary: n/a

Gallagher, T. and S. Storment (1994). "Confined Space Rescue, Part Iv: Respiratory and Retrieval Systems." Rescue **7**(6): p. 93-98.

Summary: Extrication devices; lighting; energy hazard controls and personal protective equipment.

Glen, S. and M. Pesaresi (1997). Search and Rescue. New York, Fawcett Crest.

Summary: n/a

Jeffers, H. P. (2006). Burning Cold : The Cruiseship Prinsendam and the Greatest Sea Rescue of All Time. Grand Rapids, Mich., Zenith.

Summary: In October 1980, the Holland America cruise ship Prinsendam rolled over on her starboard side and sank in 1,473 fathoms of icy water in the Gulf of Alaska. Amazingly, none of the 320 passengers or 190 crew went down with her, recounts Jeffers (The 1,000 Greatest Heroes) in this workmanlike account of disaster and rescue on the high seas. After a fire broke out in the vessel's engine room and spread unchecked, everyone aboard was forced to abandon ship in a rising gale. Through the heroic efforts of the U.S. Coast Guard, the evacuation resulted in no lives lost.

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Summary: The MERD program is a simulation of mine emergency situations, which seeks to improve the responsiveness of mine personnel during fires, explosions, and related mine accidents. It provides participants the opportunity to experience the associated emotions, stress, and problems and explore possible solutions. The training shows the need for proper planning and contingency measures should an emergency situation occur. It also delineates the tasks of various agencies involved in rescue operations Evaluations of the MERD program over the years indicate a satisfactory performance mark. Participants have attested to the importance of the program in stressing the role of effective communication and proper organization.

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Summary: The experience of a Trench Rescue team while rescuing 21-year-old construction worker who was caught in a trench collapse and nearly lost his life, is presented. When the team arrived on-scene, the victim was in a 12-foot trench buried up to his chest. The victim was finally strapped to backboard and put into a rescue basket. The team felt that on several occasions when things started to get out of control, everybody was reminded of their respective in-charge operations. In many situations, a trench rescue could be augmented by the use of a vacuum cleaning truck. The use of the incident command system, as much personnel to the scene as possible, plan for getting the victim out of trench once he is freed, are all essential for a successful operation.

Royston, A. and R. Stewart (1998). Emergency Rescue. Des Plaines, Ill., Heinemann Interactive Library.

Summary: Describes the work of paramedics, firefighters, doctors, mechanics, and other emergency rescue workers.

Trotman, B. (1996). "Change in Direction for the New South Wales' Mines Rescue Service." Mining Technology **78**(900): 221-222.

Summary: This paper will overview the formation of the Mines Rescue Service in New South Wales (NSW), its current role and capabilities, and strategies being developed to enhance its emergency response, mine rescue training, specialist safety and technical services to the Australian coal industry.

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Veasey, D. A. and Wiley InterScience (Online service) (2006). Confined Space Entry and Emergency Response. Hoboken, N.J., John Wiley & Sons**:** xxi, 486 p.

Summary: n/a

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von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

Summary: In the last few decades in the German coal mining industry, the number of accidents and resulting rescue operations involving the mine emergency teams has fallen. Research and development work and operational measures to guard against dangers, i. e. to prevent, monitor, recognize, control and eliminate risks are gaining in importance. The aim of this paper is to outline the duties of the advance party leader and of the deployment group in the 'first hour' of a mining accident, to show the interrelationship between the decisions and measures taken and to give an idea of the important results and insights gained over the last few years.

3.5 Technology (61)

Abi-Zeid, I. a. D., Bernard. (2003). "Using a Geographic Decision Support System to Plan Search and Rescue Operations." International Journal of Emergency Management **1**: 16.

Summary: n/a

Blitch, J. (2002). "Robot Intelligence for Tunneling and Confined Space Search and Rescue." NIST Special Publication: 309.

Summary: n/a

Blitch, J. G., R. R. Murphy, et al. (1996). Knobsar : An Expert System Prototype for Robot Assisted Urban Search and Rescue, Colorado School of Mines, 1996.**:** viii, 145 leaves.

Summary: n/a

Boer, L. and S. van Wijngaarden (2004). "Directional Sound Evacuation from Smoke-Filled Tunnels." Proceedings of the first International Symposium, Safe and Reliable Tunnels Innovative European Achievements: 4-6.

Summary: n/a

Both, W. (1983). Some Guidelines on Self-Rescue, Rescue and Fire Protection Techniques for Use in the Drivage of Auxiliary-Ventilated Roadways with Full-Face Coal-Cutting Machines, Sheffield, Engl.

Summary: The paper describes measures of fire prevention, explosion protection and control, improvement of ventilation and monitoring for safety purposes and the use of air measuring instruments and fire detectors. It also deals with the preparations for fire control, including preparations for neutralization with nitrogen and preparations for warning and evacuating the workers. Furthermore, it examines the preparations for possible action by the mine fire brigade in recovering a heading temporarily abandoned. The paper indicates some medium-term objectives with a view to the improvement of safety in drivages with full-face coal cutters; some of these objectives have already been attained; in other cases some further development is required.

Boulougouris, E. K. and A. Papanikolaou (2002). Modeling and Simulation of the Evacuation Process of Passenger Ships. Proc. 10th Int. Congress of the International Maritime Association of the Mediterranean (IMAM 2002). Crete.

Summary: The need to safely evacuate within very short time a large number of people from a confined space, such as the superstructure of large passenger ships, is a difficult task of great practical interest, as documented in recent discussions at the Marine Safety Committee of the International Maritime Organisation (MSC-IMO).

This paper describes the methodology utilized by the code EVDEMON (EVacuation DEmonstration & MOdeliNg), currently under development at SDL-NTUA, for the simulation of the evacuation process onboard passenger ships and presents typical results of application to the evacuation of a modern Ro-Ro passenger ferry. The code is understood as a design tool assisting the designer in the early design stage as to the consideration of proper arrangements for enabling a timely and safe evacuation. The designer is asked to care of optimal measures in terms of internal arrangements to allow for the fast evacuation without bottlenecks, when the ship is in danger. Given the uncertainty of human behavior under stress and the restrictions of a possible mathematical modeling thereof, only multiple simulations of different evacuation scenarios may give the naval architect an indication about the potential outcome in such an event, so that bottlenecks can be identified and removed to the extent possible. At a later development stage, namely after the validation phase, simulation codes, like the presented one, might be used as evidence for the approval of evacuation plans by relevant authorities, as documented by MSC-IMO (MSC Circ. 909/ 1999).

Bourgoyne, A. T. and M. R. Chauvin (1988). An Experimental Study of Suppression of Obstructed Gas Well Blowout Fires Using Water Sprays. Gaithersburg, MD 52 p.

Summary: n/a

Brake, R. and G. Bates (2001). "Criteria for the Design of Emergency Refuge Stations for an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **54**(2): 5-13.

Summary: Design strategies for emergency refuge stations (ERS) in underground metal mines were discussed. The set up of relocatable refuge stations backed up by cribrooms was proposed to provide multiple options for a person to escape from fire. The minimum number and placement of ERS was standardized. The provision of compressed breathing air from cylinders using individual face masks or from cached self-contained self-rescuers was reported to be unsuitable. An ideal system to keep toxic fumes out of the ERS by putting ERS under positive pressure with respect to external environment was proposed.

Bystron, H. (1983). Role of Budryk's Throttling Air Doors in Stabilizing Ascensional Ventilation of Mine Workings in Case of a Fire, Sheffield, Engl.

Summary: Prevention of mining disasters in case of fires in inclined mine workings is based first of all on the stabilization of ascensional ventilation. Such stabilization is carried out by dividing the mine with Budryk's throttling air doors into two zones (I and II). Zone I (safe) is connected with the intake shaft and zone II (dangerous) with the upcast shaft. The air door which throttles the air inflow to the fire is called the fundamental air door and that throttling the air flow to the working, through which the fire fumes flow in the direction of the exhausting main fan, is called the auxiliary air door. The aim of this work is to present the latest study results obtained at the Central Mining Institute in Katowice. The studies were based on foreign achievements, using the same simplifying assumptions, but making use of gas mechanics and phenomenological thermodynamics to a greater extent than previously.

Casper, J. and R. R. Murphy (2003). "Human-Robot Interactions During the Robot-Assisted Urban Search and Rescue Response at the World Trade Center." Systems, Man, and Cybernetics, Part B, IEEE Transactions on **33**(3): 367-385.

Summary: The World Trade Center (WTC) rescue response provided an unfortunate opportunity to study the human-robot interactions (HRI) during a real unstaged rescue for the first time. A post-hoc analysis was performed on the data collected during the response, which resulted in 17 findings on the impact of the environment and conditions on the HRI: the skills displayed and needed by robots and humans, the details of the Urban Search and Rescue (USAR) task, the social informatics in the USAR domain, and what information is communicated at what time. The results of this work impact the field of robotics by providing a case study for HRI in USAR drawn from an unstaged USAR effort. Eleven recommendations are made based on the findings that impact the robotics, computer science, engineering, psychology, and rescue fields. These recommendations call for group organization and user confidence studies, more research into perceptual and assistive interfaces, and formal models of the state of the robot, state of the world, and information as to what has been observed.

Cawley, J. C. (2001). Electrical Accidents in the Mining Industry, 1990-1999, Chicago, IL, Institute of Electrical and Electronics Engineers Inc.

Summary: This National Institute for Occupational Safety and Health study was conducted to focus future research on the most significant electrical problems in the mining industry. Data from 1,926 mine electrical accidents (including 75 fatalities) that occurred between 1990 and 1999 were studied. Coal and metal-nonmetal operator- and contractor-reported data are presented. All data used in this analysis were MSHA closeout data, except 1999, which were preliminary data. Electricity was the 4th leading cause of death reported in mining despite being the 14th leading cause of injuries. During the 1990s, 1 of every 272 mining accidents resulted in a fatality. In comparison, 1 of every 26 mine electrical accidents was fatal. Burns were the leading Nature of Injury in electrical accidents, but were rarely fatal. Electrical shock caused 70 of the 75 electrical fatalities reported. About one-half of mine electrical accidents and fatalities were sustained during electrical maintenance. Small mines experience a disproportionately high number of electrical accidents and fatalities based on total average employment. The injury severity for victims of nonfatal mine electrical injuries does not increase with age in victims 50 years and older, unlike many other types of occupational accidents. High-reaching mobile equipment is involved in about 20% of mine electrical fatalities, indicating that overhead power line hazards need to be addressed. Electrical accident narratives containing the six most frequently mentioned keywords were isolated for further analysis. 1,321 narratives containing the keywords "breaker", "cable", "battery", "ground", "energized" and "meter" were analyzed to more accurately determine causal factors. Technical suggestions for mitigating electrical hazards are proposed.

Christ, R. D. and R. L. Wernli (2007). The Rov Manual a User Guide to Observation-Class Remotely Operated Vehicles. Amsterdam ; Boston ; London, Butterworth-Heinemann**:** xviii, 308 p.

Summary: Many underwater operations that were once carried out by divers can now be carried out more efficiently and with less risk with Remotely Operated Vehicles (ROVs). This is the first ROV how-to manual for those involved with smaller observation class ROVs used for surveying, inspection, observation and research purposes. As ROV technology becomes increasingly efficient and affordable, their use is rapidly spreading throughout a myriad of industries, everything from aquaculture to port and harbour security to underwater crime scene investigation, marine salvage, deep sea archaeology and commercial diving even deep sea rescue missions are handled by ROVs. Any industry involved with underwater investigation and surveying will inevitably rely on these machines. The ROV Manual is the first user guide to provide complete training and knowledge on ROV operations for engineers, technicians or underwater recreational enthusiasts, whether working inland or offshore. *The first book to focus on observation class ROV underwater deployment and usage in real conditions for industrial, commercial, scientific and recreational tasks *A complete user guide to ROV operation with basic information on the usage of underwater robotics and navigation equipment to obtain mission results quickly and efficiently *Ideal for anyone involved with ROVs whether in research, business or leisure underwater activities, or for heavier offshore projects, complete with self-learning questions and answers.

Cottam, H. a. S., Nigel. (1998). "Knowledge Acquisition for Search and Rescue Planning " International Journal of Human-Computer Studies **48**: 24.

Summary: n/a

Crook, J. (1992). "Protection of Platforms from Gas Blasts." Fire International **16**(133): p. 26-27+.

Summary: Predicting explosive forces; North Sea oil platform design

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Crossland, P., A. Furnell, et al. (2005). Modelling and Assessment of an Offshore Rescue Vessel, Halkidiki, Greece, American Society of Mechanical Engineers, New York, NY 10016-5990, United States.

Summary: BP Exploration has developed a new concept in providing safety cover for personnel working on offshore installations. The concept involves the use of a new design of rigid inflatable boat, which can be deployed in emergencies to recover casualties from the water, sustain their life and then return them to a surgical facility for primary care. This paper describes the innovative trials run by QinetiQ in order to simulate elements of the vessel and to build a more complete picture of its usability and operational capability. The team has taken a total systems multi-disciplinary approach to the solution, encompassing offshore engineering, surgical expertise and ergonomics. The trials encompass the retrieval of casualties from a wave tank onto an afterdeck mock-up, their treatment under conditions of motion in a large displacement motion simulator and the flow of casualties within a mock-up of the vessel. The paper describes how the data gathered from these trials was then integrated to allow an appreciation of likely casualty handling capability of the vessel. Copyright © 2005 by ASME.

Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. **Preliminary Report**.

Summary: n/a

Echternacht, J. E. (1981). Gaseous Fire Protection Extinguishing Agents for Offshore. Boston, MA 8 p.

Summary: n/a

Edgerly, B. (2005). "Survivability and Rescue Transceiver Technology." Fire Engineering **158**(5): 122-125.

Summary: Firefighter rescue transceivers (FRT), introduced at the 2004 Fire Department Instructors Conference (FDIC), are finding a home in the increasingly dangerous US fire service. FRT can detect the victim's signal through walls, floors, and other obstacles. The Tracker FRT from Exit Technologies is switched from transmit to search mode by pressing the red search button for at least one second. It is stated that the most effective strategy for rescuing firefighters alive is for the search to be carried out by fellow crew members already operating inside the building.

Evans, D. D. (1984). Control of Blowout Fires with Water Sprays. Washington, DC 95 p.

Summary: n/a

Fahy, R. F. (2002). "Tools for the Simulation of Human Behavior." Fire Protection Engineering **101**(47): 16701-16706.

Summary: n/a

Fiscor, S. (2004). "Minexpo 2004 Preview." Engineering and Mining Journal **205**(8): 16-18.

Summary: The preview of MINExpo 2004, the exposition held every four years in Las vegas by the National Mining Association, is given. The display will include ultra-haul trucks, super-sized dozers, drill bits, and mine modeling. MINExpo is one of the programs in the department of commerce's international buyer program. The concurrent technical brainstorming sessions will be the specific feature of the MINExpo 2004.

Gao, G., B. Yan, et al. (2006). An Accident Prevention and Emergency Rescue System for Expressway Tunnels, Pretoria, South Africa, Document Transformation Technologies cc., Irene, 0062, South Africa.

Summary: Using the idea of safety management for the technical transmission of modern traffic and network information as the basis, this paper sets up a traffic accident prevention and emergency rescue system for expressway tunnels, which is an important means of improving the safe operation and management of expressway tunnels. According to the characteristics of traffic accidents in expressway tunnels, the traffic accident prevention and emergency rescue system administration, consisting of a supervision layer, an infrastructure layer, a shared layer and a value-added service layer, is an integrated, comprehensive, systematic platform which incorporates data communication, database and GIS into an organic whole and has a certain intelligence function. This paper then studies the framework of an accident prevention and emergency rescue system for expressway tunnels and describes the primary function modules and workflow. Finally, the paper examines the Shaoguan tunnel of the Jing-zhu expressway in China and puts forward some constructive suggestions for setting up an accident prevention and emergency rescue system.

Gochioco, L. M., R. Rodriguez, et al. (2008). "Employing the Underground Inseam Seismic Method to Detect Old Abandoned Mines and Improve Mine Safety." Leading Edge (Tulsa, OK) **27**(1): 88-97.

Summary: In July 2002, a high hydrostatic head pressure and thinner coal barrier caused a major water break that flooded the QueCreek Mine in southwest Pennsylvania. Nine miners were trapped for nearly 77 hours before they were rescued. This high-profile accident motivated the US government to investigate measures that would minimize similar accidents in the future. © 2008 Society of Exploration Geophysicists.

Goldstein, I. (2006). "Safety of High-Rise Buildings: Should Be up to the Mark!" Elevator World **54**(12): 61-66.

Summary: Even after the 9/11 tragedy, there is not a skycraper existing today of which its creators could boast of a reliable system of ensuring quick and safe evacuation of a large number of people in an emergency. However, there are many evacuation methods for emergencies in high-rise buildings being proposed. Moscow inventor Pavel Korchagin has proposed his alternative called ARC Technology. The system consists of a rail of a certain profile that is fixed on the surface of a building along which a hoist can move that is equipped with a telescopic arm. A self-contained power supply, firefighting-agent tanks, the use of heat-resistant materials and state-of-the-art control and communication devices convert the hoist into a mobile robotic system intended for extinguishing fire and rescuing people at any height. However, ARC Technology can also function as building maintenance system and as a solution for carparking problems.

Gwynne, S., E. Galea, et al. (1999). "A Review of the Methodologies Used in Evacuation Modelling." Fire and Materials **23**(6): 383-388.

Summary: n/a

Haack, A. (1992). "Fire Protection in Traffic Tunnels - Initial Findings from Large-Scale Tests." Tunnelling and Underground Space Technology **7**(4): 363-375.

Summary: As the number and length of road and rail tunnels increases and more people use them, fire safety issues take on ever greater importance. In order to improve fire protection in subsurface traffic facilities, eight Western European nations have joined Germany in undertaking a comprehensive study of fire in such facilities. Laboratory tests and tests conducted in existing tunnels are being carried out in Germany, Finland and Norway, with the overall objective of investigating the possibilities for optimal protection of people and preservation of property in the event of fires in subsurface transportation facilities.

Harrison, T., J. Gil-Garcia, et al. (2006). "Learning About Interoperability for Emergency Response: Geographic Information Technologies and the World Trade Center Crisis." Proceedings of the 39th Annual Hawaii International Conference on System Sciences-Volume 04.

Summary: n/a

Hjertager, B. H., S. Hoiset, et al. (1998). "Properties of Simulated Gas Explosions of Interest to the Structural Design Process." Process Safety Progress **17**(4): p. 278-287.

Summary: The article describes the EXSIM gas explosion simulation software.

Huse, J. R. (1995). Safety in Offshore Arctic Field Development, Copenhagen, Den, ASME, New York, NY, USA.

Summary: Operations in Arctic environment represents a challenge with regard to safety and do call for innovations and planning of safety from the initial phase of project development. The paper discusses safety aspects and their implications on the field design. The increased importance of maintaining the integrity of the installation and a safe refuge is discussed. A need for further developments of evacuation and rescue means is identified. Fire protection will have to be ensured with less use of large quantities of water. Alternative systems as well as extended use of passive means are discussed. Outdoor operations will have to be restricted to the minimum and the impact on equipment and system design is addressed. A short review of Rules and Regulations is included.

Inoue, K., M. Yamamoto, et al. (2005). Design of Search Balls with Wide Field of View for Searching inside of Rubble, Kobe, Japan, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Summary: "Search balls" are small sensor units for searching inside of rubble. A search ball is not equipped with locomotion mechanisms but contains some sensors for searching disaster victims and a radio transceiver. Many balls are thrown into rubble and fall down while repeating collision; they are scattered inside the rubble. The sensor information from the balls is transmitted on radio out of the rubble and monitored at safe area by rescuers. Thus search balls allow rapid and wide-area search inside rubble. Two types of search balls with wide field of view are developed: one type has three fixed wireless cameras, and the other has two wireless cameras rotated by a motor. Both types have infrared LEDs for illumination, a radio receiver for communication with monitoring computers, batteries and electronic circuit; these components are packed into sphere impact-resistant outer shells. Impact-resistance of the balls is tested by drop experiment on wooden floors. It is experimentally checked using a model of rubble that the monitoring computer can send commands to the ball inside this rubble and the ball can transmit the video signal of its cameras out. We also check if humans can be found in the camera images sent from the ball in darkness. © 2005 IEEE.

International Maritime Organization (2007). Gmdss Manual : Manual on the Global Maritime Distress and Safety System. London, IMO.

Summary: The entry into force and implementation of the global maritime distress and safety system (GMDSS) between 1992 and 1999 was the most far-reaching development in maritime emergency assistance since the invention of the radio. The GMDSS Manual presents the principles on which the GMDSS is based, the requirements for its implementation, the standards to be met by GMDSS equipment, and the method of operation of the various radio services which make up the GMDSS. The manual is divided into eight sections and several substantial annexes: Part 1 introduces the background to the GMDSS, including its history and development. Part 2 describes the basic functions of the GMDSS. Part 3 outlines the various communications systems within the GMDSS. Part 4 lays down requirements for the carriage of GMDSS equipment. Part 5 describes the method of operation of the various radio services within the GMDSS. Part 6 focuses on the shore-based side of the GMDSS. Part 7 presents the Master Plan for the GMDSS. Part 8 offers guidance on maintenance of equipment. The annexes give comprehensive information on all aspects of the GMDSS, including primary texts such as: relevant texts of the 1974 SOLAS Convention relevant to the GMDSS, relevant IMO Assembly resolutions, MSC and COM circulars, articles of the Radio Regulations, resolutions of WARC and WARC-Mob-87 conferences, IMO performance standards and related ITU-R recommendations, and the Master Plan for the GMDSS.--Publisher's description.

Kincaid, J. P., J. Donovan, et al. (2003). "Simulation Techniques for Training Emergency Response [1]." International Journal of Emergency Management **1**(3): 238-246.

Summary: The Institute for Simulation and Training (IST), University of Central Florida, in conjunction with the US Army and the Orange County (Florida) Fire Rescue Department have developed and fielded a series of simulation techniques for conducting disaster exercises and training public safety personnel to respond to disasters. Simulator training offers several important advantages, including cost and safety. We are also gathering persuasive evidence that training effectiveness is substantially improved by the use of simulation as compared with traditional field exercises. Our program is now in its seventh year and has concentrated on training for two main skill domains: emergency management incident command, and emergency medical care performed in the field. We provide a programmatic overview, including descriptions and illustrations of the following projects: Project Plowshares, sponsored by the US Army, involved conversion of a war game simulation to support civilian emergency management exercises. The Combat Trauma Patient Simulator, a project funded by the US Army and the manufacturer (METI), uses a highly realistic medical simulator connected to the internet to model treatment of battlefield casualties. Crisis management field exercises have been supported by the use of simulation techniques and technology, in conjunction with the US and Swedish military and local public safety agencies, particularly the Orange County Fire Rescue Department.

King, R. L. and M. L. Bowser (1976). "Borehole Instrumentation for Emergency Mine Rescue Operations." Technical Progress Report - United States, Bureau of Mines(99): 14.

Summary: The Bureau of Mines has developed probes to be used in emergency mine rescue operations by being lowered through a borehole drilled into an underground mine. Various probes can provide two-way voice communication with trapped miners, continuous mine atmosphere monitoring, temperature indication, and television searching capability. At present, an infrared imaging probe is being developed for left double quote seeing right double quote through coal smoke.

Knapp, J. (2004). "Unusual Rescue Requires Unusual Solution." Fire Engineering **157**(9): 69-72.

Summary: The development of new recycling machine and its use in fire protection is discussed. The machine is typical customer use machine and can be find in any supermarket recycling center. This particular model represents about 50 percent of all can recycling machines in the northeastern United States other models are significantly different in design. The new recycling machines are much more heavily designed because of the tight spaces and the design of the machine.

Kral, S. (2002). "Teamwork, Technology Key in Rescuing Coal Miners." Mining Engineering **54**(9): 33-35.

Summary: The dramatic rescue of nine Pennsylvania coal miners trapped nearly 90 m (300 ft) underground for 77 hours probably would not have happened without the high technology equipment and improved mine rescue training techniques available today. By now, most everyone has heard the story of the accident that occurred at the Quecreek Mine near Somerset, PA. At about 9 pm on Wednesday, July 24, the miners were drilling coal in the room-and-pillar mine. Their drilling accidentally punched through to the adjacent, abandoned Saxman Mine. Old mine maps of the Saxman Mine led Black Wolf Coal, Quecreek's owners, to believe they were between 60 to 90 m (200 to 300 m) away from the abandoned mine. Those maps proved to be inaccurate.

Kubicki, D. J. (1981). "Fire Protection and Rescue Planning for the Nasa Space Shuttle." Fire Journal (Boston) **75**(4): 34-40.

Summary: This article gives an overview of the planning, identifies and explains specific fire protection features and systems, and relates general fire proection engineering concepts to the firesafety strategies of the space program.

Li, F., P. Han, et al. (2007). A Wireless Localization Method Used in Coal Mine, Harbin, China, Institute of Electrical and Electronics Engineers Computer Society, Piscataway, NJ 08855-1331, United States.

Summary: The working condition in coal mine is atrocious, once miners are stranded in coal mine when accident happened, how to find the location of the miners rapidly is the crux of rescue. This paper puts forward a wireless localization method used in coal mine which aims at the actual condition of coal mine, uses beacons and object nodes, measures the distance with the method of RF propagating time, with the precondition of comparing and analyzing the existing classic algorithm of measuring distance and localization. It discusses various factors that influence the precision of measuring distance and localization, calculates and provides the value of precision of measuring distance and localization based on node hardware.

Liu, C., Y. Ai, et al. (2002). "The Technique Key and Realization of Fault Blocking of Mine Explosion-Proof Magnetic Starter." Proceedings in Mining Science and Safety Technology: 672-674.

Summary: Only electric-leakage blocking, generally, is set in the fault blocking mine explosion-proof magnetic starter. That is not perfect. For this reason, short circuit blocking and open-phase blocking are added in the fault blocking and the method of accomplishment and its technique key are described in detail in this paper.

Liu, H. and D. Yang (2004). Gis-Based Mine Ventilation Network and Safety Analysis, Anchorage, AK, United States, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ 08855-1331, United States.

Summary: The paper constructed the mine ventilation network model using the powerful function of attributes management, display visually and spatial analysis of GIS based on the character study of GIS and mine ventilation network. The mine ventilation network model we put forward in this paper is a COM-based extension of the Geo-network of Arclnfo. In mine ventilation network model, specified result can be obtained by defining weigh values for attribute fields as the constraint condition. It is of great importance for mines to determine the best rescue and leaving route by mine ventilation network route analysis, node analysis and loop analysis when mine accident happens. By the mine ventilation network model we put forward in this paper, the best rescue and leaving route can be implemented in a short time. The research achievement is used successfully in ShiGejie mine, Shanxi Province of China. The application result shows the feasibility of the study achievement.

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin. Copyright 2006, Society of Petroleum Engineers.

Mehrotra, S., C. Butts, et al. (2004). "Project Rescue: Challenges in Responding to the Unexpected." Proceedings of SPIE **5304**: 179-192.

Summary: n/a

Mishima, D., T. Aoki, et al. (2006). "Development of a Pneumatically Controlled Expandable Arm for Rescue Searches in Tight Spaces." International Journal of Robotics Research **25**(1): 103-110.

Summary: There is a strong demand for efficient rescue techniques and devices in preparation for large-scale earthquakes. In this study we aim to develop a robot that focuses on the efficient search for survivors. We think that efficient rescue operation is achieved when many people can work using the rescue tools at the same time. Therefore, we believe that rescue tools are more important than expensive and specialized robots. In this paper we report on the pneumatic-drive expandable arm "Slime Scope", which has a search device, such as a CCD camera, at the end of the pneumatically controlled expandable arm. This can drive stably in environments that have much debris, no electric power, and no wireless communication. © 2006 SAGE Publications.

Modroo, J. J., G. R. Olhoeft, et al. (2004). Ground Penetrating Radar Location of Buried Avalanche Victims, Colorado School of Mines, 2004.**:** x, 62 leaves.

Summary: n/a

Murphy, R., J. Casper, et al. (2000). "Assessment of the Nist Standard Test Bed for Urban Search and Rescue." NIST Workshop on Performance Metrics for Intelligent Systems: 14-16.

Summary: The USF team in the 2000 AAAI Mobile Robot Competition had the most extensive experience with the NIST Standard Test Bed for USAR. Based on those experiences, the team reports on the utility of the test bed, and makes over 20 specific recommendations on both scoring competitions and on future improvements to the test bed.

Naum, C. J. (2002). Basic Rescue Skills. Ottawa, Public Safety and Emergency Preparedness Canada.

Summary: n/a

Operation Respond (2004). Oreis 6.0 Operation Respond Emergency Information System. Washington, D.C., Operation Respond Institute**:** 1 CD-ROM.

Summary: OREIS [TM] is a software tool that provides on-scene fire, police and EMS responders with vital information for dealing with rescue, response and counter-terrorism operations on or around railroads and highways, including those involving hazardous materials. OREIS [TM] connects first responders to the databases of participating railroad and trucking companies to provide hazardous materials content information for tank cars, trailers and containers that have been involved in an incident or accident. The connection is established through the Internet and supplies emergency information and guidance in a real-time environment. The system will identify dangerous goods contents of an affected railcar or tank truck, and provide advice for handling that substance.

Pasche, A., B. Holand, et al. (1991). Emergency Systems for Divers, Hague, Neth, Publ by Soc of Petroleum Engineers of AIME, Richardson, TX, USA.

Summary: Accidents during operational diving have on some occasions resulted in situations where the divers have been left in the diving bell or welding habitat at the sea bottom for several hours. In some of these situations, there have been casualties due to hypothermia. As a result, the diving industry and authorities have required that emergency equipment be developed and installed in the diving systems. The early emergency systems consisted of passive insulation systems and a lung powered CO2-scrubber/respiratory heat exchanger. From tests as well as actual emergency situations, it has been pointed out that certain improvements are required. The systems should include some means of preventing urine-wetting of the insulation system. In addition, the divers are reluctant to undress their regular diving suit as they are concerned that they would later be unable to put it on again during the rescue operation. The aim of the reported project has been to develop and test a new emergency system. New elements are a urine collection system and an evacuation system which could be used as a hot water suit and prevent the necessity of changing suits. The evacuation suit was tested during a simulated dive to 450 metres and fulfilled the requirements for prevention of cold water shock. The passive insulation system and the lung powered CO2-scrubber/rebreather have further been improved ergonomically and with regards to thermal properties.

Pate-Cornell, M. E. (1995). "Managing Fire Risk Onboard Offshore Platforms: Lessons from Piper Alpha and Probabilistic Assessment of Risk Reduction Measures." Fire Technology **31**(2): p. 99-119.

Summary: n/a

Pritchard, C. J. and D. R. Malicoat (1993). Mine Emergency Planning Aspects of Underground Barricade Chambers, Salt Lake City, UT, USA, Publ by SME, Littleton, CO, USA.

Summary: Tg Soda Ash operates an underground trona mine located in southwestern Wyoming, which utilizes continuous mining machinery to produce 2.0M tpy (2.2M stpy) by shortwall and room land pillar methods. As the mine developed, the increasing distance from the shafts caused travel times to be a significant factor in planning of mine emergencies. It was decided to construct a barricade chamber, a modified refuge chamber, to increase safety and to provide an additional escape option in the case of a mine frequency. Fortunately, there has been no need to use these facilities during the last 9 years, but mine emergency planning has been greatly improved.

Pu, S. and S. Zlatanova (2005). Evacuation Route Calculation of Inner Buildings. Geo-Information for Disaster Management**:** 1143-1161.

Summary: Disastrous accidents (fire, chemical releases, earthquake, terrorist attacks, etc) in large public and residential buildings (discotheques, cafes, trade and industrial buildings) usually result in tragic consequences for people and environments. Such accidents have clearly showed that need for reliable systems supporting rescue operations is urgently appealing. Amongst all, giving appropriate information to the ordinary people in/around the affected area considering the disaster developments (available exists, assessable corridors, etc.) and the human factors (age, gender, disability) are of critical importance for the success of the rescue operation.

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Summary: Written by veteran rescuer Chase Sargent, this book is a comprehensive, single-source guide to such subject areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation, retrieval systems, backup teams, and operational procedures. Effective methods of training and regulations governing operations in confined spaces also are discussed at length.

Sharpe, J. (2006). "Rushing Down the Wrong Road." Rock Products **109**(4): 14.

Summary: Lawmakers such as West Virginia Gov. Joe Manchin III(D) has made regulatory requirements for coal mines, giving the mining companies just 90 days to come into compliance. Influenced by the tragedies at Sago and Alma, initial efforts are focused on communication systems, trackers, rescue chambers, self-contained self-rescuers, and rescue teams. One of MSHA's research priorities is developing an analytical method to distinguish deadly asbestos fibers from their non-asbestos counterparts. The agency also wants to rekindle an effort to examine technologies for minimizing blind spots on mobile vehicles.

Shetty, N. K., D. M. Deaves, et al. (1996). Unified Methodology for Fire Safety Assessment and Optimal Design, Florence, Italy, ASME, New York, NY, USA.

Summary: The paper presents a unified, fully-probabilistic approach to fire safety assessment and optimal design of fire protection on offshore topside structures. The methodology has been developed by integrating Quantitative Risk Analysis (QRA) techniques with the modern methods of Structural System Reliability Analysis (SRA) and Reliability Based Design Optimisation (RBDO). The integration has been achieved by using platform-specific 'extended' event-trees which model in detail the escalation paths leading to the failure of Temporary Refuge (TR), Escape, Evacuation and Rescue (EER) systems or structural collapse of the topside. Probabilities of events for which historical data are not generally available are calculated using structural reliability methods. The optimisation of fire protection is performed such that the total expected cost of the protection system and the cost of failure of the platform (loss of life, loss of asset, environmental damage) is minimised while satisfying reliability constraints.

Shimshoni, J. (2005). "Evacuating High-Rise Buildings." Standardization News **33**(3): 22-25.

Summary: The problems related with the evacuation from high-rise building during fire accident and various ways to evacuate people are discussed. The challenge is to devise and design the most creative and effective solution and method, and to ensure their effectiveness and reasonable safety through world-class standard. Systems for external evacuation from high-rise building provide an alternate escape route and additional evacuation capacity. Such type of technologies include suspended rescue platform system, controlled descent device and escape chute. Suspended rescue platform system is defined as an enclosed platform (cabin) or set of enclosed platforms moving along guides on the exterior of a building.

Singer, E. (2004). "Send in the Rescue Rats." New Scientist **183**(2466): 21.

Summary: The use of rats equipped with radios that transmit their brainwaves in locating earthquake survivors buried in the wreckage of collapsed buildings is discussed. Rats have an exquisitely sensitive sense of smell and can crawl just about anywhere. Each rat has electrodes implanted in three areas of the brain, the olfactory cortex, motor cortex, and the reward centre, which are permanently implanted in the brain and can give accurate signals for up to nine months. Signals from the rat's brain will be relayed to a radio transmitter pack strapped to the animal's back, which is still in the development process. Rescuers will be able to follow the rat's position by tracking these signals.

Thorne, R. (1996). "Reducing Rock Falls During Mine Rescue." Mining Engineering (Littleton, Colorado) **48**(12): 15-18.

Summary: The rock strata in open pits has usually been disturbed by mechanical means and explosives. This is why benching is mandated for worker safety in this environment. Rock continually falls due to the unstable nature of the geology in the mine. This paper presents some techniques that can minimize the potential for rescue-party-induced rock fall. They are the rescue setup location, the steep-angle rescue technique and the use of high directionals. Each requires proper training and repeated practice in advance of the actual rescue. Attempting any of these procedures without first learning the forces involved can lead to serious injury or death.

Thorvald, S. (1996). Building Collapse Rescue Engineering, Washington, DC, USA.

Summary: The increasing involvement of engineers in building collapses has led to the development of a new field of expertise called rescue engineering. Rescue engineering is aimed at training engineers for building collapse situations and state-of-the-art hazard mitigation techniques so they may ensure that rescue operations proceed as safely as possible. Rescue engineers provide rescue crews with essential information regarding the structural integrity of the remaining structure, the likelihood of further collapse and the removal of the rubble.

Timko, R. J. and R. L. Derick (1988). Determining the Integrity of Escapeways During a Simulated Fire in an Underground Coal Mine, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Summary: The Bureau of Mines evaluated the integrity of escapeways in a three entry underground coal mine. A center conveyor belt entry (secondary escapeway), was flanked by an intake (primary escapeway) and a return entry. Diesel equipment was used throughout the mine for material and personnel haulage. A carbon monoxide monitoring system, tied to a data recording computer on the surface, was deployed throughout the belt entry and at selected sites in the intake and return entries. Previously, the company had a fire of unknown origin in another mine, which prompted an interest in the performance of their escapeways. An initial qualitative evaluation was performed by burning approximately 14 kg of coal at the mouth of the intake entry. The first test was followed by a similar burn at the mouth of the belt entry. These initial trials showed a high quantity of leakage between entries. In several follow-up evaluations, simulated fires, using a tracer gas, were set in the intake and belt entries. The results of tests showed that permanent stoppings could not guarantee isolated, contaminant-free escapeways.

Tzeng, G.-H. and Y.-W. Chen (1999). "Optimal Location of Airport Fire Stations: A Fuzzy Multi-Objective Programming and Revised Genetic Algorithm Approach." Transportation Planning and Technology **23**(1): 37-55.

Summary: As the global aviation business expands rapidly, issues of aviation safety become correspondingly important. In turn, aviation safety should be more emphasized. The crashes of China Airlines planes at Nagoya (Japan) international airport in 1994, and near Taipei's international airport in 1998, caused airport authorities around the world to pay closer attention to rescue and fire-protection plans at their airports. Our research reveals that the location and number of fire stations at an international airport is an important factor in its fire protection capability. However, if the sites of the fire stations are not appropriately planned and located, fire engines and crews cannot arrive at the accident area in a timely manner. Similarly, if the number of fire stations at an airport is not sufficient, fires caused by aircraft accidents may take longer to be extinguished, resulting in more injuries and fatalities. Therefore, a location model based on a fuzzy multi-objective approach is proposed in this paper. This model can help in determining the optimal number and sites of fire stations at an international airport, and can also assist the relevant authorities in drawing up optimal locations for fire stations. Finally, because of the combinatorial complexity of our model, a genetic algorithm (GA) is employed and compared with the enumeration method. The study results show that our revised GA is comparatively effective in resolution and that our model can be applied to the optimal location of other emergency facilities.

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

Wagner, M. J. (1999). "Smoke Location System Boosts Tunnel Rescue." Fire International **23**(September): 33-34

Summary: n/a

3.6 Training (43)

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary: n/a

Anon (2003). "Safety Guide Aims to Reduce Death Toll." Mining, Quarrying and Recycling **32**(1): 24.

Summary: The safety guidelines for the quarrying industry of Ireland to reduce the death toll are discussed. These guidelines covers the duties and responsibilities of quarry operators and contractors and outlines the contents of the safety statements. Vehicles, fixed plant, falls from a height and working at the quarry face have emerged as the main causes of fatal accidents.

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

Awad, S., S. Fagan, et al. (2005). "Bridging the Communication Gap in the Operating Room with Medical Team Training." The American Journal of Surgery **190**(5): 770-774.

Summary: n/a

Batley, L. (1998). "Canadian Training for Confined Spaces." Fire International(163).

Summary: To manage the risks associated with working in confined spaces, a Confined Space Hazard Assessment and Control Program should be developed and implemented. A Confined Space Hazard Assessment and Control Program, specific for the work being conducted, should be written for work in each and every confined space.

Boulougouris, E. K. and A. Papanikolaou (2002). Modeling and Simulation of the Evacuation Process of Passenger Ships. Proc. 10th Int. Congress of the International Maritime Association of the Mediterranean (IMAM 2002). Crete.

Summary: The need to safely evacuate within very short time a large number of people from a confined space, such as the superstructure of large passenger ships, is a difficult task of great practical interest, as documented in recent discussions at the Marine Safety Committee of the International Maritime Organisation (MSC-IMO).

This paper describes the methodology utilized by the code EVDEMON (EVacuation DEmonstration & MOdeliNg), currently under development at SDL-NTUA, for the simulation of the evacuation process onboard passenger ships and presents typical results of application to the evacuation of a modern Ro-Ro passenger ferry. The code is understood as a design tool assisting the designer in the early design stage as to the consideration of proper arrangements for enabling a timely and safe evacuation. The designer is asked to care of optimal measures in terms of internal arrangements to allow for the fast evacuation without bottlenecks, when the ship is in danger. Given the uncertainty of human behavior under stress and the restrictions of a possible mathematical modeling thereof, only multiple simulations of different evacuation scenarios may give the naval architect an indication about the potential outcome in such an event, so that bottlenecks can be identified and removed to the extent possible. At a later development stage, namely after the validation phase, simulation codes, like the presented one, might be used as evidence for the approval of evacuation plans by relevant authorities, as documented by MSC-IMO (MSC Circ. 909/ 1999).

Boyle, P. and E. J. Smith (2000). Emergency Planning Using the Hse's Evacuation, Escape and Rescue (Eer) Hazop Technique, Manchester, UK, Institute of Chemical Engineers, Rugby, Engl.

Summary: The Health and Safety Executive (HSE) commissioned the development of a technique (EER HAZOP) for analyzing Evacuation, Escape and Rescue from offshore installations. DNV has used this technique on several installations and considers the concept could be suitable for onshore process plant. For representative accident scenarios, each stage of emergency response is considered, e.g. detection, initial command and control of the emergency, evacuation (if required), etc. Guidewords are then used to analyze what can go wrong in each stage. The technique ensures that emergency response is analyzed in a structured manner and response arrangements are based on a documented, traceable process. With increased attention on emergency planning resulting from COMAH legislation, the use of such a systematic method would provide a valuable complement to emergency exercises for onshore facilities. The approach enables the specific features of the facility and its command structure to be assessed removing generic and possibly unrealistic assumptions.

Brake, R. (2000). "Integrated Strategy for Emergency Egress from an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **53**(2): 53-61.

Summary: The fact that major fires are rare events in underground metal mines means there is often little on-site experience in dealing with these situations. Elaborate strategies that rely on a high degree of training at all levels to be effective are likely to fail, especially with the trend in Australia towards smaller mines and `fly-in fly-out' operations. A robust strategy is required. The key items in such a strategy are: early detection and warning of personnel, personal belt-worn oxygen-generating self-rescuers, high integrity escape routes and self-contained refuge stations, simple procedures, reliable personnel `tagging' systems and sufficient, trained search and rescue and fire fighting personnel and equipment.

Carlisle, T. D., T. B. Kyte, et al. (2007). Rail Crew Resource Management (Crm): Survey of Teams in the Railroad Operating Environment and Identification of Available Crm Training Methods.

Summary: This report summarizes the work undertaken by the Texas Transportation Institute to document the common teams or crews that are present within the rail industry and to evaluate the existing crew resource management (CRM) training methods used in other industries for their applicability to those railroad teams. Several railroads were visited in order to identify railroad crews, and an extensive literature search was performed to classify the broad variety of CRM training methods available. Facilities of five different railroad types were visited to gain a cross-sectional picture of the teams in the rail industry. These railroads included an eastern Class I railroad, a western Class I railroad, a shortline railroad, an urban commuter railroad, and an inter-city passenger railroad. Methods of CRM training from the commercial airline industry, the military, the medical field, the offshore oil production industry, and the nuclear power industry as well as existing railroad CRM training courses were examined concerning their application to the existing teams found during the site visits. Recommendations regarding the appropriate training methods for each railroad team are then made.

Cooper, D. (2005). Fundamentals of Search and Rescue, Jones & Bartlett Publishers.

Summary: n/a

Cottam, H. a. S., Nigel. (1998). "Knowledge Acquisition for Search and Rescue Planning " International Journal of Human-Computer Studies **48**: 24.

Summary: n/a

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Summary: As South African mines penetrate greater depths and new mining methods are developed, Mines Rescue Services also have to adapt in order to render a professional, cost-effective fire fighting, rescue and recovery service to the South African mining industry. This overview will address the structure, training and equipment of Mines Rescue Services as well as fire statistics.

Drabek, T. E. (1981). Managing Multiorganizational Emergency Responses : Emergent Search and Rescue Networks in Natural Disaster and Remote Area Settings. Boulder, CO, Institute of Behavioral Science, University of Colorado.

Summary: n/a

Flin, R. (1995). "Crew Resource Management for Teams in the Offshore Oil Industry." Journal of European Industrial Training **19**(9): 23-27.

Summary: n/a

Fundemeyer, M. and J. Stoklossa (1985). "Preparing Mine Rescue Teams for Deployment under Tough Climatic Conditions." Glueckauf & Translation **121**(18): 417-420.

Summary: In 1986 the Central Mine Rescue Station of Bergbau-Forschung set up a climate test facility in which team members undergo exercises at dry-bulb temperatures of up to 50 degree C and relative humidities up to 70%. In addition to a 100 min standard exercise with a minus 10 min climatic part (t//t equals 40 degree C; t//f equals 31 degree C) other exercises from 15 to 75 min duration were organized with different clothing, including cooling clothing. Cooling vests can keep physiological indicators (heart rate and rectal temperature) lower with the same workload and at high climatic values, thereby extending deployment time.

Helmreich, R., A. Merritt, et al. (1999). "The Evolution of Crew Resource Management Training in Commercial Aviation." The International Journal of Aviation Psychology **9**(1): 19-32.

Summary: n/a

Hogan, J. (2003). "Is Your Fire Department Prepared for a Well Rescue?" Water Well Journal **57**(7): 54.

Summary: The importance of pre-rescue planning of fire departments in well rescue is discussed. The local fire departments must be aware of well drilling operations, so as to preplan for any emergencies. The fire departments generally do not have the required equipments, budgets and methodologies to prevent any accidents during the well drilling.

Kincaid, J. P., J. Donovan, et al. (2003). "Simulation Techniques for Training Emergency Response [1]." International Journal of Emergency Management **1**(3): 238-246.

Summary: The Institute for Simulation and Training (IST), University of Central Florida, in conjunction with the US Army and the Orange County (Florida) Fire Rescue Department have developed and fielded a series of simulation techniques for conducting disaster exercises and training public safety personnel to respond to disasters. Simulator training offers several important advantages, including cost and safety. We are also gathering persuasive evidence that training effectiveness is substantially improved by the use of simulation as compared with traditional field exercises. Our program is now in its seventh year and has concentrated on training for two main skill domains: emergency management incident command, and emergency medical care performed in the field. We provide a programmatic overview, including descriptions and illustrations of the following projects: Project Plowshares, sponsored by the US Army, involved conversion of a war game simulation to support civilian emergency management exercises. The Combat Trauma Patient Simulator, a project funded by the US Army and the manufacturer (METI), uses a highly realistic medical simulator connected to the internet to model treatment of battlefield casualties. Crisis management field exercises have been supported by the use of simulation techniques and technology, in conjunction with the US and Swedish military and local public safety agencies, particularly the Orange County Fire Rescue Department.

Moxie Media Emergency Platform, Rig and Vessel Abandonment. New Orleans, LA Moxie Media, Inc. n.d.

Summary: n/a

National Fire Protection Association (2008). NFPA 402: Guide for Aircraft Rescue and Fire Fighting Operations, 2008 Edition

Summary: n/a

Osuka, K., R. Murphy, et al. (2002). "Usar Competitions for Physically Situated Robots." Robotics & Automation Magazine, IEEE **9**(3): 26-33.

Summary: n/a

Requires, N. (2004). "The Complexity of Team Training: What We Have Learned from Aviation and Its Applications to Medicine." Quality and Safety in Health Care **13**(1): i72-i79.

Summary: n/a

Rhea, R. (1997). "Organizing and Training Special Rescue Teams." Fire Engineering **150**(3): 5.

Summary: Organizing effective training programs for rescue teams begins well before the first text is opened or the first lesson plan is developed. For end results favorable from the instructor's as well as the student's perspectives, planning must begin with the actual development of the team. The development issues from which the skeleton of a training program will evolve includes: (1) identifying rescue target hazards; (2) determining the need for a special team; (3) identifying response alternatives; and (4) selecting the mode of response.

Sargent, C. N. (1988). "Tunneling Tenets: Performing Underground Rescue Operations Safely " Firehouse **13**(March): 50-52.

Summary: n/a

Sniezek, J., D. Wilkins, et al. (2001). "Running Head: Advanced Training for Crisis Decision Making." Journal of Management Information Systems.

Summary: n/a

Suruda, A. J., T. A. Pettit, et al. (1994). "Deadly Rescue: The Confined Space Hazard." Journal of Hazardous Materials **36**(1): 45-53.

Summary: Rescue operations in confined spaces can expose the person(s) attempting rescue to hazardous atmospheres or to physical hazards such as engulfment, which are potentially fatal. Two sources of data in the United States on work-related fatalities - the National Institute for Occupational Safety and Health (NIOSH) National Traumatic Occupational Fatalities (NTOF) surveillance system and investigations performed under the NIOSH Fatality Assessment and Control Evaluation (FACE) program - were used to examine confined space-related deaths. For the years 1980 through 1988, there was an average of 89 work-related deaths in confined spaces per year, and approximately 23 (25.5%) of those who died were persons attempting rescue. Asphyxiation by atmospheric hazards was the primary cause of death of those persons attempting rescue. Those persons who were attempting rescue and who died were more likely to be co-workers than public safety or emergency medical service (EMS) personnel. Since rescue operations in confined spaces present unique hazards, proper training of personnel and the availability of specialized equipment are required to protect persons attempting rescue from injury and death. Safety supervisors and public safety and EMS personnel should be familiar with the recognition of confined space hazards and the use of appropriate rescue techniques.

Swanick, J. T. (2005). "How Fast Is Your Fast Team?" Fire Engineering **158**(3): 14-22.

Summary: The necessity of crew firefighters on-scene to immediately assist a firefighter who may be in distress during a fire hazard, to satisfy the two-in/two-out requirement, is discussed. These firefighters may be referred as FAST, a rapid intervention team (RIT), a rapid intervention crew (RIC) , or a Go Team. The FAST will be dispatched prior to the arrival of all units, responding and arriving on-scene early in the incident. The FAST firefighters should also be properly prepared to enter the structure and they should have personal protective equipment and a flshlight. The team should always retain two firefighters who will be immediately available to begin a rescue.

Trotman, B. (1996). "Change in Direction for the New South Wales' Mines Rescue Service." Mining Technology **78**(900): 221-222.

Summary: This paper will overview the formation of the Mines Rescue Service in New South Wales (NSW), its current role and capabilities, and strategies being developed to enhance its emergency response, mine rescue training, specialist safety and technical services to the Australian coal industry.

Tyson, A. and M. Loomis (2006). Climbing Self-Rescue : Improvising Solutions for Serious Situations. Seattle, Mountaineers Books.

Summary: Table of Contents available via http://www.loc.gov/catdir/toc/ecip064/2005035066.html

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U.S. House of Representatives (2002). *House Report 107-777: Maritime Transportation Security Act of 2002*. Sec. 109: Maritime Security Professional Training.

Summary: n/a

United States Bureau of Mines, Mountain Empire Community College / Division of Mining and Industrial Technology, et al. (1989). Carl T. Donaldson Exercise : Instructor's Copy. Lexington, Ky. / Big Stone Gap, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Division of Mining and Industrial Technology, Mountain Empire Community College.

Summary: n/a

United States Bureau of Mines, Southwest Virginia Community College / Miner Training Program, et al. (1989). Man in the Bin Exercise : Instructor's Copy. Lexington, Ky.; Richlands, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Miner Training Project, Southwest Virginia Community College.

Summary: n/a

United States Coast Guard (1977). Boat Crew Training Guide. Washington, DC, Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1979). Merchant Ship Search and Rescue Manual (Mersar). Washington, DC, Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1996). Auxiliary Specialty Course : Search and Rescue (Auxsar) : Instructor Guide. Washington, DC, U.S. Dept. of Transportation, U.S. Coast Guard.

Summary: n/a

United States Coast Guard and United States Coast Guard Auxiliary (1977). Basic Instructor : Cornerstone Training Course : Student Workbook. Washington, Dept. of Transportation, Coast Guard.

Summary: n/a

United States Dept. of the Air Force (1985). Search and Rescue : Survival Training. Washington, DC, Dept. of the Air Force.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2007). Hurricane Katrina : Urban Search and Rescue in a Catastrophe : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, Second Session, January 30, 2006. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Veasey, D. A. and Wiley InterScience (Online service) (2006). Confined Space Entry and Emergency Response. Hoboken, N.J., John Wiley & Sons**:** xxi, 486 p.

Summary: n/a

Virginia Dept. of Fire Programs (2003). Mayday, Firefighter Down! : Student Manual. Richmond, VA, Virginia Dept. of Fire Programs.

Summary: n/a

Whitby, C. (2004). "Basic Essentials of Rit." Fire Engineering **157**(2): 30-32.

Summary: The responsibilities of the rapid intervention team (RIT) also knowns as FAST (firefighter assistance and search team) and the type of training needed for each are discussed. The elimination or reduction of hazards that may trap a firefighter or hinder escape are studied. The personnel training in victim removal and rescue techniques is emphasized. The standard equipment assignment for each RIT/FAST member at a residential structure fire is also elaborated.

Wright, R. (2003). "A Rescuer's Guide to Rapid Confined-Space Entry." Advanced Rescue Technology **6**(2): 13+.

Summary: n/a

4.1 Language (8)

American National Standards Institute (ANSI). "Homeland Security Standards Database." Retrieved August 18, 2008, from http://www.hssd.us/.

Summary: This database provides one-stop access to standards critical to the jobs of first responders, code officials, and others charged with keeping America safe. This information can be accessed by browsing a provided DHS taxonomy, or by using a search box.

American National Standards Institute. and National Fire Protection Association. (1991). Manual for Aircraft Rescue and Fire Fighting Operations. Quincy, MA, National Fire Protection Association.

Summary: n/a

International Maritime Organization (2006). Sar Convention : International Convention on Maritime Search and Rescue, 1979 : As Amended by Resolution Msc.70(69) and Msc.155(78). London, International Maritime Organization.

Summary: The 1979 Convention, adopted at a Conference in Hamburg, was aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations.

Although the obligation of ships to go to the assistance of vessels in distress was enshrined both in tradition and in international treaties (such as the International Convention for the Safety of Life at Sea (SOLAS), 1974), there was, until the adoption of the SAR Convention, no international system covering search and rescue operations. In some areas there was a well-established organization able to provide assistance promptly and efficiently, in others there was nothing at all.

The technical requirements of the SAR Convention are contained in an Annex, which was divided into five Chapters. Parties to the Convention are required to ensure that arrangements are made for the provision of adequate SAR services in their coastal waters.

Parties are encouraged to enter into SAR agreements with neighbouring States involving the establishment of SAR regions, the pooling of facilities, establishment of common procedures, training and liaison visits. The Convention states that Parties should take measures to expedite entry into its territorial waters of rescue units from other Parties.

The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue co-ordination centres and subcentres. It outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. This includes the designation of an on-scene commander and his duties.

Parties to the Convention are required to establish ship reporting systems, under which ships report their position to a coast radio station. This enables the interval between the loss of contact with a vessel and the initiation of search operations to be reduced. It also helps to permit the rapid determination of vessels which may be called upon to provide assistance including medical help when required.

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary: Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

Rekus, J. (Mar. 1996). "Confined Space Rescue Planning." Occupational Hazards.

Summary: This handbook provides the practitioner with recommended procedures and guidance for safe entry into confined spaces. It reviews selected case histories of confined space accidents and uses more than 100 line drawings and more than 150 photographs in describing hazards and accidents, and discusses how they could have been prevented by a confined space entry program. It outlines the requriements of the OSHA permit-entry confined space standard and provides detailed explanations of requirements for air sampling, ventilation, lockout/tagout emergency planning, and employee training.

U.S. Department of Labor (1999). Permit-Required Confined Spaces. Standard 1910.146.

Summary: OSHA Standard

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Summary: n/a

4.2 Practices (39)

Agencies, F. "Working in Confined Spaces." National Aeronautics and Space Administration.

Summary: n/a

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary: n/a

American National Standards Institute (ANSI). "Homeland Security Standards Database." Retrieved August 18, 2008, from http://www.hssd.us/.

Summary: This database provides one-stop access to standards critical to the jobs of first responders, code officials, and others charged with keeping America safe. This information can be accessed by browsing a provided DHS taxonomy, or by using a search box.

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

Bea, K. and Library of Congress. Congressional Research Service. (2005). Urban Search and Rescue Task Forces Facts and Issues. Washington, D.C., Congressional Information Service, Library of Congress,.

Summary: n/a

Bercha, F. G., E. Radloff, et al. (2003). Development of Canadian Performance-Based Eer Standards, Honolulu, HI, United States, International Society of Offshore and Polar Engineers.

Summary: The Canadian government, through the federal Transportation Development Centre (TDC), in 1999 initiated a program to develop performance-based escape, evacuation, and rescue (EER) standards for offshore installations in Canadian waters. Performance-based standards (PBS) set expected activity, task, and process achievement levels and goals, rather than prescribing equipment quantities, types, dimensions, and other specifications. This paper describes the standards, their development program and the associated research projects needed to fill relevant data gaps.

Boer, L. and S. van Wijngaarden (2004). "Directional Sound Evacuation from Smoke-Filled Tunnels." Proceedings of the first International Symposium, Safe and Reliable Tunnels Innovative European Achievements: 4-6.

Summary: n/a

Collins, L. (2004). Technical Rescue Operations. Tulsa, Okla., PennWell Corp.

Summary: n/a

Crook, J. (1989). "The Aftermath of Piper Alpha." Fire Prevention(225): p. 28-32.

Summary: July 6, 1988, was the date of the offshore oil industry explosion which killed 167 people. This incident raised serious questions about oil platform safety. The author, a technical writer, looks at how the findings of the long running public inquiry have affected design and safety procedures.

Department of Homeland Security Science and Technology Directorate and National Institute of Standards and Technology (2005). Statement of Requirements for Urban Search and Rescue Robot Performance Standards. **Preliminary Report**.

Summary: n/a

Drabek, T. E. (1985). "Managing the Emergency Response." Public Administration Review **5**: 85-92.

Summary: The first few hours following any large-scale disaster present a complex array of organizational demands that constitute a unique managerial problem. As the disaster agent changes from tornado or hurricane to toxic chemical spill or terrorist threat so, too, does the set of responding organizations and the specific tasks they confront. Despite obvious differences in the demand structures generated by such large-scale emergencies, research studies completed during the last two decades have validated the utility of a generalized approach. Initially referred to as a dual-use orientation, the concept of Comprehensive Emergency Management (CEM)' has emerged as a partial response to a long-recognized need -improved hazard and disaster management, including emergency responses. "Fiscal year 1984 marks the initial implementation of the Integrated Emergency Management System (IEMS) at all levels of government nationwide." CEM is the long-term objective, IEMS is the current implementation strategy.

The thesis of this article is that efforts to promote IEMS, or any other disaster management tool, require explicit recognition of fundamental structural qualities that characterize emergency responses within American society. The presentation is divided into four sections: (1) the American scene; (2) who actually responds?; (3) strategies for enhancing intergovernmental coordination; and (4) implications for managing emergency responses.

Drangeid, S. O. (2003). "Will Stricter Regulations Improve Disaster Management? A Discussion of the Norwegian Petroleum Directorate's Experience with the Use of Functional Legal Requirements." International Journal of Emergency Management **1**(2): p. 268-277.

Summary: n/a

Fermaud, C., E. Maerki, et al. (1997). "Rendering the Swiss Railway Alptransit Safe." Tunnelling and Underground Space Technology **12**(3): 369-375.

Summary: The safe operation of AlpTransit, a part of the planned European high-speed railway network, is a consequence of influencing factors related to construction, railway technology, and rolling stock. On the human side, operational and organizational guidelines concerning rescue measures and the adequate behaviour of people involved are equally important. The safety concept described in the paper governs and coordinates the safety planning within the different special fields and problem areas.

Flin, R., P. O'Connor, et al. "Spe 46766 Crew Resource Management for Offshore Teams: Lessons from Aviation."

Summary: n/a

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Summary: n/a

Government Accountability Office (2008). Nrc's Oversight of Fire Protection at U. S. Commercial Nuclear Reactor Units Could Be Strengthened. Washington, DC, Government Accountability Office, . **GAO-08-747:** 43.

Summary: After a 1975 fire at the Browns Ferry nuclear plant in Alabama threatened the unit's ability to shut down safely, the Nuclear Regulatory Commission (NRC) issued prescriptive fire safety rules for commercial nuclear units. However, nuclear units with different designs and different ages have had difficulty meeting these rules and have sought exemptions to them. In 2004, NRC began to encourage the nation's 104 nuclear units to transition to a less prescriptive, risk-informed approach that will analyze the fire risks of individual nuclear units. GAO was asked to examine (1) the number and causes of fire incidents at nuclear units since 1995, (2) compliance with NRC fire safety regulations, and (3) the transition to the new approach. GAO visited 10 of the 65 nuclear sites nationwide, reviewed NRC reports and related documentation about fire events at nuclear units, and interviewed NRC and industry officials to examine compliance with existing fire protection rules and the transition to the new approach. [STAR#: 175225]

Hudson, S., J. C. Hempel, et al. (1988). Manual of U.S. Cave Rescue Techniques. Huntsville, Ala., National Cave Rescue Commission, National Speleological Society.

Summary: n/a

International Maritime Organization (2006). Sar Convention : International Convention on Maritime Search and Rescue, 1979 : As Amended by Resolution Msc.70(69) and Msc.155(78). London, International Maritime Organization.

Summary: The 1979 Convention, adopted at a Conference in Hamburg, was aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations.

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The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue co-ordination centres and subcentres. It outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. This includes the designation of an on-scene commander and his duties.

Parties to the Convention are required to establish ship reporting systems, under which ships report their position to a coast radio station. This enables the interval between the loss of contact with a vessel and the initiation of search operations to be reduced. It also helps to permit the rapid determination of vessels which may be called upon to provide assistance including medical help when required.

International Maritime Organization (2007). A Pocket Guide to Recovery Techniques. London, International Maritime Organization.

Summary: n/a

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary: Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

Jioras, R. J. (1991). Validation of Tunnel Rescue Incident Command System: A Case Study - Metro Rail Tunnel Fire, Los Angeles, Ca, July 13, 1990. Emmitsburg, MD, National Fire Academy.

Summary: In 1981, the City of Los Angeles began design of a transit system to address traffic congestion. For 50 years, all mass transit within the City traveled on the surface streets. The new design brought back travel in a subway system. For the Fire Department, a subway system presented emergency and firefighting problems not encountered for ½ a century. Waiting for such a project to become operational before becoming involved was courting disaster. By requiring Fire Department involvement from the design phase of the "Metro Rail" project, fire/life safety systems were designed into the project and operational procedures were developed. As design moved into construction, the Los Angeles Fire Department developed and trained on the "new" Tunnel Rescue I.C. System. Although the concept in practice, the system had never been validated at a real incident. On July 13, 1990, a fire occurred in a metro rail tunnel under construction. The incident allowed for the implementation of the tunnel rescue I.C.S. and as was an accurate test of the operational effectiveness and the resource needs of the system. The incident also was a testimony to the ability of the fire service to preplan for unique situations, as well as demonstrating the effectiveness of a flexible I.C.S. by integrating a situation specific sub-system. In addition to the operational aspects of the tunnel rescue I.C.S., this study demonstrates that the Fire Service must not allow technology to overcome it, but must constantly be moving into the future through planning, training and foresight.

McClung, C. (2002). "Tunnel Rescue - a Systematic Approach " Fire & Rescue(July): 29-31.

Summary: n/a

McCormack, J. and Fire Department Training Network (Firm) (2003). Firefighter Rescue & Rapid Intervention Teams : Saving One of Our Own. Indianapolis, IN, FD Training Network.

Summary: n/a

Mitropoulos, P., G. Howell, et al. (2003). "Workers at the Edge; Hazard Recognition and Action." 11th International Group for Lean Construction Conference.

Summary: n/a

National Transportation Safety Board (1996). Fire on Board the U. S. Modu Rowan Odessa, Gulf of Mexico, December 1, 1994. Washington, DC 5 p.

Summary: This brief report explains the accident that resulted when workers struck and ruptured a submerged natural gas pipeline while positioning a mobile offshore drilling unit, the ROWAN ODESSA, in the Gulf of Mexico. Escaping gas ignited, engulfing the drilling rig in flames. The rig manager remains missing and is presumed dead. Damages to the drilling unit and the pipeline were estimated at $13 million. As a result of its investigation of this accident, the Safety Board made one new safety recommendation and reiterated one safety recommendation to the U. S. Coast Guard.

Rekus, J. (Mar. 1996). "Confined Space Rescue Planning." Occupational Hazards.

Summary: This handbook provides the practitioner with recommended procedures and guidance for safe entry into confined spaces. It reviews selected case histories of confined space accidents and uses more than 100 line drawings and more than 150 photographs in describing hazards and accidents, and discusses how they could have been prevented by a confined space entry program. It outlines the requriements of the OSHA permit-entry confined space standard and provides detailed explanations of requirements for air sampling, ventilation, lockout/tagout emergency planning, and employee training.

Rixner, J. (2003). "Basement Fire Reinforces Basics." Fire Engineering **156**(6): 97-100.

Summary: On December 7, 2002, A three-alarm building fire in Richmond, Virginia, reinforced basic firefighting lessons for seasoned veterans and taught new firefighters lessons in courage and endurance. At 0422 hours, a caller reported trashcans on fire at the rear of the building at 320 West Grace Street and fire extending into the basement. The alarm was transmitted at 0422.51 hours, sending Quint Companies 6,5,12,1,18; Rescue Company 2; and Battalion Fire Chief 1. The lessons learned from the operations includes: trash fires next to buildings sometimes set the building on fire, rescue companies and other support apparatus must be careful not to block the street in front of the fire building and check pipe chases and shafts with thermal imaging cameras.

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Summary: Written by veteran rescuer Chase Sargent, this book is a comprehensive, single-source guide to such subject areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation, retrieval systems, backup teams, and operational procedures. Effective methods of training and regulations governing operations in confined spaces also are discussed at length.

Schaefer, B. (2003). "Developing Standard Operating Guidelines." Fire Engineering **156**(10): 24-32.

Summary: A discussion on developing standard operating guidelines (SOG) for the rapid intervention team (RIT) is presented. The ultimate goal is to develop a guideline that will work for all departments in the county. It is reported that the purpose of the RIT is to provide rapid rescue for structural firefighting crews operating at an emergency scene.

Shaluf, I. M. and F. l.-R. Ahamadun (2008). "An Overview on the Offshore Emergency Response Planning in Malaysia." Disaster Prevention and Management **17**(1): p. 83-93.

Summary: n/a

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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U.S. Department of Labor (1999). Permit-Required Confined Spaces. Standard 1910.146.

Summary: OSHA Standard

United States Congress. House. Committee on Homeland Security. Subcommittee on Emergency Preparedness Science and Technology. (2007). Incident Command, Control, and Communications During Catastrophic Events. Committee on Homeland Security, Subcommittee on Emergency Preparedness Science and Technology. Washington, U.S. G.P.O.**:** iii, 49 p.

Summary: n/a

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Summary: n/a

United States Joint Chiefs of Staff. Special Operations Review Group (1980). Rescue Mission Report. Washington, D.C., Joint Chiefs of Staff**:** vi, 78 leaves.

Summary: n/a

United States. Congress. House. Committee on Transportation and Infrastructure. Subcommittee on Coast Guard and Maritime Transportation. (2000). Coast Guard's Search and Rescue Mission : Hearing before the Subcommittee on Coast Guard and Maritime Transportation of the Committee on Transportation and Infrastructure, House of Representatives, One Hundred Sixth Congress, First Session, November 3, 1999. Washington, U.S. G.P.O. : [U.S. G.P.O., Supt. of Docs., Congressional Sales Office, distributor].

Summary: n/a

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Summary: n/a

Vogel, M. and H. P. Rast (2000). "Alptransit-Safety in Construction as a Challenge: Health and Safety Aspects in Very Deep Tunnel Construction." Tunnelling and Underground Space Technology **15**(4): 481-484.

Summary: After a brief presentation of the AlpTransit projects (Gotthard and Lotschberg base tunnels) special aspects of safety and health protection are discussed: access via deep shafts, rock pressure, ingress of water and mud, ventilation, cooling, fire protection, escape routes and rescue. Medical aspects of climate and ventilation are discussed as dust and diesel soot emissions, blast fumes and hazards resulting from the shotcreting process. The preparation of safety concepts and comments on the planning and drawing up of safety measures are presented. © 2001 South African Institute of Mining and Metallurgy. Published by Elsevier Science Ltd. All rights reserved.

4.3 Symbols (7)

American National Standards Institute (ANSI). "Homeland Security Standards Database." Retrieved August 18, 2008, from http://www.hssd.us/.

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American National Standards Institute. and National Fire Protection Association. (1991). Manual for Aircraft Rescue and Fire Fighting Operations. Quincy, MA, National Fire Protection Association.

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Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary: Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

U.S. Department of Labor (1999). Permit-Required Confined Spaces. Standard 1910.146.

Summary: OSHA Standard

United States Fire Administration and Federal Emergency Management Agency (1999). Personnel Accountability System Technology Assessment. Immitsburg, Md.

Summary: n/a

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Summary: n/a

4.4 Training Standards (37)

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary *n/a*

American National Standards Institute (ANSI). "Homeland Security Standards Database." Retrieved August 18, 2008, from http://www.hssd.us/.

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American National Standards Institute. and National Fire Protection Association. (1991). Manual for Aircraft Rescue and Fire Fighting Operations. Quincy, MA, National Fire Protection Association.

Summary *n/a*

Anon (2000). "Mine Health and Safety Council Award Scheme - Recognising High Standards of Health and Safety." Journal of the Mine Ventilation Society of South Africa **53**(4): 165-166.

Summary The Mine Health and Safety Council (MHSC) award scheme heralds a new era in the South African mining history. The main aim of the new system is to provide recognition for significant achievements made in mine health and safety. A tripartite working group, which includes representatives from government, industry and labor, identified all the awards in the new scheme.

Batley, L. (1998). "Canadian Training for Confined Spaces." Fire International(163).

Summary To manage the risks associated with working in confined spaces, a Confined Space Hazard Assessment and Control Program should be developed and implemented. A Confined Space Hazard Assessment and Control Program, specific for the work being conducted, should be written for work in each and every confined space.

Boyle, P. and E. J. Smith (2000). Emergency Planning Using the Hse's Evacuation, Escape and Rescue (Eer) Hazop Technique, Manchester, UK, Institute of Chemical Engineers, Rugby, Engl.

Summary The Health and Safety Executive (HSE) commissioned the development of a technique (EER HAZOP) for analyzing Evacuation, Escape and Rescue from offshore installations. DNV has used this technique on several installations and considers the concept could be suitable for onshore process plant. For representative accident scenarios, each stage of emergency response is considered, e.g. detection, initial command and control of the emergency, evacuation (if required), etc. Guidewords are then used to analyze what can go wrong in each stage. The technique ensures that emergency response is analyzed in a structured manner and response arrangements are based on a documented, traceable process. With increased attention on emergency planning resulting from COMAH legislation, the use of such a systematic method would provide a valuable complement to emergency exercises for onshore facilities. The approach enables the specific features of the facility and its command structure to be assessed removing generic and possibly unrealistic assumptions.

Collins, L. (2004). Technical Rescue Operations. Tulsa, Okla., PennWell Corp.

Summary n/a

Eady, M. (2006). "The Rescue Technician and NFPA Standards." Fire Engineering **159**(9): 87-92.

Summary Rescue technician plays a very important role in technical rescue, which is a high-risk and a low-frequency occurrence in the rescue industry. The National Fire Protection Association (NFPA) offers three standards that apply directly to technical rescue operations. NFPA 1670 standard is on operations and training for technical search and rescue incidents, which identifies and establishes levels of functional capability for conducting operations at technical search and rescue incidents while minimizing threats to rescuers. NFPA 1006 addresses standards for rescue technician professional qualification and establishes the minimum job performance requirements necessary for fire service and other emergency response personnel. NFPA 1983 addresses standards for fire service life safety rope and equipment for emergency services. Each person involved with technical rescue should be able to identify the critical points of the NFPA rescue standards as it helps to do the best possible job.

FEMA (2000). Urban Search and Rescue (Us&R) Incident Support Team (Ist) Operations Manual. FEMA.

Summary *n/a*

Fermaud, C., E. Maerki, et al. (1997). "Rendering the Swiss Railway Alptransit Safe." Tunnelling and Underground Space Technology **12**(3): 369-375.

Summary The safe operation of AlpTransit, a part of the planned European high-speed railway network, is a consequence of influencing factors related to construction, railway technology, and rolling stock. On the human side, operational and organizational guidelines concerning rescue measures and the adequate behaviour of people involved are equally important. The safety concept described in the paper governs and coordinates the safety planning within the different special fields and problem areas.

Flin, R., P. O'Connor, et al. "Spe 46766 Crew Resource Management for Offshore Teams: Lessons from Aviation."

Summary *n/a*

Franseen, H. W. (1995). Hydropower Application of Confined Space Regulations, San Francisco, CA, USA, ASCE, New York, NY, USA.

Summary OSHA's `Permit Required Confined Space' rules, 1910.146, became effective April 15, 1993. Their rules define a `confined space' and `permit required confined space'; provide general requirements for those entering the confined space, for the attendant and entry supervisor; define what a confined space program and permit system should be; and describe training requirements and rescue considerations. Tapoco Inc., began preparing confined space procedures in 1992 using Alcoa Engineering Standards and OSHA's proposed rules. A joint union management team was formed, and this team began evaluating spaces which meet the confined space definition. In 1993, employees were trained, and all entries into spaces were done according to Alcoa's and OSHA's proposed rules. Rescue teams have been trained at each site. Some unique confined spaces and or unique entry conditions have been encountered which have required extensive evaluation.

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Summary n/a

Hudson, S., J. C. Hempel, et al. (1988). Manual of U.S. Cave Rescue Techniques. Huntsville, Ala., National Cave Rescue Commission, National Speleological Society.

Summary n/a

International Maritime Organization (2006). Sar Convention : International Convention on Maritime Search and Rescue, 1979 : As Amended by Resolution Msc.70(69) and Msc.155(78). London, International Maritime Organization.

Summary The 1979 Convention, adopted at a Conference in Hamburg, was aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations.

Although the obligation of ships to go to the assistance of vessels in distress was enshrined both in tradition and in international treaties (such as the International Convention for the Safety of Life at Sea (SOLAS), 1974), there was, until the adoption of the SAR Convention, no international system covering search and rescue operations. In some areas there was a well-established organization able to provide assistance promptly and efficiently, in others there was nothing at all.

The technical requirements of the SAR Convention are contained in an Annex, which was divided into five Chapters. Parties to the Convention are required to ensure that arrangements are made for the provision of adequate SAR services in their coastal waters.

Parties are encouraged to enter into SAR agreements with neighbouring States involving the establishment of SAR regions, the pooling of facilities, establishment of common procedures, training and liaison visits. The Convention states that Parties should take measures to expedite entry into its territorial waters of rescue units from other Parties.

The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue co-ordination centres and subcentres. It outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. This includes the designation of an on-scene commander and his duties.

Parties to the Convention are required to establish ship reporting systems, under which ships report their position to a coast radio station. This enables the interval between the loss of contact with a vessel and the initiation of search operations to be reduced. It also helps to permit the rapid determination of vessels which may be called upon to provide assistance including medical help when required.

International Maritime Organization and International Civil Aviation Organization (1998). International Aeronautical and Maritime Search and Rescue Manual. London, Montreal, Quebec, International Maritime Organization and International Civil Aviation Organization.

Summary *n/a*

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

Kovacs, T. (2002). "Model Triage and Dispatch Guidelines for Search and Rescue Coordinators and Communications Personnel." Risks in Mountain Rescue Operations. Mountain Rescue Association, ed. Poway, CA: 27–30.

Summary *n/a*

McClincy, W. D. (2002). Instructional Methods in Emergency Services. New Jersey, Prentice Hall.

Summary *n/a*

McCormack, J. and Fire Department Training Network (Firm) (2003). Firefighter Rescue & Rapid Intervention Teams : Saving One of Our Own. Indianapolis, IN, FD Training Network.

Summary *n/a*

Mills, S. (2003). "Trench Rescue: The Basics." Fire Engineering **156**(12): 78-81.

Summary The difficulties in trench rescue, not typical response for many fire departments, are discussed. The risk for emergency personnel responding to a trench accident is very high. The Occupational Safety and Health Administration (OSHA) specifies that employees working in excavations should be protected from potential cave-ins by a protective system. NFPA 1006, Standard for Rescue Technician Professional Qualifications, contains provisions for the rapid, nonentry rescue of victims. Rest and rehabilitation are essential for rescuers to reduce rescuer fatigue and prevent injuries in trench rescue operations. The incident management system and accountability system in the trench rescue operation will ensure the availability of sufficient personnel.

National Fire Protection Association (2003). NFPA 403: Standard for Aircraft Rescue and Fire Fighting Services at Airports.

Summary Document Scope: This standard contains the minimum requirements for aircraft rescue and fire-fighting (ARFF) services at airports. Requirements for other airport fire protection services are not covered in this document.

National Fire Protection Association (2003). NFPA 412: Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment.

Summary Document Scope: This standard establishes test procedures for evaluating the foam fire-fighting equipment installed on rescue and fire-fighting vehicles designed in accordance with the applicable portions of NFPA 414.

National Fire Protection Association (2004). NFPA 1670: Standard on Operations and Training for Technical Rescue Incidents.

Summary Document Scope: 1.1.1* This standard shall identify and establish levels of functional capability for conducting operations at technical search and rescue incidents while minimizing threats to rescuers. 1.1.2* The requirements of this standard shall apply to organizations that provide response to technical search and rescue incidents including those not regulated by governmental mandates.

National Fire Protection Association (2005). NFPA 1936: Standard on Powered Rescue Tools.

Summary Document Scope: 1-1.1 This standard shall specify the minimum requirements for the design, performance, testing, and certification of powered rescue tool systems and the individual components of spreaders, rams, cutters, combination tools, power units, and power transmission cables, conduit, or hose. 1-1.2 This standard shall apply to the design, manufacturing, and certification of newly manufactured powered rescue tool systems. 1-1.3 This standard shall not apply to manually powered tools and shall not apply to small multipurpose tools including, but not limited to, saws, drills, chisels, pry bars, shoring systems, and similar tools. 1-1.4 This standard shall not apply to powered rescue tool systems or rescue tools that are manufactured prior to the effective date of this standard or to powered rescue tool systems or rescue tools that are manufactured in accordance with other specifications or standards of other organizations. 1-1.5 The requirements of this standard shall not apply to accessories that might be attached to powered rescue tool systems unless such accessories are specifically addressed herein. 1-1.6 Nothing herein shall restrict any jurisdiction from specifying or shall restrict a manufacturer from producing powered rescue tool systems that exceed the minimum requirements of this standard.

National Fire Protection Association (2007). NFPA 414: Standard for Aircraft Rescue and Fire-Fighting Vehicles.

Summary Document Scope: 1.1 Scope. 1.1.1* This standard specifies the minimum design, performance, and acceptance criteria for aircraft rescue and firefighting (ARFF) vehicles intended to transport personnel and equipment to the scene of an aircraft emergency for the purpose of rescuing occupants and conducting rescue and firefighting operations. 1.1.2 Vehicles without wheels, such as track, amphibious, or air-cushion types, are not covered by this standard.

National Fire Protection Association (2007). NFPA 1951: Standard on Protective Ensembles for Technical Rescue Incidents.

Summary Document Scope: 1.1* Scope. 1.1.1 This standard shall specify the minimum design, performance, testing, and certification requirements for utility technical rescue, rescue and recovery technical rescue, and chemicals, biological agents, and radiological particulate [also known as chemical, biological, radiological, and nuclear (CBRN) technical rescue] protective ensembles for use by emergency services personnel during technical rescue incidents. 1.1.2 This standard shall also specify the minimum requirements for the various elements of the utility technical rescue ensembles and the rescue and recovery technical rescue protective ensembles, including garments, helmets, gloves, footwear, interface, and eye and face protection devices. 1.1.3* This standard shall also specify the minimum requirements for the respiratory protection for the CBRN technical rescue protective ensembles. 1.1.4 This standard shall not specify requirements for respiratory protection equipment for technical rescue utility and technical rescue and recovery protective ensembles; those requirements are specified by NIOSH in 42 CFR 84, and by OSHA in 29 CFR 1910.134. 1.1.5 This standard shall not establish criteria for water or wilderness operations. 1.1.6* This standard shall not specify requirements for any visibility markings. 1.1.7 This standard shall not establish criteria for protection from ionizing radiation. 1.1.8 This standard shall not establish criteria for protection for any fire-fighting operations or hazardous materials emergencies. 1.1.9* This standard shall not specify requirements for accessories that could be attached to any ensemble or ensemble element but are not required for the ensemble or element to meet the requirements of this standard. 1.1.10 Certification of technical rescue protective ensembles or ensemble elements to the requirements of this standard shall not preclude certification to additional applicable standards where the protective ensemble or ensemble elements meet all the applicable requirements of the other standards. 1.1.11 This standard shall not be construed as addressing all the safety concerns associated with the use of compliant protective ensembles or elements. It shall be the responsibility of the persons and organizations that use compliant protective ensembles or elements to establish safety and health practices and to determine the applicability of regulatory limitations prior to use. 1.1.12 This standard shall not be construed as addressing all the safety concerns, if any, associated with the use of this standard by testing facilities. It shall be the responsibility of the persons and organizations that use this standard to conduct testing of protective ensembles or elements to establish safety and health practices and to determine the applicability of regulatory limitations prior to using this standard for any designing, manufacturing, and testing. 1.1.13 Nothing herein shall restrict any jurisdiction or manufacturer from exceeding these minimum requirements.

National Fire Protection Association (2008). NFPA 402: Guide for Aircraft Rescue and Fire Fighting Operations, 2008 Edition

Summary *n/a*

Pg, T. (2006). "North Zone Training Manual Search and Rescue." Terminology.

Summary *n/a*

Rekus, J. (Mar. 1996). "Confined Space Rescue Planning." Occupational Hazards.

Summary This handbook provides the practitioner with recommended procedures and guidance for safe entry into confined spaces. It reviews selected case histories of confined space accidents and uses more than 100 line drawings and more than 150 photographs in describing hazards and accidents, and discusses how they could have been prevented by a confined space entry program. It outlines the requriements of the OSHA permit-entry confined space standard and provides detailed explanations of requirements for air sampling, ventilation, lockout/tagout emergency planning, and employee training.

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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Tyson, A. and M. Loomis (2006). Climbing Self-Rescue : Improvising Solutions for Serious Situations. Seattle, Mountaineers Books.

Summary Table of Contents available via http://www.loc.gov/catdir/toc/ecip064/2005035066.html

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U.S. Department of Labor (1999). Permit-Required Confined Spaces. Standard 1910.146.

Summary OSHA Standard

United States Bureau of Mines, Mountain Empire Community College / Division of Mining and Industrial Technology, et al. (1989). Carl T. Donaldson Exercise : Instructor's Copy. Lexington, Ky. / Big Stone Gap, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Division of Mining and Industrial Technology, Mountain Empire Community College.

Summary *n/a*

United States Bureau of Mines, Southwest Virginia Community College / Miner Training Program, et al. (1989). Man in the Bin Exercise : Instructor's Copy. Lexington, Ky.; Richlands, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Miner Training Project, Southwest Virginia Community College.

Summary *n/a*

United States Coast Guard (2002). U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (Nss) to the International Aeronautical and Maritime Search and Rescue Manual (Iamsar), U.S. Department of Transportation.

Summary *n/a*

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Summary *n/a*

5.1 Arctic (2)

Huse, J. R. (1995). Safety in Offshore Arctic Field Development, Copenhagen, Den, ASME, New York, NY, USA.

Summary: Operations in Arctic environment represents a challenge with regard to safety and do call for innovations and planning of safety from the initial phase of project development. The paper discusses safety aspects and their implications on the field design. The increased importance of maintaining the integrity of the installation and a safe refuge is discussed. A need for further developments of evacuation and rescue means is identified. Fire protection will have to be ensured with less use of large quantities of water. Alternative systems as well as extended use of passive means are discussed. Outdoor operations will have to be restricted to the minimum and the impact on equipment and system design is addressed. A short review of Rules and Regulations is included.

Selters, A. and NetLibrary Inc. (1999). Glacier Travel & Crevasse Rescue. Seattle, WA, The Mountaineers**:** 143 p.

Summary: n/a

5.2 Avalanche (3)

Ferguson, S. and E. LaChapelle (2003). The Abcs of Avalanche Safety, Mountaineers Books.

Summary: n/a

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Summary: On 23 May 1983, an avalanche occurred at the Revenue-Virginius Mine. Six mine personnel and two contract diamond drillers were trapped when the avalanche covered and blocked the portal, the only access into the mine. Fortunately, all eight persons were rescued. Surveying the damage, issues that have contributed to the disaster emerged. By blocking the snow slide chute, the snow weight was allowed to accumulate until the fences failed and it all came at once. If the snow would have been allowed to run in smaller amounts throughout the winter, no damage would have occurred. The original ventilation system was installed in line with the snow slide by people who were not aware of or did not recognize the hazard. If a detailed map with the individual sets mapped could have been used, it would have been easier to, quicker and safer to dig horizontally than vertically. All unused equipment or facilities should be removed or neutralized. Furthermore, vehicles should not be parked and personnel should bot be allowed to walk in zones of danger.

Modroo, J. J., G. R. Olhoeft, et al. (2004). Ground Penetrating Radar Location of Buried Avalanche Victims, Colorado School of Mines, 2004.**:** x, 62 leaves.

Summary: n/a

5.3 Aviation (19)

Agencies, F. "Working in Confined Spaces." National Aeronautics and Space Administration.

Summary: n/a

American National Standards Institute. and National Fire Protection Association. (1991). Manual for Aircraft Rescue and Fire Fighting Operations. Quincy, MA, National Fire Protection Association.

Summary: n/a

Cooper, G., M. White, et al. (1980). "Resource Management on the Flightdeck: Proceedings of a Nasa." Industry Workshop.

Summary: n/a

Covert, K. (2000). U.S. Air Force Special Forces : Pararescue. Mankato, Minn., Capstone Books.

Summary: An introduction to the United States Air Force pararescue units whose mission is to help Air Force members whose aircraft have crashed, including the development of the units and the equipment they use.

Flin, R., P. O'Connor, et al. "Spe 46766 Crew Resource Management for Offshore Teams: Lessons from Aviation."

Summary: n/a

Hall, L. (1982). "To Save the Pilot's Life--Soviet Air Rescue Service." Air University Review.

Summary: n/a

Helmreich, R., A. Merritt, et al. (1999). "The Evolution of Crew Resource Management Training in Commercial Aviation." The International Journal of Aviation Psychology **9**(1): 19-32.

Summary: n/a

International Maritime Organization and International Civil Aviation Organization (1998). International Aeronautical and Maritime Search and Rescue Manual. London, Montreal, Quebec, International Maritime Organization and International Civil Aviation Organization.

Summary: n/a

Lee, R. M. (1993). Death and Deliverance : The True Story of an Airplane Crash at the North Pole. Golden, Colo., Fulcrum Pub.

Summary: n/a

Marrett, G. J. (2003). Cheating Death : Combat Air Rescues in Vietnam and Laos. Washington, D.C., Smithsonian Books.

Summary: That was the pilots' creed. They flew low and slow, at treetop level, at night, in monsoons, and in point-blank range of enemy guns and missiles. They accepted missions no one else wanted, and they were the heroes other pilots prayed for when shot down. Flying the World War II–vintage Douglas A-1 Skyraider, a single-engine, propeller-driven relic in a war of "fast movers" -- that is, jets -- those intrepid Air Force pilots flew one of the most dangerous missions of the Vietnam War, helping rescue thousands of downed Air Force and Navy pilots.

With a flashback memory and a style all his own, former Air Force Captain George J. Marrett depicts some of the most compelling aerial combat of any war, rendering the people, places, and battles with a unique blend of warts-and-all clarity, heart-pounding passion, and mordant wit.

National Fire Protection Association (2008). NFPA 402: Guide for Aircraft Rescue and Fire Fighting Operations, 2008 Edition

Summary: n/a

Requires, N. (2004). "The Complexity of Team Training: What We Have Learned from Aviation and Its Applications to Medicine." Quality and Safety in Health Care **13**(1): i72-i79.

Summary: n/a

Tilford, E. H. (1992). Search and Rescue in Southeast Asia. [Washington, D.C.], Center for Air Force History.

Summary: n/a

Tzeng, G.-H. and Y.-W. Chen (1999). "Optimal Location of Airport Fire Stations: A Fuzzy Multi-Objective Programming and Revised Genetic Algorithm Approach." Transportation Planning and Technology **23**(1): 37-55.

Summary: As the global aviation business expands rapidly, issues of aviation safety become correspondingly important. In turn, aviation safety should be more emphasized. The crashes of China Airlines planes at Nagoya (Japan) international airport in 1994, and near Taipei's international airport in 1998, caused airport authorities around the world to pay closer attention to rescue and fire-protection plans at their airports. Our research reveals that the location and number of fire stations at an international airport is an important factor in its fire protection capability. However, if the sites of the fire stations are not appropriately planned and located, fire engines and crews cannot arrive at the accident area in a timely manner. Similarly, if the number of fire stations at an airport is not sufficient, fires caused by aircraft accidents may take longer to be extinguished, resulting in more injuries and fatalities. Therefore, a location model based on a fuzzy multi-objective approach is proposed in this paper. This model can help in determining the optimal number and sites of fire stations at an international airport, and can also assist the relevant authorities in drawing up optimal locations for fire stations. Finally, because of the combinatorial complexity of our model, a genetic algorithm (GA) is employed and compared with the enumeration method. The study results show that our revised GA is comparatively effective in resolution and that our model can be applied to the optimal location of other emergency facilities.

United States Dept. of the Air Force (1985). Search and Rescue : Survival Training. Washington, DC, Dept. of the Air Force.

Summary: n/a

United States National Transportation Safety Board (1981). Special Investigation Report : Search and Rescue Procedures and Arming of Emergency Locator Transmitter : Aircraft Accident near Michigan City, Indiana, December 7, 1980. Washington, DC, National Transportation Safety Board.

Summary: n/a

Virginia Dept. of Fire Programs (2003). Mayday, Firefighter Down! : Student Manual. Richmond, VA, Virginia Dept. of Fire Programs.

Summary: n/a

Whitcomb, D. D. (1998). The Rescue of Bat 21. Annapolis, Md., Naval Institute Press.

Summary: "When his electronic warfare plane, call sign Bat 21, was shot down on 2 April 1972, fifty-three-year-old Air Force navigator Iceal "Gene" Hambleton parachuted into the middle of a North Vietnamese invasion force and set off the biggest and most controversial air rescue effort of the Vietnam War. Now, after twenty-five years of official secrecy, the story of that dangerous and costly rescue is revealed for the first time by a decorated Air Force pilot and Vietnam veteran."--BOOK JACKET. "Involving personnel from all services, including the Coast Guard, the unorthodox rescue operation claimed the lives of eleven soldiers and airmen, destroyed or damaged several aircraft, and put hundreds of airmen, a secret commando unit, and a South Vietnamese infantry division at risk. It also examines the thorny debates arising from an operation that balanced one man's life against mounting U.S. and South Vietnamese casualties and material losses, the operation's impact on one of the most critical battles of the war, and the role played by search and rescue as America disengaged from that war."--BOOK JACKET.

Wyoming Aeronautics Commission., Wyoming., et al. (1976). Wyoming Aircraft Search and Rescue. Cheyenne, Wyo., Wyoming Aeronautics Commission.

Summary: n/a

5.4 Cave (2)

Holdcraft, R. L. (1985). "Fire Protection Criteria for Caves." Fire Journal (Boston) **79**(3): 35-37.

Summary: Caves present some rather challenging fire protection problems. Because they do not have the natural venting available to most above-ground structures, the rapid build-up of a large fire could quickly produce temperatures and smoke levels that occupants and fire fighters would find intolerable. Fire protection, venting, and evacuation and rescue plans are discussed.

Hudson, S., J. C. Hempel, et al. (1988). Manual of U.S. Cave Rescue Techniques. Huntsville, Ala., National Cave Rescue Commission, National Speleological Society.

Summary: n/a

5.5 Confined Space (11)

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary: n/a

Batley, L. (1998). "Canadian Training for Confined Spaces." Fire International(163).

Summary: To manage the risks associated with working in confined spaces, a Confined Space Hazard Assessment and Control Program should be developed and implemented. A Confined Space Hazard Assessment and Control Program, specific for the work being conducted, should be written for work in each and every confined space.

Gallagher, T. and S. Storment (1994). "Confined Space Rescue, Part Iv: Respiratory and Retrieval Systems." Rescue **7**(6): p. 93-98.

Summary: Extrication devices; lighting; energy hazard controls and personal protective equipment.

Ibbetson, T. (2002). "Confined Space Rescue - When Communication Really Counts." Fire International(195): p. 15.

Summary: n/a

Lee, H., T. Wang, et al. (2003). "Development of a New Confined Space Model." Annual Disaster Medical Volume **2**(1).

Summary: n/a

Macintyre, A., J. Barbera, et al. (2006). "Surviving Collapsed Structure Entrapment after Earthquakes: A “Time-to-Rescue” Analysis." Prehospital and Disaster Medicine **21**(1): 4.

Summary: Massive earthquakes often cause structures to collapse, trapping victims under dense rubble for long periods of time. Commonly, this spurs resource intensive, dangerous, and frustrating attempts to find and extricate live victims. The search and rescue phase usually is maintained for many days beyond the last “save,” potentially diverting critical attention and resources away from the pressing needs of non-trapped survivors and the devastated community. This recurring phenomenon is driven by the often-unanswered question “Can anyone still be alive under there?” The maximum survival time in entrapment is an important issue for responders, yet little formal research has been conducted on this issue. Knowing the maximum survival time in entrapment helps responders: (1) decide whether or not they should continue to assign limited resources to search and rescue activities; (2) assess the safety risks versus the benefits; (3) determine when search and rescue activities no longer are indicated; and (4) time and pace the important transition to community recovery efforts.

Rekus, J. (Mar. 1996). "Confined Space Rescue Planning." Occupational Hazards.

Summary: This handbook provides the practitioner with recommended procedures and guidance for safe entry into confined spaces. It reviews selected case histories of confined space accidents and uses more than 100 line drawings and more than 150 photographs in describing hazards and accidents, and discusses how they could have been prevented by a confined space entry program. It outlines the requriements of the OSHA permit-entry confined space standard and provides detailed explanations of requirements for air sampling, ventilation, lockout/tagout emergency planning, and employee training.

Sargent, C. (2000). Confined Space Rescue, Fire Engineering Bk Dept.

Summary: Written by veteran rescuer Chase Sargent, this book is a comprehensive, single-source guide to such subject areas as hazardous atmospheres, detection equipment, breathing apparatus, ventilation, retrieval systems, backup teams, and operational procedures. Effective methods of training and regulations governing operations in confined spaces also are discussed at length.

Suruda, A. J., T. A. Pettit, et al. (1994). "Deadly Rescue: The Confined Space Hazard." Journal of Hazardous Materials **36**(1): 45-53.

Summary: Rescue operations in confined spaces can expose the person(s) attempting rescue to hazardous atmospheres or to physical hazards such as engulfment, which are potentially fatal. Two sources of data in the United States on work-related fatalities - the National Institute for Occupational Safety and Health (NIOSH) National Traumatic Occupational Fatalities (NTOF) surveillance system and investigations performed under the NIOSH Fatality Assessment and Control Evaluation (FACE) program - were used to examine confined space-related deaths. For the years 1980 through 1988, there was an average of 89 work-related deaths in confined spaces per year, and approximately 23 (25.5%) of those who died were persons attempting rescue. Asphyxiation by atmospheric hazards was the primary cause of death of those persons attempting rescue. Those persons who were attempting rescue and who died were more likely to be co-workers than public safety or emergency medical service (EMS) personnel. Since rescue operations in confined spaces present unique hazards, proper training of personnel and the availability of specialized equipment are required to protect persons attempting rescue from injury and death. Safety supervisors and public safety and EMS personnel should be familiar with the recognition of confined space hazards and the use of appropriate rescue techniques.

Veasey, D. A. and Wiley InterScience (Online service) (2006). Confined Space Entry and Emergency Response. Hoboken, N.J., John Wiley & Sons**:** xxi, 486 p.

Summary: n/a

Wright, R. (2003). "A Rescuer's Guide to Rapid Confined-Space Entry." Advanced Rescue Technology **6**(2): 13+.

Summary: n/a

5.6 Earthquake (1)

Tanaka, I. (1997). Emergency Management for Coastal Earthquake Disaster from the Viewpoint of the Sea, Honolulu, HI, USA, Int Soc of Offshore and Polar Engineerns (ISOPE), Golden, CO, USA.

Summary: The Southern Hyogo-Prefecture Earthquake occurred in Japan on January 17, 1995 with the magnitude 7.2 in the Richter scale brought a great deal of disastrous damages over Kobe-Osaka area, which was thus named `Hanshin-Awaji Earthquake Disaster'. The Kansai Society of Naval Architects, Japan, KSNAJ, organized a committee to investigate various aspects of the disasters and to propose methods of crisis and risk management for such a coastal earthquake disasters, especially from the viewpoint from the sea. The items to be investigated are the rescue activity by means of ships, marine transportation, harbor damages, activities by various organizations, risk management planning in coastal city, etc. The present article is an overview of the discussions and proposals on these items.

5.7 Fire (17)

Aguirre, B. E., D. E. Wenger, et al. (1995). "The Social Organization of Search and Rescue : Evidence from the Guadalajara Gasoline Explosion." International Journal of Mass Emergencies and Disasters **13**(1): 67-92.

Summary: This research uses information from the Guadalajara gasoline explosion of 22 April, 1992, to show the importance of social organization in search and rescue activities. Information is obtained from forty three victims that had been buried alive by the explosion throughout the impacted area, and twenty two volunteers who had participated in the direct rescue phase. They reported on their own experience during SAR and the experience of victims and rescuers near them. Most of the people that were rescued alive in the aftermath of the tragedy were rescued by these volunteers. Volunteers' social identities in peer groups, extended families, the neighborhood, and the Catholic Church structured their search and rescue activities. Chances of people surviving the blast were directly proportional to the presence among the searchers of a person or persons who cared for the victim and who knew the victim's likely location. The behavior of the victims was marked by the continuation of preexisting motivational, normative, and value orientations. Victims acted cooperatively during entrapment. Most of the victims that were rescued alive were rescued during the first two hours immediately after the explosion. The article concludes with the implication of the study for collective behavior and disaster research and planning.

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary: n/a

Ashmore, F. S. (1987). "Only the Best for Off-Shore Protection but It May Not Fit the Job Elsewhere." Fire **80**(990): 31.

Summary: n/a

Bourgoyne, A. T. and M. R. Chauvin (1988). An Experimental Study of Suppression of Obstructed Gas Well Blowout Fires Using Water Sprays. Gaithersburg, MD 52 p.

Summary: n/a

Coates, M. L., Kate (1989). "Offshore Drilling Rig: North Sea, Off Aberdeen, Grampian." Fire Prevention(225): p. 47.

Summary: Fire was caused by a build-up of pressure in well base causing the explosion followed by fire.

Evans, D. D. (1984). Control of Blowout Fires with Water Sprays. Washington, DC 95 p.

Summary: In: Technology Assessment and Research Program for Offshore Minerals Operations. OCS Report MMS 84-0001. United States Dept. of the Interior Minerals Management Service, 1984.

Government Accountability Office (2008). Nrc's Oversight of Fire Protection at U. S. Commercial Nuclear Reactor Units Could Be Strengthened. Washington, DC, Government Accountability Office, . **GAO-08-747:** 43.

Summary: After a 1975 fire at the Browns Ferry nuclear plant in Alabama threatened the unit's ability to shut down safely, the Nuclear Regulatory Commission (NRC) issued prescriptive fire safety rules for commercial nuclear units. However, nuclear units with different designs and different ages have had difficulty meeting these rules and have sought exemptions to them. In 2004, NRC began to encourage the nation's 104 nuclear units to transition to a less prescriptive, risk-informed approach that will analyze the fire risks of individual nuclear units. GAO was asked to examine (1) the number and causes of fire incidents at nuclear units since 1995, (2) compliance with NRC fire safety regulations, and (3) the transition to the new approach. GAO visited 10 of the 65 nuclear sites nationwide, reviewed NRC reports and related documentation about fire events at nuclear units, and interviewed NRC and industry officials to examine compliance with existing fire protection rules and the transition to the new approach. [STAR#: 175225]

Gowar, R. G. (1978). Developments in Fire Protection of Offshore Platforms.

Summary: n/a

McCaffrey, B. J. (1984). Jet Diffusion Flame Suppression Using Water Sprays: An Interim Report. Washington, DC 56 p.

Summary: n/a

McCormack, J. and Fire Department Training Network (Firm) (2003). Firefighter Rescue & Rapid Intervention Teams : Saving One of Our Own. Indianapolis, IN, FD Training Network.

Summary: n/a

Morgan, J. (1989). "Nuclear Power Stations: 'Other Risks' More of a Problem to the Fire Service." Fire & Rescue **82**.

Summary: n/a

National Transportation Safety Board (1996). Fire on Board the U. S. Modu Rowan Odessa, Gulf of Mexico, December 1, 1994. Washington, DC 5 p.

Summary: This brief report explains the accident that resulted when workers struck and ruptured a submerged natural gas pipeline while positioning a mobile offshore drilling unit, the ROWAN ODESSA, in the Gulf of Mexico. Escaping gas ignited, engulfing the drilling rig in flames. The rig manager remains missing and is presumed dead. Damages to the drilling unit and the pipeline were estimated at $13 million. As a result of its investigation of this accident, the Safety Board made one new safety recommendation and reiterated one safety recommendation to the U. S. Coast Guard.

Rushbrook, F. (1979). Fire Aboard: The Problems of Prevention and Control in Ships, Port Installations and Offshore Structures. Glascow, Scotland Brown Son & Ferguson, Limited.

Summary: n/a

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Summary: Provides the Incident Commander with an understanding of the FFPE protection and the associated risks if worn while performing rescue operations at the scene of a terrorist incident involving military chemical warfare agents.

Veasey, D. A. and Wiley InterScience (Online service) (2006). Confined Space Entry and Emergency Response. Hoboken, N.J., John Wiley & Sons**:** xxi, 486 p.

Summary: n/a

William, J., H. Stambaugh, et al. (2003). Rapid Intervention Teams and How to Avoid Needing Them Special Report. Technical report series USFA-TR-123. [Emmitsburg, Md.], Federal Emergency Management Agency, U.S. Fire Administration, National Fire Data Center**:** [54] p.

Summary: n/a

5.8 Hurricane (2)

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2007). Hurricane Katrina : Urban Search and Rescue in a Catastrophe : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, Second Session, January 30, 2006. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

5.9 Maritime (33)

Boulougouris, E. K. and A. Papanikolaou (2002). Modeling and Simulation of the Evacuation Process of Passenger Ships. Proc. 10th Int. Congress of the International Maritime Association of the Mediterranean (IMAM 2002). Crete.

Summary: The need to safely evacuate within very short time a large number of people from a confined space, such as the superstructure of large passenger ships, is a difficult task of great practical interest, as documented in recent discussions at the Marine Safety Committee of the International Maritime Organisation (MSC-IMO).

This paper describes the methodology utilized by the code EVDEMON (EVacuation DEmonstration & MOdeliNg), currently under development at SDL-NTUA, for the simulation of the evacuation process onboard passenger ships and presents typical results of application to the evacuation of a modern Ro-Ro passenger ferry. The code is understood as a design tool assisting the designer in the early design stage as to the consideration of proper arrangements for enabling a timely and safe evacuation. The designer is asked to care of optimal measures in terms of internal arrangements to allow for the fast evacuation without bottlenecks, when the ship is in danger. Given the uncertainty of human behavior under stress and the restrictions of a possible mathematical modeling thereof, only multiple simulations of different evacuation scenarios may give the naval architect an indication about the potential outcome in such an event, so that bottlenecks can be identified and removed to the extent possible. At a later development stage, namely after the validation phase, simulation codes, like the presented one, might be used as evidence for the approval of evacuation plans by relevant authorities, as documented by MSC-IMO (MSC Circ. 909/ 1999).

Christ, R. D. and R. L. Wernli (2007). The Rov Manual a User Guide to Observation-Class Remotely Operated Vehicles. Amsterdam ; Boston ; London, Butterworth-Heinemann**:** xviii, 308 p.

Summary: Many underwater operations that were once carried out by divers can now be carried out more efficiently and with less risk with Remotely Operated Vehicles (ROVs). This is the first ROV how-to manual for those involved with smaller observation class ROVs used for surveying, inspection, observation and research purposes. As ROV technology becomes increasingly efficient and affordable, their use is rapidly spreading throughout a myriad of industries, everything from aquaculture to port and harbour security to underwater crime scene investigation, marine salvage, deep sea archaeology and commercial diving even deep sea rescue missions are handled by ROVs. Any industry involved with underwater investigation and surveying will inevitably rely on these machines. The ROV Manual is the first user guide to provide complete training and knowledge on ROV operations for engineers, technicians or underwater recreational enthusiasts, whether working inland or offshore. *The first book to focus on observation class ROV underwater deployment and usage in real conditions for industrial, commercial, scientific and recreational tasks *A complete user guide to ROV operation with basic information on the usage of underwater robotics and navigation equipment to obtain mission results quickly and efficiently *Ideal for anyone involved with ROVs whether in research, business or leisure underwater activities, or for heavier offshore projects, complete with self-learning questions and answers.

Harbst, J. and F. Madsen The Behaviour of Passengers in a Critical Situation on Board a Passenger Vessel or Ferry, Technical report, Danish Investment Foundation, Kopenhagen, 1996.

Summary: n/a

International Maritime Organization (2006). Sar Convention : International Convention on Maritime Search and Rescue, 1979 : As Amended by Resolution Msc.70(69) and Msc.155(78). London, International Maritime Organization.

Summary: The 1979 Convention, adopted at a Conference in Hamburg, was aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations.

Although the obligation of ships to go to the assistance of vessels in distress was enshrined both in tradition and in international treaties (such as the International Convention for the Safety of Life at Sea (SOLAS), 1974), there was, until the adoption of the SAR Convention, no international system covering search and rescue operations. In some areas there was a well-established organization able to provide assistance promptly and efficiently, in others there was nothing at all.

The technical requirements of the SAR Convention are contained in an Annex, which was divided into five Chapters. Parties to the Convention are required to ensure that arrangements are made for the provision of adequate SAR services in their coastal waters.

Parties are encouraged to enter into SAR agreements with neighbouring States involving the establishment of SAR regions, the pooling of facilities, establishment of common procedures, training and liaison visits. The Convention states that Parties should take measures to expedite entry into its territorial waters of rescue units from other Parties.

The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue co-ordination centres and subcentres. It outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. This includes the designation of an on-scene commander and his duties.

Parties to the Convention are required to establish ship reporting systems, under which ships report their position to a coast radio station. This enables the interval between the loss of contact with a vessel and the initiation of search operations to be reduced. It also helps to permit the rapid determination of vessels which may be called upon to provide assistance including medical help when required.

International Maritime Organization (2007). Gmdss Manual : Manual on the Global Maritime Distress and Safety System. London, IMO.

Summary: The entry into force and implementation of the global maritime distress and safety system (GMDSS) between 1992 and 1999 was the most far-reaching development in maritime emergency assistance since the invention of the radio. The GMDSS Manual presents the principles on which the GMDSS is based, the requirements for its implementation, the standards to be met by GMDSS equipment, and the method of operation of the various radio services which make up the GMDSS. The manual is divided into eight sections and several substantial annexes: Part 1 introduces the background to the GMDSS, including its history and development. Part 2 describes the basic functions of the GMDSS. Part 3 outlines the various communications systems within the GMDSS. Part 4 lays down requirements for the carriage of GMDSS equipment. Part 5 describes the method of operation of the various radio services within the GMDSS. Part 6 focuses on the shore-based side of the GMDSS. Part 7 presents the Master Plan for the GMDSS. Part 8 offers guidance on maintenance of equipment. The annexes give comprehensive information on all aspects of the GMDSS, including primary texts such as: relevant texts of the 1974 SOLAS Convention relevant to the GMDSS, relevant IMO Assembly resolutions, MSC and COM circulars, articles of the Radio Regulations, resolutions of WARC and WARC-Mob-87 conferences, IMO performance standards and related ITU-R recommendations, and the Master Plan for the GMDSS.--Publisher's description.

International Maritime Organization (2007). A Pocket Guide to Recovery Techniques. London, International Maritime Organization.

Summary: n/a

International Maritime Organization and International Civil Aviation Organization (1998). International Aeronautical and Maritime Search and Rescue Manual. London, Montreal, Quebec, International Maritime Organization and International Civil Aviation Organization.

Summary: n/a

Jeffers, H. P. (2006). Burning Cold : The Cruiseship Prinsendam and the Greatest Sea Rescue of All Time. Grand Rapids, Mich., Zenith.

Summary: In October 1980, the Holland America cruise ship Prinsendam rolled over on her starboard side and sank in 1,473 fathoms of icy water in the Gulf of Alaska. Amazingly, none of the 320 passengers or 190 crew went down with her, recounts Jeffers (The 1,000 Greatest Heroes) in this workmanlike account of disaster and rescue on the high seas. After a fire broke out in the vessel's engine room and spread unchecked, everyone aboard was forced to abandon ship in a rising gale. Through the heroic efforts of the U.S. Coast Guard, the evacuation resulted in no lives lost.

Lee, R. M. (1993). Death and Deliverance : The True Story of an Airplane Crash at the North Pole. Golden, Colo., Fulcrum Pub.

Summary: n/a

Maas, P. (1999). The Terrible Hours : The Man Behind the Greatest Submarine Rescue in History. New York, HarperCollins Publishers.

Summary: On the eve of World War II, America's newest submarine plunged out of control to the ocean bottom during a test dive. Miraculously, thirty-three crew members remained alive.

Mayor, L., O. Boing, et al. (2006). Achieving Zero Accidents in Marine Stimulation Vessels, San Antonio, TX, United States, Society of Petroleum Engineers (SPE), Richardson, TX 75083-3836, United States.

Summary: Operations of marine stimulation vessels are considered a highly risky activity, by the standards of oil and gas industry. Activity performed by these vessels include acidizing, hydraulic fracturing, scale, asphaltene, hydrate, water, and sand control. The inherent hazards related to the nature of manipulated fluids involved on these different scenarios, comprised by acids in different strengths, non aromatic solvents, chemical inhibitors, and the pressure under which they are usually pumped into an oil or gas well, added to vessels navigation hazards such as potential leaks, sea and weather conditions, contribute to the risk involved. In addition, confinement created by lack of space, and the need to run simultaneous work, such as pumping and maintenance on the stimulation plant, add to the overall risk, involving health, safety and environmental components. It is like having in the same site the Base Plant and the Well. Exposure to chemicals, relatively high noise levels, weather conditions and stress due to marine confinement is a daily reality to the workforce. Simply there is no room for mistakes. To control and minimize these risks, oil industry has applied intense efforts. Incorporation of new technologies, development of better personnel protective equipment, improvement of procedures and workforce training/qualification are concrete examples of these efforts. Specific management tools have also been applied in the search of an accident free environment, and are mentioned on this paper. Additional efforts will be required to continue running a zero accident environment. These efforts include the development and maintenance of a high level culture with focus on human behavior. This paper describes how the application of a safety culture, together with traditional safety management tools ended accidents and allowed achieving two consecutive years without accidents by two marine stimulation vessels operating in Brazilian coast, Macae Basin. Copyright 2006, Society of Petroleum Engineers.

Noble, D. L. (2002). The Rescue of the Gale Runner : Death, Heroism, and the U.S. Coast Guard. Gainesville, University Press of Florida.

Summary: n/a

Ockerby, P. (2001). "Evacuation of a Passenger Ship - Is Panic a Major Factor." Australian Journal of Emergency Management **16**(1): 8-14.

Summary: n/a

Pasche, A., B. Holand, et al. (1991). Emergency Systems for Divers, Hague, Neth, Publ by Soc of Petroleum Engineers of AIME, Richardson, TX, USA.

Summary: Accidents during operational diving have on some occasions resulted in situations where the divers have been left in the diving bell or welding habitat at the sea bottom for several hours. In some of these situations, there have been casualties due to hypothermia. As a result, the diving industry and authorities have required that emergency equipment be developed and installed in the diving systems. The early emergency systems consisted of passive insulation systems and a lung powered CO2-scrubber/respiratory heat exchanger. From tests as well as actual emergency situations, it has been pointed out that certain improvements are required. The systems should include some means of preventing urine-wetting of the insulation system. In addition, the divers are reluctant to undress their regular diving suit as they are concerned that they would later be unable to put it on again during the rescue operation. The aim of the reported project has been to develop and test a new emergency system. New elements are a urine collection system and an evacuation system which could be used as a hot water suit and prevent the necessity of changing suits. The evacuation suit was tested during a simulated dive to 450 metres and fulfilled the requirements for prevention of cold water shock. The passive insulation system and the lung powered CO2-scrubber/rebreather have further been improved ergonomically and with regards to thermal properties.

Rushbrook, F. (1979). Fire Aboard: The Problems of Prevention and Control in Ships, Port Installations and Offshore Structures. Glascow, Scotland Brown Son & Ferguson, Limited.

Summary: n/a

Shelford, W. O. (1960). Subsunk; the Story of Submarine Escape. Garden City, N.Y., Doubleday.

Summary: n/a

Tanaka, I. (1997). Emergency Management for Coastal Earthquake Disaster from the Viewpoint of the Sea, Honolulu, HI, USA, Int Soc of Offshore and Polar Engineerns (ISOPE), Golden, CO, USA.

Summary: The Southern Hyogo-Prefecture Earthquake occurred in Japan on January 17, 1995 with the magnitude 7.2 in the Richter scale brought a great deal of disastrous damages over Kobe-Osaka area, which was thus named `Hanshin-Awaji Earthquake Disaster'. The Kansai Society of Naval Architects, Japan, KSNAJ, organized a committee to investigate various aspects of the disasters and to propose methods of crisis and risk management for such a coastal earthquake disasters, especially from the viewpoint from the sea. The items to be investigated are the rescue activity by means of ships, marine transportation, harbor damages, activities by various organizations, risk management planning in coastal city, etc. The present article is an overview of the discussions and proposals on these items.

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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United States Coast Guard On Scene. [Washington, D.C.], Dept. of Transportation**:** v.

Summary: The national maritime SAR review.

United States Coast Guard Sar Statistics. Washington, D.C., Coast Guard.

Summary: n/a

United States Coast Guard (1975). Search and Rescue : Auxiliary Operational Specialty Course, Student Workbook. Washington, U.S. Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1977). Boat Crew Training Guide. Washington, DC, Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1979). Merchant Ship Search and Rescue Manual (Mersar). Washington, DC, Dept. of Transportation, Coast Guard.

Summary: n/a

United States Coast Guard (1982). Coast Guard Rescue and Survival Systems Manual. Washington, D.C., Dept. of Transportation, U.S. Coast Guard.

Summary: n/a

United States Coast Guard (1996). Auxiliary Specialty Course : Search and Rescue (Auxsar) : Instructor Guide. Washington, DC, U.S. Dept. of Transportation, U.S. Coast Guard.

Summary: n/a

United States Coast Guard (2002). U. S. Coast Guard Addendum to the United States National Search and Rescue Supplement (Nss) to the International Aeronautical and Maritime Search and Rescue Manual (Iamsar), U.S. Department of Transportation.

Summary: n/a

United States Coast Guard and United States Coast Guard Auxiliary (1977). Basic Instructor : Cornerstone Training Course : Student Workbook. Washington, Dept. of Transportation, Coast Guard.

Summary: n/a

United States General Accounting Office and United States Coast Guard (2003). Coast Guard New Communication System to Support Search and Rescue Faces Challenges. Washington, D.C., U.S. General Accounting Office.

Summary: n/a

United States Government Accountability Office (2006). United States Coast Guard Improvements Needed in Management and Oversight of Rescue System Acquisition : Report to Congressional Committees. Washington, D.C., U.S. Government Accountability Office**:** i, 54 p.

Summary: n/a

United States. Congress. House. Committee on Transportation and Infrastructure. Subcommittee on Coast Guard and Maritime Transportation. (2000). Coast Guard's Search and Rescue Mission : Hearing before the Subcommittee on Coast Guard and Maritime Transportation of the Committee on Transportation and Infrastructure, House of Representatives, One Hundred Sixth Congress, First Session, November 3, 1999. Washington, U.S. G.P.O. : [U.S. G.P.O., Supt. of Docs., Congressional Sales Office, distributor].

Summary: n/a

United States. Congress. Senate. Committee on Foreign Relations. (1980). International Convention on Maritime Search and Rescue, 1979, with Annex : Report to Accompany Ex. J, 96-2. [Washington, U.S. Govt. Print. Off.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Yeomans, K. (2004). Dead Men Tapping : The End of the Heather Lynne Ii. Camden, Me., International Marine/McGraw-Hill.

Summary: A 1996 collision off the Massachusetts coast between a barge-pulling tugboat and the fishing boat Heather Lynn II resulted in the latter overturning and trapping all three crewmen, who tapped on the ship's hull to let nearby fishermen know they were alive. When the Coast Guard showed up too late to help the crew, questions were asked and lawsuits filed. Tracking the 2000 lawsuit, Yeomans, herself a writer, fisherman and boat captain, jumps back and forth between courtroom statements and the events of the fateful day. Connecting the testimony of each participant-the tugboat captain, the salvager, local fishermen and Coast Guard personnel-and a recap of their day with her clean prose and knowledgeable insight, Yeomans brings the tragic day to life on the page. Helping to put this sad tale in the right context and provide the reader with a historical perspective, Yeomans intersperses similar tales of boat-to-boat collisions and rescue missions where the Coast Guard's actions and protocol were questioned. While the story is compelling, this book doesn't truly pull at one's heart-strings like the best of ocean adventure books have, because Yeomans never really puts the reader in the shoes of the three lost fishermen. Still, filled with examples of maritime law and the unwritten laws of the sea and seafarers, this book provides an intriguing glimpse into the lives of the men and women who are employed in one of America's most dangerous professions.

5.10 Military (6)

Gonzales, D. (2005). Network-Centric Operations Case Study : The Stryker Brigade Combat Team. Santa Monica, CA, Rand Corp.

Summary: n/a

U.S. Army Soldier and Biological Chemical Command. and Edgewood Chemical Biological Center. (2003). Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident. [Aberdeen Proving Ground, Md., U.S. Army Soldier and Biological Chemical Command**:** ix, 14, [10] p.

Summary: Provides the Incident Commander with an understanding of the FFPE protection and the associated risks if worn while performing rescue operations at the scene of a terrorist incident involving military chemical warfare agents.

United States General Accounting Office and United States Coast Guard (2003). Coast Guard New Communication System to Support Search and Rescue Faces Challenges. Washington, D.C., U.S. General Accounting Office.

Summary: n/a

United States Joint Chiefs of Staff (1996). Doctrine for Joint Combat Search and Rescue. Joint pub 3-50.2. Washington, D.C., Joint Chiefs of Staff.

Summary: n/a

United States. Congress. Senate. Committee on Homeland Security and Governmental Affairs. (2006). Always Ready : The Coast Guard's Response to Hurricane Katrina : Hearing before the Committee on Homeland Security and Governmental Affairs, United States Senate, One Hundred Ninth Congress, First Session, November 9, 2005. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O.

Summary: n/a

Whitcomb, D. D. (2006). Combat Search and Rescue in Desert Storm. Maxwell Air Force Base, Ala., Air University Press.

Summary: n/a

5.11 Mine (42)

Amyotte, P. R. and A. M. Oehmen (2002). "Application of a Loss Causation Model to the Westray Mine Explosion." Process Safety and Environmental Protection: Transactions of the Institution of Chemical Engineers, Part B **80**(1): 55-59.

Summary: On 9 May 1992 an underground explosion destroyed the Westray coal mine located in Plymouth, Nova Scotia, Canada. Twenty-six miners were killed. This paper attempts to resolve the multiple layers of accident causation by systematic application of a loss causation model. Immediate and basic causes having their origin in lack of management control are identified. The analysis helps to identify the lessons to be learned from this disaster, the two most important of which are the need for a rigorous loss management system and an appropriate attitude toward industrial safety.

Anon (2000). "Mine Health and Safety Council Award Scheme - Recognising High Standards of Health and Safety." Journal of the Mine Ventilation Society of South Africa **53**(4): 165-166.

Summary: The Mine Health and Safety Council (MHSC) award scheme heralds a new era in the South African mining history. The main aim of the new system is to provide recognition for significant achievements made in mine health and safety. A tripartite working group, which includes representatives from government, industry and labor, identified all the awards in the new scheme.

Both, W. (1983). Some Guidelines on Self-Rescue, Rescue and Fire Protection Techniques for Use in the Drivage of Auxiliary-Ventilated Roadways with Full-Face Coal-Cutting Machines, Sheffield, Engl.

Summary: The paper describes measures of fire prevention, explosion protection and control, improvement of ventilation and monitoring for safety purposes and the use of air measuring instruments and fire detectors. It also deals with the preparations for fire control, including preparations for neutralization with nitrogen and preparations for warning and evacuating the workers. Furthermore, it examines the preparations for possible action by the mine fire brigade in recovering a heading temporarily abandoned. The paper indicates some medium-term objectives with a view to the improvement of safety in drivages with full-face coal cutters; some of these objectives have already been attained; in other cases some further development is required.

Brake, R. (2000). "Integrated Strategy for Emergency Egress from an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **53**(2): 53-61.

Summary: The fact that major fires are rare events in underground metal mines means there is often little on-site experience in dealing with these situations. Elaborate strategies that rely on a high degree of training at all levels to be effective are likely to fail, especially with the trend in Australia towards smaller mines and `fly-in fly-out' operations. A robust strategy is required. The key items in such a strategy are: early detection and warning of personnel, personal belt-worn oxygen-generating self-rescuers, high integrity escape routes and self-contained refuge stations, simple procedures, reliable personnel `tagging' systems and sufficient, trained search and rescue and fire fighting personnel and equipment.

Brake, R. and G. Bates (2001). "Criteria for the Design of Emergency Refuge Stations for an Underground Metal Mine." Journal of the Mine Ventilation Society of South Africa **54**(2): 5-13.

Summary: Design strategies for emergency refuge stations (ERS) in underground metal mines were discussed. The set up of relocatable refuge stations backed up by cribrooms was proposed to provide multiple options for a person to escape from fire. The minimum number and placement of ERS was standardized. The provision of compressed breathing air from cylinders using individual face masks or from cached self-contained self-rescuers was reported to be unsuitable. An ideal system to keep toxic fumes out of the ERS by putting ERS under positive pressure with respect to external environment was proposed.

Bresser, G., B. Kampmann, et al. (1994). "Entwicklung Und Erprobung Neuer Filterselbstretter (New Filter Self-Rescuers)." Glueckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **130**(10): 716-719.

Summary: Following a unanimous vote by the mining companies, the mines inspectorates, the technical bodies and the employees' organisations a new filter self-rescuer was developed for the German coal mining industry. Feasibility studies confirmed the technical realisability of the required improvements in respiratory physiology. The DMT Institute for Rescue, Fire and Explosion Protection is coordinating and monitoring the project and in particular is conducting the tests on the prototypes above and below ground. Meanwhile a first prototype series has been manufactured and tested. The clear reduction of the breathing resistance and temperature of the inhaled air, but also the improved method of wearing the new filter self-rescuer during breathing and the easier method of fitting are a safety advantage.

Bystron, H. (1983). Role of Budryk's Throttling Air Doors in Stabilizing Ascensional Ventilation of Mine Workings in Case of a Fire, Sheffield, Engl.

Summary: Prevention of mining disasters in case of fires in inclined mine workings is based first of all on the stabilization of ascensional ventilation. Such stabilization is carried out by dividing the mine with Budryk's throttling air doors into two zones (I and II). Zone I (safe) is connected with the intake shaft and zone II (dangerous) with the upcast shaft. The air door which throttles the air inflow to the fire is called the fundamental air door and that throttling the air flow to the working, through which the fire fumes flow in the direction of the exhausting main fan, is called the auxiliary air door. The aim of this work is to present the latest study results obtained at the Central Mining Institute in Katowice. The studies were based on foreign achievements, using the same simplifying assumptions, but making use of gas mechanics and phenomenological thermodynamics to a greater extent than previously.

Cawley, J. C. (2001). Electrical Accidents in the Mining Industry, 1990-1999, Chicago, IL, Institute of Electrical and Electronics Engineers Inc.

Summary: This National Institute for Occupational Safety and Health study was conducted to focus future research on the most significant electrical problems in the mining industry. Data from 1,926 mine electrical accidents (including 75 fatalities) that occurred between 1990 and 1999 were studied. Coal and metal-nonmetal operator- and contractor-reported data are presented. All data used in this analysis were MSHA closeout data, except 1999, which were preliminary data. Electricity was the 4th leading cause of death reported in mining despite being the 14th leading cause of injuries. During the 1990s, 1 of every 272 mining accidents resulted in a fatality. In comparison, 1 of every 26 mine electrical accidents was fatal. Burns were the leading Nature of Injury in electrical accidents, but were rarely fatal. Electrical shock caused 70 of the 75 electrical fatalities reported. About one-half of mine electrical accidents and fatalities were sustained during electrical maintenance. Small mines experience a disproportionately high number of electrical accidents and fatalities based on total average employment. The injury severity for victims of nonfatal mine electrical injuries does not increase with age in victims 50 years and older, unlike many other types of occupational accidents. High-reaching mobile equipment is involved in about 20% of mine electrical fatalities, indicating that overhead power line hazards need to be addressed. Electrical accident narratives containing the six most frequently mentioned keywords were isolated for further analysis. 1,321 narratives containing the keywords "breaker", "cable", "battery", "ground", "energized" and "meter" were analyzed to more accurately determine causal factors. Technical suggestions for mitigating electrical hazards are proposed.

De Klerk, C. (2003). "Mine Rescue Services South Africa - an Overview." Journal of the Mine Ventilation Society of South Africa **56**(3): 113-118.

Summary: As South African mines penetrate greater depths and new mining methods are developed, Mines Rescue Services also have to adapt in order to render a professional, cost-effective fire fighting, rescue and recovery service to the South African mining industry. This overview will address the structure, training and equipment of Mines Rescue Services as well as fire statistics.

Fiscor, S. (2004). "Minexpo 2004 Preview." Engineering and Mining Journal **205**(8): 16-18.

Summary: The preview of MINExpo 2004, the exposition held every four years in Las vegas by the National Mining Association, is given. The display will include ultra-haul trucks, super-sized dozers, drill bits, and mine modeling. MINExpo is one of the programs in the department of commerce's international buyer program. The concurrent technical brainstorming sessions will be the specific feature of the MINExpo 2004.

Frank, I. (2002). "Miracle of the Miners: The Quecreek Rescue from an Ed Perspective." Journal of Emergency Nursing **28**(6): 544-548.

Summary: n/a

Fuchs, E., W. Hermulheim, et al. (2004). "Restrukturierung Des Grubenrettungswesens Restructuring of the Mine Rescue Service." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **140**(10): 453-457.

Summary: About 1,200 voluntary mine rescue workers are currently on stand-by for underground deployment with respirators in the Ruhr, Saar and Ibbenburen coalfields. The minimum requirement of mine rescue workers for a major incident is 600 men for three physically separated coalfields and is still safely covered in the medium term. The concentration of specific qualifications (packing and drilling operations with respirators, inertisation) in the voluntary central mine rescue station DSK Ruhr continues to be practical and is being maintained; by contrast the continuous stand-by service of the central mine rescue station was disbanded on 31 December 2003 in the course of the deployment profile modified in recent years. The professional mine and works fire brigade in Friedrichsthal, Saar including the stand-by service is being maintained with its previous strength essentially on the basis of the existing specifications by regulations or service contracts. A subsequent solution for the period after closure of the Warndt/Luisenthal site of the Saar colliery is being investigated with regard to feasibility in a project with participation of the mining authorities, the Saar colliery and the main mine rescue service station. The main mine rescue stations in Herne and Friedrichsthal have significantly intensified their cooperation in the course of mutual simplification of the technical fields.

Fundemeyer, M. and J. Stoklossa (1985). "Preparing Mine Rescue Teams for Deployment under Tough Climatic Conditions." Glueckauf & Translation **121**(18): 417-420.

Summary: In 1986 the Central Mine Rescue Station of Bergbau-Forschung set up a climate test facility in which team members undergo exercises at dry-bulb temperatures of up to 50 degree C and relative humidities up to 70%. In addition to a 100 min standard exercise with a minus 10 min climatic part (t//t equals 40 degree C; t//f equals 31 degree C) other exercises from 15 to 75 min duration were organized with different clothing, including cooling clothing. Cooling vests can keep physiological indicators (heart rate and rectal temperature) lower with the same workload and at high climatic values, thereby extending deployment time.

Gochioco, L. M., R. Rodriguez, et al. (2008). "Employing the Underground Inseam Seismic Method to Detect Old Abandoned Mines and Improve Mine Safety." Leading Edge (Tulsa, OK) **27**(1): 88-97.

Summary: In July 2002, a high hydrostatic head pressure and thinner coal barrier caused a major water break that flooded the QueCreek Mine in southwest Pennsylvania. Nine miners were trapped for nearly 77 hours before they were rescued. This high-profile accident motivated the US government to investigate measures that would minimize similar accidents in the future. © 2008 Society of Exploration Geophysicists.

Goodell, J. (2002). Our Story : 77 Hours That Tested Our Friendship and Our Faith. New York, Hyperion.

Summary: The story of the nine Pennsylvania coal miners who were trapped underground for more than three days is a blessedly unsentimental and true-to-life account of a horrifying situation and a triumphant escape.

Goodman, G. V. R. and F. N. Kissell (1988). Fault Tree Analysis of Miner Escape During Mine Fires, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Summary: This paper discusses the use of fault tree analysis for evaluating escapeway reliability. A fault tree is developed using standard logic formulations. It is later evaluated using commercially available software. The computer model uses Boolean reduction to obtain the minimal cut sets and minimal path sets of the tree. A brief analysis is also conducted to determine the occurrence probability of the TOP event. This study shows that fault tree analysis is a viable means of analyzing escapeway reliability. The cut and path sets reveal those event sequences leading to fatalities. The probability of the TOP event shows the frequency of occurrence for fatalities in an underground mine fire. The usefulness of this value, however, is limited by the accuracy of the data for the initiating events. For mining events, the data is difficult to estimate precisely.

Graham, N. and G. G. Eave (1995). "Emergency Control Rooms Structure and Procedures." Journal of the Mine Ventilation Society of South Africa **48**(4): 126-132.

Summary: A well designed and efficient surface control centre is the key to success in controlling an emergency operation. The control room is the nerve centre during a crisis. An important component is the creation of an efficient communication network, whereby relevant information is gathered and analysed. From this analysis a strategy will emerge, for translation into action plans. The execution of planned action by clear and comprehensive briefing of rescue teams and other personnel will greatly enhance operational efficiency and limit loss. This paper is intended as a quick reference for inclusion into the mine emergency procedure manual.

Hermulheim, W. and G. Bresser (2006). "Neue Atemschutzgerate Fur Dsk-Grubenwehren (New Respirators for Dsk Mine Fire-Fighting Teams)." Gluckauf: Die Fachzeitschrift fur Rohstoff, Bergbau und Energie **142**(4): 130-134.

Summary: The supply of spare parts for the well-known Drager BG 174 respirator for mine fire-fighting teams will terminate in a few years. Hence the mine fire-fighting teams of the DSK coal mines still in production after the end of the current decade must be re-equipped with a new type of respirator. Two different variants will come into consideration with inclusion of new types of equipment from Drager and MSA-Auer. The development of the new respirators has been monitored by the DSK Centres for Mine Rescue Services since the early 1990s and is an example of successful cooperation between manufacturers and users.

Hurley, T. (2006). "Minesite Avalanche - Some Lessons Learned." Mining Engineering **58**(4): 24-26.

Summary: On 23 May 1983, an avalanche occurred at the Revenue-Virginius Mine. Six mine personnel and two contract diamond drillers were trapped when the avalanche covered and blocked the portal, the only access into the mine. Fortunately, all eight persons were rescued. Surveying the damage, issues that have contributed to the disaster emerged. By blocking the snow slide chute, the snow weight was allowed to accumulate until the fences failed and it all came at once. If the snow would have been allowed to run in smaller amounts throughout the winter, no damage would have occurred. The original ventilation system was installed in line with the snow slide by people who were not aware of or did not recognize the hazard. If a detailed map with the individual sets mapped could have been used, it would have been easier to, quicker and safer to dig horizontally than vertically. All unused equipment or facilities should be removed or neutralized. Furthermore, vehicles should not be parked and personnel should bot be allowed to walk in zones of danger.

Jones, B. (1998). "New Technology Provides Effective Communications for Underground Rescue Operations." Coal International (Redhill, England) **246**(5): 171-174.

Summary: This feature describes the introduction of a new underground communication system designed for underground rescue operations. Known as the 'm-Comm' system, it employs a light-weight guide wire which can be payed out over considerable distances by the rescue team. A member of the team simply needs to clip on a handset to the wire to talk.

Kampmann, B. and G. Bresser (1999). "Heat Stress and Flame Protective Clothing in Mine Rescue Brigadesmen: Inter- and Intraindividual Variation of Strain." Annals of Occupational Hygiene **43**(5): 357-365.

Summary: A climatic exposure was conducted for the 52 rescue brigadesmen of a mine while they wore flame protective clothing. We looked for individual parameters allowing prediction of tolerated exposure times in the climate tested. Of all individual parameters, only body temperature at the end of the Stoklossa heat tolerance test and physical fitness showed significant influence on the tolerated exposure time, although not very strongly. Age, body mass, and Body Mass Index showed no significant influence on the tolerated exposure time. It was found during a longitudinal study that the tolerance time within the climate for four subjects showed considerable variations, and so it was decided neither to take the result of the heat tolerance test as admittance criterion for the mine rescue service nor to perform a ranking of brigadesmen with respect to heat tolerance by this test.

Kass, L. M. (2006). "Early Mining Safety Heroes." Mining Engineering **58**(3): 46.

Summary: Addressing the increasing deaths resulting from various mining accidents, the Congress in 1910 created the U.S. Bureau of Mines. Its first director, Joseph A. Holmes dedicated his life to improving the safety and health of coal miners by training miners in safe mining methods, forming local mine rescue teams, providing breathing devices for mine rescuers, and investigating the causes of mine fatalities and conducting research to eliminate safety hazards. It was also under Holmes' leadership that the "Three Bureau Heroes" came to be known. The three Bureau rescuers who gave their lives in the line of duty included: Joseph Evans at the Price-Pancoast Mine fire, Throop, PA, 7 April 1911; John Ferrel at the Cherry Valley Mine fire, Cherry Valley, PA. 19 January 1912; and Edward Evans, at Rock Springs, WY, 30 September 1913. The decrease in mine disasters and the increased efficiency of the rescue work, as now conducted by the Bureau of Mines, are fitting tributes to the memory of Joseph Evans, John Ferrel and Edward Evans. Holmes died in 1915, but his early leadership and vision remained with the Bureau.

Kielblock, A. J., J. P. van Rensburg, et al. (1999). "Work Load Training: Enhanced Safety Standards for Rescue Brigades' Operations in the South African Mining Industry." Journal of the Mine Ventilation Society of South Africa **52**(2): 44-46.

Summary: As South African mines reach ever-increasing depths, the corresponding increase in temperature due to the geothermal gradient and auto-compression, heightens the risk of heat-related disorders to underground workers, as well as the early onset of fatigue. This is particularly important when rescue teams are deployed in sealed (unventilated) areas during fire fighting and other emergencies. The approximately 970 volunteer rescue brigadesman serving the South African mining industry are largely drawn from full-time occupations from mid-management. This implies that by the nature of their daily jobs they are unaccustomed to the extreme physical demands required during rescue and fire fighting operations. The combination of high work rates in harsh environmental conditions, coupled with very high motivational levels, therefore poses a threat to the health and safety of these workers. This paper examines the physiological protection of rescue bridagesmen with specific reference to the scientific development of work load tests.

King, R. L. and M. L. Bowser (1976). "Borehole Instrumentation for Emergency Mine Rescue Operations." Technical Progress Report - United States, Bureau of Mines(99): 14.

Summary: The Bureau of Mines has developed probes to be used in emergency mine rescue operations by being lowered through a borehole drilled into an underground mine. Various probes can provide two-way voice communication with trapped miners, continuous mine atmosphere monitoring, temperature indication, and television searching capability. At present, an infrared imaging probe is being developed for left double quote seeing right double quote through coal smoke.

Kral, S. (2002). "Teamwork, Technology Key in Rescuing Coal Miners." Mining Engineering **54**(9): 33-35.

Summary: The dramatic rescue of nine Pennsylvania coal miners trapped nearly 90 m (300 ft) underground for 77 hours probably would not have happened without the high technology equipment and improved mine rescue training techniques available today. By now, most everyone has heard the story of the accident that occurred at the Quecreek Mine near Somerset, PA. At about 9 pm on Wednesday, July 24, the miners were drilling coal in the room-and-pillar mine. Their drilling accidentally punched through to the adjacent, abandoned Saxman Mine. Old mine maps of the Saxman Mine led Black Wolf Coal, Quecreek's owners, to believe they were between 60 to 90 m (200 to 300 m) away from the abandoned mine. Those maps proved to be inaccurate.

Liu, C., Y. Ai, et al. (2002). "The Technique Key and Realization of Fault Blocking of Mine Explosion-Proof Magnetic Starter." Proceedings in Mining Science and Safety Technology: 672-674.

Summary: Only electric-leakage blocking, generally, is set in the fault blocking mine explosion-proof magnetic starter. That is not perfect. For this reason, short circuit blocking and open-phase blocking are added in the fault blocking and the method of accomplishment and its technique key are described in detail in this paper.

Liu, H. and D. Yang (2004). Gis-Based Mine Ventilation Network and Safety Analysis, Anchorage, AK, United States, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ 08855-1331, United States.

Summary: The paper constructed the mine ventilation network model using the powerful function of attributes management, display visually and spatial analysis of GIS based on the character study of GIS and mine ventilation network. The mine ventilation network model we put forward in this paper is a COM-based extension of the Geo-network of Arclnfo. In mine ventilation network model, specified result can be obtained by defining weigh values for attribute fields as the constraint condition. It is of great importance for mines to determine the best rescue and leaving route by mine ventilation network route analysis, node analysis and loop analysis when mine accident happens. By the mine ventilation network model we put forward in this paper, the best rescue and leaving route can be implemented in a short time. The research achievement is used successfully in ShiGejie mine, Shanxi Province of China. The application result shows the feasibility of the study achievement.

Morrow, H. (2001). "Incident Command System." Internet Journal of Rescue and Disaster Medicine, The.

Summary: The case report "Lassing Mining Accident" reviews a multi-agency response to a multiple casualty incident in which many problems developed due to the lack of any pre-disaster mutual aid agreements which would have aided in coordinating the response.

Mott, M. L. and M. P. Snyder (1993). "Mine Emergency Responsiveness Development Program Procedures." Mining Engineering (Littleton, Colorado) **45**(10): 1258-1261.

Summary: The MERD program is a simulation of mine emergency situations, which seeks to improve the responsiveness of mine personnel during fires, explosions, and related mine accidents. It provides participants the opportunity to experience the associated emotions, stress, and problems and explore possible solutions. The training shows the need for proper planning and contingency measures should an emergency situation occur. It also delineates the tasks of various agencies involved in rescue operations Evaluations of the MERD program over the years indicate a satisfactory performance mark. Participants have attested to the importance of the program in stressing the role of effective communication and proper organization.

Pritchard, C. J. and D. R. Malicoat (1993). Mine Emergency Planning Aspects of Underground Barricade Chambers, Salt Lake City, UT, USA, Publ by SME, Littleton, CO, USA.

Summary: Tg Soda Ash operates an underground trona mine located in southwestern Wyoming, which utilizes continuous mining machinery to produce 2.0M tpy (2.2M stpy) by shortwall and room land pillar methods. As the mine developed, the increasing distance from the shafts caused travel times to be a significant factor in planning of mine emergencies. It was decided to construct a barricade chamber, a modified refuge chamber, to increase safety and to provide an additional escape option in the case of a mine frequency. Fortunately, there has been no need to use these facilities during the last 9 years, but mine emergency planning has been greatly improved.

Rae, B. (1990). "Piper Alpha-Restoring Communications." Disaster Management **3**(1): p. 8-10.

Summary: n/a

Sharpe, J. (2006). "Rushing Down the Wrong Road." Rock Products **109**(4): 14.

Summary: Lawmakers such as West Virginia Gov. Joe Manchin III(D) has made regulatory requirements for coal mines, giving the mining companies just 90 days to come into compliance. Influenced by the tragedies at Sago and Alma, initial efforts are focused on communication systems, trackers, rescue chambers, self-contained self-rescuers, and rescue teams. One of MSHA's research priorities is developing an analytical method to distinguish deadly asbestos fibers from their non-asbestos counterparts. The agency also wants to rekindle an effort to examine technologies for minimizing blind spots on mobile vehicles.

Strauss, S. J. (1996). "Efficacy of Self-Contained Self-Rescuers." Journal of the Mine Ventilation Society of South Africa **49**(3): 52-54.

Summary: The deployment of the compressed oxygen type self rescuers, OCENCO M20, at Koffiefontein Mine demonstrated self-rescuer performances that remained generally unaffected, with no trend indicative of deteriorating function being observed to be of practical significance. No build-up of CO2 was evident and no dusting was experienced. Moreover, the distances reached were most satisfactory, with the underground travel distances to alternative independent fresh air supplies in the event of a fire or disaster to be well within the reach of the distances achieved. However, tiredness and disorientation of the wearer of Self Contained Self Rescuers (SCSR) is expected to be a common phenomena due to the restricted airflow.

Su, J. (1998). On the Organization and Command of Township-Owned Coal Mine Serious and Great Accident Spot, Beijing, China, Sci Press.

Summary: This thesis raises the three following key steps of an accident rescuing, directed against the safe production and an accident characters of township-owned mines. 1) decision of a right rescuing group. 2) drawing up a scientific rescuing program. 3) organizing to rescue strictly. At the same time, the thesis expounds the three following points. 1) giving full play to expert group's function. 2) asking for help from state -owned coal mines. 3) keeping a good order on the spot. A township-owned coal mine is a field, in which a lot of accidents often take place. There is a very low rescuing successful rate of serious and great accidents for the lack of rescuing and avoiding-accident abilities, material safeguard, and rescuing experience etc, when an accident happens, economical loss will get more serious and more people will be dead. Because of the inefficient on-the-spot-command and the delay of the rescuing time, the key of a township-owned coal mine serious and great accident rescue lies in the on-the-spot-command. Some suggestions about it are given here according to some experiences and lessons in our county.

Thorne, R. (1996). "Reducing Rock Falls During Mine Rescue." Mining Engineering (Littleton, Colorado) **48**(12): 15-18.

Summary: The rock strata in open pits has usually been disturbed by mechanical means and explosives. This is why benching is mandated for worker safety in this environment. Rock continually falls due to the unstable nature of the geology in the mine. This paper presents some techniques that can minimize the potential for rescue-party-induced rock fall. They are the rescue setup location, the steep-angle rescue technique and the use of high directionals. Each requires proper training and repeated practice in advance of the actual rescue. Attempting any of these procedures without first learning the forces involved can lead to serious injury or death.

Timko, R. J. and R. L. Derick (1988). Determining the Integrity of Escapeways During a Simulated Fire in an Underground Coal Mine, Berkeley, CA, USA, Publ by SME, Littleton, CO, USA.

Summary: The Bureau of Mines evaluated the integrity of escapeways in a three entry underground coal mine. A center conveyor belt entry (secondary escapeway), was flanked by an intake (primary escapeway) and a return entry. Diesel equipment was used throughout the mine for material and personnel haulage. A carbon monoxide monitoring system, tied to a data recording computer on the surface, was deployed throughout the belt entry and at selected sites in the intake and return entries. Previously, the company had a fire of unknown origin in another mine, which prompted an interest in the performance of their escapeways. An initial qualitative evaluation was performed by burning approximately 14 kg of coal at the mouth of the intake entry. The first test was followed by a similar burn at the mouth of the belt entry. These initial trials showed a high quantity of leakage between entries. In several follow-up evaluations, simulated fires, using a tracer gas, were set in the intake and belt entries. The results of tests showed that permanent stoppings could not guarantee isolated, contaminant-free escapeways.

Trotman, B. (1996). "Change in Direction for the New South Wales' Mines Rescue Service." Mining Technology **78**(900): 221-222.

Summary: This paper will overview the formation of the Mines Rescue Service in New South Wales (NSW), its current role and capabilities, and strategies being developed to enhance its emergency response, mine rescue training, specialist safety and technical services to the Australian coal industry.

United States Bureau of Mines, Mountain Empire Community College / Division of Mining and Industrial Technology, et al. (1989). Carl T. Donaldson Exercise : Instructor's Copy. Lexington, Ky. / Big Stone Gap, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Division of Mining and Industrial Technology, Mountain Empire Community College.

Summary: n/a

United States Bureau of Mines, Southwest Virginia Community College / Miner Training Program, et al. (1989). Man in the Bin Exercise : Instructor's Copy. Lexington, Ky.; Richlands, Va., Behavioral Research Aspects of Safety and Health Group, Institute for Mining and Minerals Research and Miner Training Project, Southwest Virginia Community College.

Summary: n/a

United States. Congress. Senate. Committee on Appropriations. Subcommittee on Departments of Labor Health and Human Services Education and Related Agencies. (2003). Mine Disaster at Quecreek : Hearing before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Seventh Congress, Second Session, Special Hearing, October 21, 2002, Johnstown, Pa. Washington, U.S. G.P.O. : For sale by the Supt. of Docs., U.S. G.P.O. [Congressional Sales Office].

Summary: n/a

Vaught, C., M. J. Brnich, et al. (2004). An Oral History Analysis of Mine Emergency Response. Pittsburgh, PA; Cincinnati, OH, U.S. Dept. of Health and Human Services.

Summary: n/a

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von Velsen-Zerweck, R. (1987). "Duties of the Advance Party Leader and of the Deployment Group in the 'First Hour' of a Mining Accident." Glueckauf & Translation **123**(17): 464-472.

Summary: In the last few decades in the German coal mining industry, the number of accidents and resulting rescue operations involving the mine emergency teams has fallen. Research and development work and operational measures to guard against dangers, i. e. to prevent, monitor, recognize, control and eliminate risks are gaining in importance. The aim of this paper is to outline the duties of the advance party leader and of the deployment group in the 'first hour' of a mining accident, to show the interrelationship between the decisions and measures taken and to give an idea of the important results and insights gained over the last few years.

5.12 Mountain (3)

Kovacs, T. (2002). "Model Triage and Dispatch Guidelines for Search and Rescue Coordinators and Communications Personnel." Risks in Mountain Rescue Operations. Mountain Rescue Association, ed. Poway, CA: 27–30.

Summary: n/a

MacInnes, H. (2005). International Mountain Rescue Handbook. London, Frances Lincoln.

Summary: This illustrated guide to mountain rescue techniques has become the standard handbook for mountain rescue teams throughout the world. It covers all aspects of equipment, rescue dogs, snow structure, avalanche search, technical rescue techniques, radio and location equipment, winches, helicopters and many other vital elements of modern search and rescue. It is the most advanced book on mountain rescue available today. Book jacket.

Scott, J. and J. Robertson (1993). Lost in the Himalayas : James Scott's 43-Day Ordeal. Port Melbourne, Vic., Lothian.

Summary: n/a

5.13 Nuclear (4)

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

Government Accountability Office (2008). Nrc's Oversight of Fire Protection at U. S. Commercial Nuclear Reactor Units Could Be Strengthened. Washington, DC, Government Accountability Office, . **GAO-08-747:** 43.

Summary: After a 1975 fire at the Browns Ferry nuclear plant in Alabama threatened the unit's ability to shut down safely, the Nuclear Regulatory Commission (NRC) issued prescriptive fire safety rules for commercial nuclear units. However, nuclear units with different designs and different ages have had difficulty meeting these rules and have sought exemptions to them. In 2004, NRC began to encourage the nation's 104 nuclear units to transition to a less prescriptive, risk-informed approach that will analyze the fire risks of individual nuclear units. GAO was asked to examine (1) the number and causes of fire incidents at nuclear units since 1995, (2) compliance with NRC fire safety regulations, and (3) the transition to the new approach. GAO visited 10 of the 65 nuclear sites nationwide, reviewed NRC reports and related documentation about fire events at nuclear units, and interviewed NRC and industry officials to examine compliance with existing fire protection rules and the transition to the new approach. [STAR#: 175225]

Morgan, J. (1989). "Nuclear Power Stations: 'Other Risks' More of a Problem to the Fire Service." Fire & Rescue **82**.

Summary: n/a

Stanton, N. (1996). "Team Performance: Communication, Co-Ordination, Co-Operation and Control." Human Factors in Nuclear Safety.

Summary: n/a

5.14 Offshore (33)

"Piper Alpha - a Damning Report on Safety Measures." (1991). Fire International **15**(126): p. 14+.

Summary: n/a

"The Bottom Line - You Can't Walk from a Platform." (1992). Fire International **16**(133): p. 30-31.

Summary: n/a

Ashmore, F. S. (1987). "Only the Best for Off-Shore Protection but It May Not Fit the Job Elsewhere." Fire **80**(990): 31.

Summary: n/a

Basham, P. W. and R. A. Page (1985). Earthquake Hazards in the Offshore Environment. Washington, DC 74 p.

Summary: n/a

Bercha, F. G., E. Radloff, et al. (2003). Development of Canadian Performance-Based Eer Standards, Honolulu, HI, United States, International Society of Offshore and Polar Engineers.

Summary: The Canadian government, through the federal Transportation Development Centre (TDC), in 1999 initiated a program to develop performance-based escape, evacuation, and rescue (EER) standards for offshore installations in Canadian waters. Performance-based standards (PBS) set expected activity, task, and process achievement levels and goals, rather than prescribing equipment quantities, types, dimensions, and other specifications. This paper describes the standards, their development program and the associated research projects needed to fill relevant data gaps.

Boyle, P. and E. J. Smith (2000). Emergency Planning Using the Hse's Evacuation, Escape and Rescue (Eer) Hazop Technique, Manchester, UK, Institute of Chemical Engineers, Rugby, Engl.

Summary: The Health and Safety Executive (HSE) commissioned the development of a technique (EER HAZOP) for analyzing Evacuation, Escape and Rescue from offshore installations. DNV has used this technique on several installations and considers the concept could be suitable for onshore process plant. For representative accident scenarios, each stage of emergency response is considered, e.g. detection, initial command and control of the emergency, evacuation (if required), etc. Guidewords are then used to analyze what can go wrong in each stage. The technique ensures that emergency response is analyzed in a structured manner and response arrangements are based on a documented, traceable process. With increased attention on emergency planning resulting from COMAH legislation, the use of such a systematic method would provide a valuable complement to emergency exercises for onshore facilities. The approach enables the specific features of the facility and its command structure to be assessed removing generic and possibly unrealistic assumptions.

Coates, M. L., Kate (1989). "Offshore Drilling Rig: North Sea, Off Aberdeen, Grampian." Fire Prevention(225): p. 47.

Summary: Fire was caused by a build-up of pressure in well base causing the explosion followed by fire.

Crook, J. (1989). "The Aftermath of Piper Alpha." Fire Prevention(225): p. 28-32.

Summary: July 6, 1988, was the date of the offshore oil industry explosion which killed 167 people. This incident raised serious questions about oil platform safety. The author, a technical writer, looks at how the findings of the long running public inquiry have affected design and safety procedures.

Crook, J. (1992). "Protection of Platforms from Gas Blasts." Fire International **16**(133): p. 26-27+.

Summary: Predicting explosive forces; North Sea oil platform design

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Crossland, P., A. Furnell, et al. (2005). Modelling and Assessment of an Offshore Rescue Vessel, Halkidiki, Greece, American Society of Mechanical Engineers, New York, NY 10016-5990, United States.

Summary: BP Exploration has developed a new concept in providing safety cover for personnel working on offshore installations. The concept involves the use of a new design of rigid inflatable boat, which can be deployed in emergencies to recover casualties from the water, sustain their life and then return them to a surgical facility for primary care. This paper describes the innovative trials run by QinetiQ in order to simulate elements of the vessel and to build a more complete picture of its usability and operational capability. The team has taken a total systems multi-disciplinary approach to the solution, encompassing offshore engineering, surgical expertise and ergonomics. The trials encompass the retrieval of casualties from a wave tank onto an afterdeck mock-up, their treatment under conditions of motion in a large displacement motion simulator and the flow of casualties within a mock-up of the vessel. The paper describes how the data gathered from these trials was then integrated to allow an appreciation of likely casualty handling capability of the vessel. Copyright © 2005 by ASME.

Drangeid, S. O. (2003). "Will Stricter Regulations Improve Disaster Management? A Discussion of the Norwegian Petroleum Directorate's Experience with the Use of Functional Legal Requirements." International Journal of Emergency Management **1**(2): p. 268-277.

Summary: n/a

Echternacht, J. E. (1981). Gaseous Fire Protection Extinguishing Agents for Offshore. Boston, MA 8 p.

Summary: n/a

Evans, D. D. (1984). Control of Blowout Fires with Water Sprays. Washington, DC 95 p.

Summary: n/a

Fleming, M., R. H. Flin, et al. (1998). "Risk Perceptions of Offshore Workers on Uk Oil and Gas." Risk Analysis **18**(1): p. 103-110.

Summary: n/a

Flin, R., P. O'Connor, et al. "Spe 46766 Crew Resource Management for Offshore Teams: Lessons from Aviation."

Summary: n/a

Flin, R., K. Stewart, et al. (1996). "Emergency Decision Making the Offshore Oil and Gas Industry." Human Factors **38**(2).

Summary: n/a

Flin, R. H. and G. M. Slaven (1996). "Personality and Emergency Command Ability " Disaster Prevention and Management **5**(1): p. 40-46

Summary: n/a

Flin, R. H. S., Georgina M. (1992). "Emergency Command Responsibilities of Offshore Oil Installation Managers." Diaster Management **4**(4): 197-201.

Summary: n/a

Gowar, R. G. (1978). Developments in Fire Protection of Offshore Platforms.

Summary: n/a

Hjertager, B. H., S. Hoiset, et al. (1998). "Properties of Simulated Gas Explosions of Interest to the Structural Design Process." Process Safety Progress **17**(4): p. 278-287.

Summary: The article describes the EXSIM gas explosion simulation software.

Kirk, D. (1991). "Offshore Emergencies." Emergency **23**(3): p. 34-37

Summary: n/a

Lofstedt, R. E. R., Ortwin (1997). "The Brent Spar Controversy: An Example of Risk Communication Gone Wrong." Risk Analysis **17**: 5.

Summary: Brent Spar was an oil storage buoy which was no longer used, therefore, it was sunk in the U. K. offshore waters. This action caused an international uproar. It became an international environmental crisis.

Maas, P. (1999). The Terrible Hours : The Man Behind the Greatest Submarine Rescue in History. New York, HarperCollins Publishers.

Summary: On the eve of World War II, America's newest submarine plunged out of control to the ocean bottom during a test dive. Miraculously, thirty-three crew members remained alive.

Moxie Media Emergency Platform, Rig and Vessel Abandonment. New Orleans, LA Moxie Media, Inc. n.d.

Summary: n/a

National Transportation Safety Board (1996). Fire on Board the U. S. Modu Rowan Odessa, Gulf of Mexico, December 1, 1994. Washington, DC 5 p.

Summary: This brief report explains the accident that resulted when workers struck and ruptured a submerged natural gas pipeline while positioning a mobile offshore drilling unit, the ROWAN ODESSA, in the Gulf of Mexico. Escaping gas ignited, engulfing the drilling rig in flames. The rig manager remains missing and is presumed dead. Damages to the drilling unit and the pipeline were estimated at $13 million. As a result of its investigation of this accident, the Safety Board made one new safety recommendation and reiterated one safety recommendation to the U. S. Coast Guard.

O'Connor, P. and R. Flin (2003). "Crew Resource Management Training for Offshore Oil Production Teams." Safety Science **41**(7): 591-609.

Summary: n/a

Pate-Cornell, M. E. (1995). "Managing Fire Risk Onboard Offshore Platforms: Lessons from Piper Alpha and Probabilistic Assessment of Risk Reduction Measures." Fire Technology **31**(2): p. 99-119.

Summary: n/a

Rushbrook, F. (1979). Fire Aboard: The Problems of Prevention and Control in Ships, Port Installations and Offshore Structures. Glascow, Scotland Brown Son & Ferguson, Limited.

Summary: n/a

Shaluf, I. M. and F. l.-R. Ahamadun (2008). "An Overview on the Offshore Emergency Response Planning in Malaysia." Disaster Prevention and Management **17**(1): p. 83-93.

Summary: n/a

Shetty, N. K., D. M. Deaves, et al. (1996). Unified Methodology for Fire Safety Assessment and Optimal Design, Florence, Italy, ASME, New York, NY, USA.

Summary: The paper presents a unified, fully-probabilistic approach to fire safety assessment and optimal design of fire protection on offshore topside structures. The methodology has been developed by integrating Quantitative Risk Analysis (QRA) techniques with the modern methods of Structural System Reliability Analysis (SRA) and Reliability Based Design Optimisation (RBDO). The integration has been achieved by using platform-specific 'extended' event-trees which model in detail the escalation paths leading to the failure of Temporary Refuge (TR), Escape, Evacuation and Rescue (EER) systems or structural collapse of the topside. Probabilities of events for which historical data are not generally available are calculated using structural reliability methods. The optimisation of fire protection is performed such that the total expected cost of the protection system and the cost of failure of the platform (loss of life, loss of asset, environmental damage) is minimised while satisfying reliability constraints.

Touger, H. E. (2001). "Safety at Sea." NFPA Journal **95**(5): p. 46-50.

Summary: American Petroleum Institute's (API) Recommended Practice 14G (API RP 14G), Fire Prevention and Control on Open Type Offshore Production Platforms

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Wallace, I. G. (1992). Assessment of Evacuation, Escape and Rescue Provisions on Offshore Installations, Manchester, Engl, Publ by Inst of Chemical Engineers, Rugby, Engl.

Summary: A methodology for carrying out an Evacuation, Escape and Rescue Assessment is described followed by a review of the factors which should be considered and the options available for upgrading the facilities if the assessment indicates that the success rate is not acceptable.

Williams, C. (1987). "Taking an Offshore Breather: Respiratory Equipment for Use on Rigs and Platforms." Fire **80**(990): p. 35-36.

Summary: n/a

5.15 Quarrying (2)

Anon (2003). "Safety Guide Aims to Reduce Death Toll." Mining, Quarrying and Recycling **32**(1): 24.

Summary: The safety guidelines for the quarrying industry of Ireland to reduce the death toll are discussed. These guidelines covers the duties and responsibilities of quarry operators and contractors and outlines the contents of the safety statements. Vehicles, fixed plant, falls from a height and working at the quarry face have emerged as the main causes of fatal accidents.

Anon (2004). "Safe to the Core." Fire Prevention and Fire Engineers Journals **64**(251): 16-18.

Summary: Various fire safety issues at Sellafield, a nuclear engineering facility in northwest England, are discussed. The Regulatory Reform Order maintains the risk-based approach to fire safety, initially introduced by the Fire Precautions Regulations 1997. The risk assessments under the Workplace Regulations are undertaken by Sellafield Fire Service, which conducts regular inspections throughout the site. The building risk assessments were used to develop suitable alternative protection systems. Sellafield Fire Service is a well-trained and well-equipped emergency response team which meets all the requirements for a modern fire and rescue service.

5.16 Railroad (2)

Carlisle, T. D., T. B. Kyte, et al. (2007). Rail Crew Resource Management (Crm): Survey of Teams in the Railroad Operating Environment and Identification of Available Crm Training Methods.

Summary: This report summarizes the work undertaken by the Texas Transportation Institute to document the common teams or crews that are present within the rail industry and to evaluate the existing crew resource management (CRM) training methods used in other industries for their applicability to those railroad teams. Several railroads were visited in order to identify railroad crews, and an extensive literature search was performed to classify the broad variety of CRM training methods available. Facilities of five different railroad types were visited to gain a cross-sectional picture of the teams in the rail industry. These railroads included an eastern Class I railroad, a western Class I railroad, a shortline railroad, an urban commuter railroad, and an inter-city passenger railroad. Methods of CRM training from the commercial airline industry, the military, the medical field, the offshore oil production industry, and the nuclear power industry as well as existing railroad CRM training courses were examined concerning their application to the existing teams found during the site visits. Recommendations regarding the appropriate training methods for each railroad team are then made.

Ruegger, H., T. Schaub, et al. (1977). "Die Loesch- Und Rettungszuege Der Schweizerischen Bundesbahnen. Left Bracket Fire-Extinguishing and Rescue Trains of Swiss Federal Railways Right Bracket." Zeitschrift fuer Eisenbahnwesen und Verkehrstechnik - Glasers Annalen **101**(2): 57-61.

Summary: In 1976, Swiss Federal Railways have placed into service ten fire-extinguishing and rescue trains. The trains are equipped for operation in tunnels, under smoke and heat, for fire fighting with water, foam and powder. The breathing equipment of the rescue car is designed to supply 60 persons with air for more than three hours. The vehicles and the equipment are described.

5.17 Space (3)

Agencies, F. "Working in Confined Spaces." National Aeronautics and Space Administration.

Summary: n/a

Kubicki, D. J. (1981). "Fire Protection and Rescue Planning for the Nasa Space Shuttle." Fire Journal (Boston) **75**(4): 34-40.

Summary: This article gives an overview of the planning, identifies and explains specific fire protection features and systems, and relates general fire proection engineering concepts to the firesafety strategies of the space program.

Orasanu, J., Y. Tada, et al. (2005). Physiological Monitoring of Team and Task Stressors, Orlando, FL, United States, International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States.

Summary: Sending astronauts into space, especially on long-durations missions (e.g. three-year missions to Mars), entails enormous risk. Threats include both physical dangers of radiation, bone loss and other consequences of weightlessness, and also those arising from interpersonal problems associated with extended life in a high-risk isolated and confined environment. Before undertaking long-duration missions, NASA seeks to develop technologies to monitor indicators of potentially debilitating stress at both the individual and team level so that countermeasures can be introduced to prevent further deterioration. Doing so requires a better understanding of indicators of team health and performance. To that end, a study of team problem solving in a simulation environment was undertaken to explore effects of team and task stress. Groups of four males (25-45 yrs) engaged in six dynamic computer-based Antarctic search and rescue missions over four days. Both task and team Stressors were manipulated. Physiological responses (ECG, respiration rate and amplitude, SCL, EMG, and PPG); communication (voice and email); individual personality and subjective team dynamics responses were collected and related to task performance. Initial analyses found that physiological measures can be used to identify transient stress, predict performance, and reflect subjective workload. Muscle tension and respiration were the most robust predictors. Not only the level of arousal but its variability during engagement in the task is important to consider. In general, less variability was found to be associated with higher levels of performance. Individuals scoring high on specific personality characteristics responded differently to task stress.

5.18 Trench (2)

Mills, S. (2003). "Trench Rescue: The Basics." Fire Engineering **156**(12): 78-81.

Summary: The difficulties in trench rescue, not typical response for many fire departments, are discussed. The risk for emergency personnel responding to a trench accident is very high. The Occupational Safety and Health Administration (OSHA) specifies that employees working in excavations should be protected from potential cave-ins by a protective system. NFPA 1006, Standard for Rescue Technician Professional Qualifications, contains provisions for the rapid, nonentry rescue of victims. Rest and rehabilitation are essential for rescuers to reduce rescuer fatigue and prevent injuries in trench rescue operations. The incident management system and accountability system in the trench rescue operation will ensure the availability of sufficient personnel.

O'Connor, A. (2005). "Trench Rescue Lessons Learned." Fire Engineering **158**(9): 85-90.

Summary: The experience of a Trench Rescue team while rescuing 21-year-old construction worker who was caught in a trench collapse and nearly lost his life, is presented. When the team arrived on-scene, the victim was in a 12-foot trench buried up to his chest. The victim was finally strapped to backboard and put into a rescue basket. The team felt that on several occasions when things started to get out of control, everybody was reminded of their respective in-charge operations. In many situations, a trench rescue could be augmented by the use of a vacuum cleaning truck. The use of the incident command system, as much personnel to the scene as possible, plan for getting the victim out of trench once he is freed, are all essential for a successful operation.

5.19 Tunnel (15)

Allsop, E. (1997). "Confined Space Rescue and Collapsed Tunnel Course " Fire Engineers Journal **57**(September): 10-11.

Summary: n/a

Blitch, J. (2002). "Robot Intelligence for Tunneling and Confined Space Search and Rescue." NIST Special Publication: 309.

Summary: n/a

Boer, L. (2003). "Behavior of Drivers During Tunnel Evacuation." (Re) claiming the Underground Space: Proceedings of the ITA World Tunnelling Congress 2003, 12-17 April 2003, Amsterdam, The Netherlands.

Summary: n/a

Boer, L. and S. van Wijngaarden (2004). "Directional Sound Evacuation from Smoke-Filled Tunnels." Proceedings of the first International Symposium, Safe and Reliable Tunnels Innovative European Achievements: 4-6.

Summary: n/a

Collins, L. (2004). "Close Call in Trench/Excavation Rescue." Fire Engineering **157**(9): 51-62.

Summary: The ocasional failure of measures and laws indended to protect workers in trenches and excavation is discussed. An Incident Action Plan (IAP) was included for extra precautions to ensure maximum personnel safety and redundant safety to avoid collapse in the trenches. The IAP was a rescue plan developed by USAR captains having the strategy to stabilize the excavation to prevent collapse onto resuers and to create a series of safe zones leading to the victim's location. The rescue plan included several contingencies in case of unexpected events such as secondary collapse causing entrapment of firefighters, rupture of water mains and other utilities.

Daley, M. (2004). "Trench Collapse Response for Initial-Alarm Companies." Fire Engineering **157**(10): 107-112.

Summary: The specific actions that first-in companies should take to help ensure a successful rescue in case of trench collapse are discussed. First-in companies at a trench collapse with a trapped victim can help prepare the scene for the arrival of technical rescue team. All personnel working around the trench area must be cleared, and all equipment working on-scene should be shut down and locked out to minimize vibration around the collapse. Advanced life support resources and law enforcement should be called to the scene in addition to the technical rescue team.

Fermaud, C., E. Maerki, et al. (1997). "Rendering the Swiss Railway Alptransit Safe." Tunnelling and Underground Space Technology **12**(3): 369-375.

Summary: The safe operation of AlpTransit, a part of the planned European high-speed railway network, is a consequence of influencing factors related to construction, railway technology, and rolling stock. On the human side, operational and organizational guidelines concerning rescue measures and the adequate behaviour of people involved are equally important. The safety concept described in the paper governs and coordinates the safety planning within the different special fields and problem areas.

Gao, G., B. Yan, et al. (2006). An Accident Prevention and Emergency Rescue System for Expressway Tunnels, Pretoria, South Africa, Document Transformation Technologies cc., Irene, 0062, South Africa.

Summary: Using the idea of safety management for the technical transmission of modern traffic and network information as the basis, this paper sets up a traffic accident prevention and emergency rescue system for expressway tunnels, which is an important means of improving the safe operation and management of expressway tunnels. According to the characteristics of traffic accidents in expressway tunnels, the traffic accident prevention and emergency rescue system administration, consisting of a supervision layer, an infrastructure layer, a shared layer and a value-added service layer, is an integrated, comprehensive, systematic platform which incorporates data communication, database and GIS into an organic whole and has a certain intelligence function. This paper then studies the framework of an accident prevention and emergency rescue system for expressway tunnels and describes the primary function modules and workflow. Finally, the paper examines the Shaoguan tunnel of the Jing-zhu expressway in China and puts forward some constructive suggestions for setting up an accident prevention and emergency rescue system.

Haack, A. (1992). "Fire Protection in Traffic Tunnels - Initial Findings from Large-Scale Tests." Tunnelling and Underground Space Technology **7**(4): 363-375.

Summary: As the number and length of road and rail tunnels increases and more people use them, fire safety issues take on ever greater importance. In order to improve fire protection in subsurface traffic facilities, eight Western European nations have joined Germany in undertaking a comprehensive study of fire in such facilities. Laboratory tests and tests conducted in existing tunnels are being carried out in Germany, Finland and Norway, with the overall objective of investigating the possibilities for optimal protection of people and preservation of property in the event of fires in subsurface transportation facilities.

Jain, S., T. P. Sharma, et al. (2004). Comparative Study of Fire Safety Measures in Long Distance Road Transport Tunnels, Shanghai, China, Science Press, Beijing, 100717, China.

Summary: Tunnels are being used through out the world for transport. They play an important role in developing new networks and development of economies. However, accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs. Till late 80's there had been no formal guidelines for the safety features to be installed in the tunnels. All the tunnels had different features depending upon their requirements. NFPA - 502, 'Standard for Road Tunnels, Bridges, and Other Limited Access Highways' evolved into a code in 2001. In December 2002, The European Commission proposed a new directive on 'Safety in European Road Tunnels'. In this paper details of Autostrada tunnels, Italy, St Gotthard Tunnel, Switzerland, Seelisberg Road Tunnel, Switzerland, Frejus Road Tunnel, France and Italy, The Mont Blanc Tunnel, France and Italy are studied. A comparative study of these tunnels with respect to length, purpose, location, type of construction, ventilation systems, fire detection and suppression systems etc. is done. This is then compared with NFPA 502 and proposed directive of European Commission, based on which an attempt is made to formulate general safety guidelines.

Jioras, R. J. (1991). Validation of Tunnel Rescue Incident Command System: A Case Study - Metro Rail Tunnel Fire, Los Angeles, Ca, July 13, 1990. Emmitsburg, MD, National Fire Academy.

Summary: In 1981, the City of Los Angeles began design of a transit system to address traffic congestion. For 50 years, all mass transit within the City traveled on the surface streets. The new design brought back travel in a subway system. For the Fire Department, a subway system presented emergency and firefighting problems not encountered for ½ a century. Waiting for such a project to become operational before becoming involved was courting disaster. By requiring Fire Department involvement from the design phase of the "Metro Rail" project, fire/life safety systems were designed into the project and operational procedures were developed. As design moved into construction, the Los Angeles Fire Department developed and trained on the "new" Tunnel Rescue I.C. System. Although the concept in practice, the system had never been validated at a real incident. On July 13, 1990, a fire occurred in a metro rail tunnel under construction. The incident allowed for the implementation of the tunnel rescue I.C.S. and as was an accurate test of the operational effectiveness and the resource needs of the system. The incident also was a testimony to the ability of the fire service to preplan for unique situations, as well as demonstrating the effectiveness of a flexible I.C.S. by integrating a situation specific sub-system. In addition to the operational aspects of the tunnel rescue I.C.S., this study demonstrates that the Fire Service must not allow technology to overcome it, but must constantly be moving into the future through planning, training and foresight.

Liu, H. and D. Yang (2004). Gis-Based Mine Ventilation Network and Safety Analysis, Anchorage, AK, United States, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ 08855-1331, United States.

Summary: The paper constructed the mine ventilation network model using the powerful function of attributes management, display visually and spatial analysis of GIS based on the character study of GIS and mine ventilation network. The mine ventilation network model we put forward in this paper is a COM-based extension of the Geo-network of Arclnfo. In mine ventilation network model, specified result can be obtained by defining weigh values for attribute fields as the constraint condition. It is of great importance for mines to determine the best rescue and leaving route by mine ventilation network route analysis, node analysis and loop analysis when mine accident happens. By the mine ventilation network model we put forward in this paper, the best rescue and leaving route can be implemented in a short time. The research achievement is used successfully in ShiGejie mine, Shanxi Province of China. The application result shows the feasibility of the study achievement.

McClung, C. (2002). "Tunnel Rescue - a Systematic Approach " Fire & Rescue(July): 29-31.

Summary: n/a

Sargent, C. N. (1988). "Tunneling Tenets: Performing Underground Rescue Operations Safely " Firehouse **13**(March): 50-52.

Summary: n/a

Vogel, M. and H. P. Rast (2000). "Alptransit-Safety in Construction as a Challenge: Health and Safety Aspects in Very Deep Tunnel Construction." Tunnelling and Underground Space Technology **15**(4): 481-484.

Summary: After a brief presentation of the AlpTransit projects (Gotthard and Lotschberg base tunnels) special aspects of safety and health protection are discussed: access via deep shafts, rock pressure, ingress of water and mud, ventilation, cooling, fire protection, escape routes and rescue. Medical aspects of climate and ventilation are discussed as dust and diesel soot emissions, blast fumes and hazards resulting from the shotcreting process. The preparation of safety concepts and comments on the planning and drawing up of safety measures are presented. © 2001 South African Institute of Mining and Metallurgy. Published by Elsevier Science Ltd. All rights reserved.

5.20 Water Well (1)

Hogan, J. (2003). "Is Your Fire Department Prepared for a Well Rescue?" Water Well Journal **57**(7): 54.

Summary: The importance of pre-rescue planning of fire departments in well rescue is discussed. The local fire departments must be aware of well drilling operations, so as to preplan for any emergencies. The fire departments generally do not have the required equipments, budgets and methodologies to prevent any accidents during the well drilling.

5.21 9/11 (4)

Plum, J. (2003). Careers in Police Departments' Search and Rescue Units. New York, NY, Rosen Central.

Summary: Discusses the history of search and rescue work by police departments, requirements of becoming a police officer, and the roles various police departments played during and after the events of September 11, 2001.

Roza, G. (2003). Careers in the Coast Guard's Search and Rescue Units. New York, NY, Rosen Central.

Summary: n/a

Trainor, J. E. Searching for a System: Multi-Organizational Coordination in the September 11th World Trade Center Search and Rescue Response

Summary: The objective of this study is to examine the inter-organizational effectiveness of the Incident Command System (ICS) in the *formal* Search and Rescue (SAR) response to the September 11th attacks on the World Trade Center. In order to accomplish this, a network analytic database of interactions, created at the Disaster Research Center, was gleaned from sources such as federal and local situation reports, newspapers, and a variety of other official and public sources. Using these sources as a conceptual whole, this research effort has produced a snapshot of the social organization of the response system in a network analytic form. In addition to that database, this paper also uses a series of notes and personal accounts resulting from over two months of rapid-response field research conducted by members of the DRC during an extensive project examining the response to the September 11th World Trade Center attacks. As a third source of data, this study also draws on a series of in-depth interviews conducted with key response personnel and a focus group discussion conducted with a search and rescue team that was part of the response. The combined use of network analytic tools informed by a qualitative understanding of the nature of interactions provides a better understanding of the implications of ICS organization on *Formal* Response Systems. The study findings suggest that ICS is not a universally applicable organizational form, but does have value in some response areas. Potential Implications of the application of ICS organization and actual problems responders encountered during the 911 SAR response are also discussed.

Wachtendorf, T. Improvising 9/11: Organizational Improvisation Following the World Trade Center Disaster.

Summary: Using the response to World Trade Center disaster as a case study, this research focuses on the interplay between organizational persistence and collective behavior emergence at the multi-organizational level. It explores the ways in which organizations engage in collective sense-making and improvised action under time constraints in ambiguous and turbulent environments. Analyses draw upon literature in disaster sociology; organizational theory; structuration theory; and jazz and theatre improvisation models. Findings are based on two months of systematic observation at key response locations in New York City following the attacks, in-depth interviews with decisionmakers and responders, and an extensive analysis of documents. Research suggests that organizations engage in collective sense-making when faced with uncertainty and the need to act under time constraints. In doing so, they draw upon plans and experience and take cues from one another and the broader social environment to define emerging needs.

Through this process, organizations determine whether they will maintain organizational continuity, shift to contingency plans, or instead engage in one of three forms of improvisation: 1) reproductive; 2) adaptive; or 3) creative. Reproductive improvisation is exemplified in this study by the reestablishment of the New York City Emergency Operations Center after the original facility was destroyed. Adaptive improvisation is illustrated by an examination of the credentialing and badge identification system.

Creative improvisation is discussed within the context of the activities surrounding the complex remains recovery and debris removal operation that emerged at the Fresh Kills Landfill site. Each improvisational form results from combinations of facilitators and impediments, such as a shared vision, the stability of other response elements, pressures to maintain existing systems, the diversity of response repertoires, the unanticipated consequences of previous improvisational activity, the relaxation of norms that would otherwise constrain organizational action, and the ability to interpret social cues. Although the sociological literature often uses the concept of improvisation broadly to describe unplanned-for novel actions, a closer examination points to variations in forms, objectives, and outcomes of improvisation. The study concludes with a discussion of the typology's implications for disaster policy and for understanding improvised collective action in both crises and non-disaster environments.
