ISSUES FOR TRAINING AN EVOLVING EMERGENCY MANAGEMENT WORKFORCE: A VIEW FROM THE U.S. MINING COMMUNITY

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1.0 Abstract

This paper reviews research from the U.S. mining community to define issues relevant to an evolving national and international workforce and to relate them to the emergency response population. The authors further explore and relate the key problem of an aging workforce to the resultant changes and emerging physical and psychological needs of emergency workers. Finally, the authors cite examples from the mine emergency response community and mine rescue experiences to suggest practical recommendations that include both organizational and individual formats, with an emphasis on new approaches to training this changing workforce.

2.0 Introduction

2.1 An aging world

The world population of the 21st century is changing rapidly, aging at a dramatic rate. The speed of population aging is attributed to three principal factors: First is the secular decline in fertility rates, which has the effect of gradually increasing the ratio of older to younger people in a population. Second is the decline in mortality rates attributed to advances in public health, medical technology, and standards of living. The third factor is what is usually referred to as the "baby boom," a temporary rise in post-World War II fertility rates (National Research Council 2001). As this cohort ages, it accelerates the overall aging of populations in various countries of the world. As recent articles in the print media suggest, the retirement of these so called "baby-boomers" will greatly impact various industries worldwide and nationwide (*Wall Street Journal*, January - June 2001; *Associated Press,* 2001; Cines, 2001; *Federal Employee News Digest,* 2001). The overall picture is of a world, and especially a nation, with changing, aging, and soon-to-retire workers.

This projected increase in older people provides for a number of challenges to the workforce. Usually population changes appear gradually over time and consequently policy makers can

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recognize and appreciate a certain degree of predictability. At this stage of history, however, the change is not so gradual. Recognizing the rapid aging of the present population can help to prepare for trends to come in the workforce. In the future, there will be a slower growth rate in the workforce, due to fewer workers. The declining labor force involvement of older people in many parts of the world is one of the most dramatic economic trends of the past forty years (National Research Council 2001).

The National Research Council (2001) in its "Preparing for an Aging World" report asked, "Is there a 'crisis of aging' worldwide?" (p. 17). In the year 2000, the net balance of the world's elderly population increased more than 750,000 each month. Two decades hence, the net increase likely will be on the order of 2 million per month (US Bureau of the Census, 2000).

Taking into consideration the difference between industrialized and developing nations, the point remains that most societies are aging. Given this difference, one way to look at population aging is to consider the median age of a country - the age that divides a population into numerically equal parts. While nearly all industrial countries are above the 31-year old level, developing nations have median ages under 25. Yet, in developing countries such as China, South Korea, and Thailand, where fertility rates have fallen precipitously, the median age is rising rapidly, and could exceed 40 by the year 2025.

2.2 An aging United States workforce

What is the definition of an aging worker? It is suggested that the definition is more situational than chronological, as there is considerable debate on the concept of older workers defined by age alone, whose ages may vary from 40 to 75. In the United States, the National Institute for Occupational Safety and Health reports that the number of workers aged 55 and older is expected to grow twice as fast as the total workforce for the next several years (Kisner and Pratt, 1997). Current Federal policy encourages Americans to retire at older ages than previously and makes it legally possible for all older workers to remain employed, regardless of their chronological age, for as long as they possess the ability and desire to work (Kovar and LaCroix, 1987). A substantial number of older workers return to work after retiring from one job. In fact, Castillo and Rodriguez (1997) report that from one-fourth to one-third of retirees return to the labor force.

Research has shown that injury patterns differ for older workers. Generally, older workers have lower nonfatal injury rates than younger workers, but once injured, older workers tend to have poorer outcomes than younger workers, with longer absences from work and higher fatality rates (Fotta and Bockosh, 2000; Laflamme et al. 1996, Kisner and Pratt, 1997, Layne and Landen, 1999).

Given these trends, how will changing demographics and a tendency toward differing injury patterns affect the international emergency management community? The United States mining industry provides an excellent example, in its mine rescue operations, of the issues presented by an aging emergency response community. The issues identified, questions raised, and recommendations made should provide a "heads up" for emergency management policy makers, educators, and workers world-wide.

3.0 Age and The First Responder Community

There is evidence that emergency response personnel in the United States are starting to feel the effects of an aging workforce. In the summer of 2001, The Federal Firefighters Retirement Age Fairness Act was passed which raised the retirement age from 55 to 57 for Federal firefighters. Some of the reasons the bill passed include the need for experienced firefighters on the line and in management positions, the lengthy training required for senior fire management positions, a tight

federal workforce, and the fact that Americans are living longer (Fire Chief, News & Trends, August 6, 2001).

Even with this increase, however, Federal employees are retiring long before some city firefighters. In May of 2000, the Chicago City Council reinstated a mandatory retirement age of 63 for police officers and firefighters (City of Chicago Homepage, Office of the Mayor). The Council expected the change to force the retirement of approximately 45 firefighters and about 100 police officers. According to Mayor Daley, "Police officers and firefighters have physically demanding jobs. It's not fair to them - or to the people they protect - to let them continue past an age when their physical skills tend to deteriorate." He added, "We may lose some capable people, but there is no fair and legal way to require some to retire, but not others."

This same retirement issue was at the heart of a recent labor dispute between firefighters and the city of Bristol, Connecticut (BristolPress.com, January 29, 2001 and February 20, 2002). Two firefighters filed grievances after they were asked to retire because they were at or near the age of 65. "The case involving the men is the result of a grievance filed by the firefighters union, Local No. 773, on behalf of the firefighters named on the promotion list for lieutenants, who are essentially next in line for (one of the older men's) position ... The union's position is that we agreed, the union and the city, in a binding contract that 65 be the retirement date ... it's a public safety issue."

Whether or not retirement is forced, questions are being asked about the abilities of older firefighters to fulfill their duties. An article in the December 2001 issue of *Fire Chief* discusses the issue from a physiological standpoint (Steven Loy, Fire Chief, Dec. 1, 2001). The author recognizes that not all individuals age at the same rate, but points out that everyone does go through physical changes as they age. Physiologic system changes that he thinks are important for firefighters are: maximum oxygen consumption, muscle strength, and body composition. He comments, "It's apparent that we must encourage our [firefighters] to perform their cardiovascular and strength exercise programs. If we don't, there will be a decline in performance. Even if they do continue their programs, there will still be a decline but it will likely be much more gradual in nature." And while he encourages fitness programs to keep firefighters working as long as possible, he suggests "there's an absolute amount of fitness necessary for the job to be done well. It's not enough that you're in relatively good shape for a 58-year-old. Firefighting has an absolute factor."

The need for experienced emergency response professionals and for physically fit responders might not be at odds if the older experienced personnel were working with, and training, younger more physically fit responders. But the aging and shrinking labor market, and perhaps budgetary constraints, prohibit this from happening in some locations. The median age of firefighters in 2001 in the U.S. was 38.2 years (U.S. Bureau of Labor Statistics, unpublished employment data from the Current Population Survey). The same data show that approximately 62 percent of firefighters were 35 years old or older in 2001. In Canada, a similar situation exists. Job Futures 2000 reports that 45.3 percent of police officers and firefighters are 40 years old or older (http://jobfutures.ca/jobfutures/noc/626.html). It is likely that response personnel in other industrialized nations have similar demographics. "Out of the countries represented [(at a 1991 seminar)] (Germany, France, Sweden, the Netherlands), the perspectives for the development of the working population's age structure suggest that from about the year 2010 onwards, close to 40 percent of the population will be ages between 45 and 65" (Paoli, 1994, p. 5).

While it is not certain that the workforce in the emergency response professions will follow other labor force projections, it is likely that these groups of workers will experience trends in relation to age similar with the general population and other workforce categories. The median age of the U.S. population is expected to increase from 44.2 in 2000 to 44.7 in 2010. The median age of the labor

force is projected to increase from 39.3 in 2000 to 40.6 in 2010 (Fullerton and Toossi, 2001, p. 36). "Over the 1998 to 2008 period, the oldest 'baby boomers' will turn from 52 to 62. After 2008, as more and more baby boomers reach retirement age, the impact of their retirements will continue to grow" (Brownfield, 2001, p. 6). The statistics suggest that the age of firefighters (and probably other response professionals) in the U.S. will increase over at least the next decade. The issues related to this aging of the population will also continue to grow in importance.

4.0 The U.S. mining industry

4.1 An aging mining workforce

The U.S. mining industry is a microcosm of this national and international aging trend. In fact, the trend is amplified in the mining industry due to a mining boom in the 1970s that necessitated the hiring of a large number of workers, most of whom were in their twenties. In the 1980s and 1990s, the mining process became increasingly capital-intensive, with downsizing and layoffs that resulted in a scarcity of younger new-hires. Thus, the cohort hired in the 1970s has remained the majority of the workforce, and they are aging. In 1998, the median age of a coal miner in the United States was 45.2 years (Fotta and Bockosh, 2000), and the median age continues to increase. Thus, the issue of aging workers, and particularly its relationship to the issue of emergency response in the mining industry, has been described as critical.

An aging workforce in a strenuous industry raises questions about an increase in fatal injury rates, longer injury-recovery times, and more time lost due to non-mining related medical concerns. Factors such as reduced stamina, flexibility, and strength need to be considered when designing equipment, planning maintenance, or setting protocol for mine safety and rescue procedures. Increases in chronic ailments such as back pain and deteriorating vision may also be important limitations.

4.2 Mine emergency response issues

Mining has a long history of disaster and organized emergency response. By U.S. law (Mine Safety and Health Act of 1977), every operator of an underground mine now must ensure the capability for emergency mine rescue and recovery. The mine operator may do this by establishing two mine rescue teams (each with five members and one alternate) that will be available when miners are underground, or the operator may enter into an arrangement for mine rescue services. Pursuant to this arrangement, the Act also provides for the establishment of mine rescue stations that have a centralized storage location for mine rescue apparatus and equipment.

It was determined, by the 1977 Act, that any mine served by a mine rescue team may not be more than two hours ground travel time from the associated mine rescue station. Small mines (those having fewer than 36 workers) or remote mines can, upon approval, establish alternate mine rescue arrangements (http://www.intminerescue.org).

While mining states may still be able to muster enough teams to comply with the law, there are currently no resources to spare. Since the early 1980s, many underground mines across the United States have closed. Most of these mines had at least one mine rescue team made up of miners who worked at the operation. Because of these closings, there has been an associated reduction in the number of miners, and subsequently, a decrease in the number of trained mine rescue members. The same process has also reduced the pool of potential members. In response to this problem, in July of 1992, a committee of Federal and Pennsylvania state personnel was formed to consider the status of mine rescue in Pennsylvania. The committee made the following assessment:

> Mine rescue coverage in Pennsylvania meets the requirements spelled out in Code of Federal Regulations, Title 30, Part 49. It does so with almost no reserve

> capacity, and a great reliance on Federally supplied, State Grants funding. Over two thirds of the mines in Pennsylvania rely on state trained and maintained teams for mine rescue coverage. If anything were to happen that would reduce the number of state teams or rescue stations, many mines would be unable to comply with CFR Title 30 requirements. It is also unlikely, as the situation currently exists, that sustained or multiple efforts at mine rescue could be made without assistance from out-of-state teams (http://www.dep.state.pa.us).

In other words, human resources are stretched thin, and backup support for any extended operation, if it could be found, would involve travel from great distances.

The Pennsylvania committee also noted specific concerns in the mine rescue infrastructure within the state, including a lack of information about rescue equipment availability and location. There are also unanswered liability and payment questions associated with mine rescue activities. Team members are insured by their employer while in their own mines, but a rescue operation by a mine team in another employer's mine may not be insured. Thus, Pennsylvania state teams are losing team members, and other privately maintained teams are also in jeopardy. Finally, the workforce and the rescue teams are aging (with an average age in the early 40s in 1992) (Bureau of Deep Mine Safety, 2002).

As a result of the above issues, a concern exists that there may not be enough adequately trained and equipped teams to meet the needs of an emergency. Basically, there are fewer and fewer mine rescue teams, and as experienced mine rescue personnel retire, the knowledge they have accumulated is going with them (Peterson et al., 2001).

5.0 Practical Suggestions

Researchers at the National Institute for Occupational Safety and Health have been examining the issue of aging miners, focusing not just on recruitment and retention but looking also at future concerns for miner safety (Kowalski et al. 2001). And, while recruitment and training new workers is important, maintaining the older worker has become an emergent issue. Organizations are experiencing an attitudinal change as the importance of training older workers is getting more attention. It has been suggested that with training to maintain, enhance, or update skills, older workers can continue to be very productive (Stein and Rocco, 2001). Older workers are viewed as assets in terms of work ethic, reliability, accuracy, and stability. Adaptation of the work environment and work practices, plus a re-examination of training methods and content can be a fiscally sound, production-oriented business decision.

5.1 Mandatory mine emergency response training

U.S. regulations (MSHA 2000) stipulate the minimum training requirements for mine rescue team members. Members must complete an initial 20 hours of instruction on the use, care, and maintenance of the type of breathing apparatus to be used by their team. They must also receive at least 40 hours of refresher training each year. This training must be given at least 4 hours each month or 8 hours every two months. The refresher training must include, among other subjects, underground training sessions at least once every six months and the wearing of breathing apparatus for at least two hours every two months.

5.2 Nature of traditional mine emergency response training

With the exception of the mandatory underground training, much of the required annual refresher training for rescue teams is conducted either in the classroom or in large open areas outdoors. The outdoor sessions, during which mine rescue teams don their breathing apparatus and other equipment, are designed to train the teams for participation in mine rescue contests. In an outdoor

setting such as a soccer field, teams of six rescuers work to solve a theoretical mine rescue problem in which "trapped" miners are involved and must be rescued.

While training for mine rescue contests does provide a framework for teams to practice and improve their skills, this training falls short, because the exercises are not conducted in realistic settings. Teams ordinarily practice (and compete) under conditions of good footing, unconfined space, unlimited height, optimal lighting, and clear air. In the past, team members' formal training was enriched by their many contacts with others in the mine rescue community who had responded to numerous emergencies and had stories to tell about what to expect when rescue teams enter mines where there is mud, water, unfavorable geologic features, smoke, dangerous gases, and seam heights of 90 cm or less. With the passing of those who had real-life experience to hand down, and the increasing scarcity of both teams and events to respond to, the industry has begun to look for ways to enhance the training experience.

5.3 Real-world simulation training

Considering quality hands-on training to be crucial for the remaining mine rescue teams, a number of entities in the United States have turned to real-world simulation training conducted underground (Conti et al., 1998, 1999). During these simulation exercises, rescue team members don their self-contained breathing apparatus and then travel more than 300 m in mine passages filled with non-toxic smoke. Visibilities range from 0.3 m to 0.5 m during the simulations. A kerosene heater is typically used to simulate fire, reduce the ambient oxygen concentration, and produce increased levels of carbon monoxide. Among other activities, teams must search for victims, construct temporary ventilation devices, administer first aid, rescue injured miners, connect hose, and fight a conveyor belt fire. In several of the simulations, rescue teams have to crawl through a ventilation tube that is 6.1 m long and 81cm in diameter. This obstacle was designed to simulate low mine roof conditions and is the only way into and out of the other mine passageways. Although this type of training is both physically and emotionally demanding, it does simulate the type of real-world conditions and situations mine rescue teams encounter.

5.4 Some implications for real-world simulation training

The aging of the mine rescue team population at a time when a scarcity of teams has generated a call for more realistic training certainly has implications for emergency response. Real-world simulation training is physically demanding. Team members spend two to three hours wearing their self-contained breathing apparatus and perform difficult tasks in grueling, even if simulated, conditions. A recent discussion with a Pennsylvania Bureau of Deep Mine Safety mine rescue trainer revealed that two older members of his team are considering retiring from mine rescue in the near future because of the physical demands of the work. As the population continues to age, one can expect more mine rescue team members to exit this activity.

6.0 Discussion/Recommendations

On January 27-28, 1995, some 280 people attended a Mine Emergency Preparedness Conference held at the National Mine Safety and Health Academy in Beckley, West Virginia. The participants, who came from across the United States and several foreign countries, included personal protective equipment manufacturers, mining industry officials and labor representatives, State and Federal mining personnel, educators, and mine rescue team members. These individuals were convened in multiple working groups to offer recommendations for improving mine emergency response. Their recommendations, contained in a report issued by the Mine Safety and Health Administration, addressed seven issues related to mine rescue (http://www.msha.gov/MEDIA/PRESS/1995/NR950526.HTM): the composition of mine rescue teams; how to finance the mine rescue function;

regulatory requirements; rescue equipment; communications and counseling responsibilities; maximizing the effectiveness of mine rescue contests; and liability issues.

In essence, the Mine Emergency Preparedness Conference echoed many of the concerns raised by the Pennsylvania committee a few years before: In the face of a shrinking and aging mine rescue force, there is a need for 1) more realistic emergency simulations, 2) improved mine rescue training, and 3) creation of a counseling component for traumatic incident stress related to rescue operations. It was thought that these strategies would serve to facilitate recruitment and retention.

In dynamic, physically and cognitively demanding work environments such as mine rescue and more generally, in emergency management, there are specific implications for retention. It has been suggested that the older worker today is developing a third stage of working life, the period beyond the traditional retirement age and the final disengagement from the work role (Stein and Rocco, 2001). At this stage, the older worker is an active agent negotiating various roles within the workplace. This may include part-time or mentoring work, which may be very helpful to an emergency management community. As the response community ages, it may be less able to respond quickly to the rigorous physical and mental demands of a rescue effort, but has a wealth of knowledge and experience to offer. Therefore, it is important for employers to address the special needs of this population to ensure intervention strategies and work practices that effectively protect them and keep them on the job.

Lankard (1995) suggests that numerous changes in the workplace, including increased age of employees, require a different way of thinking with respect to training. As opposed to following the traditional model of an instructor imparting knowledge to passive learners, training must allow employees to draw on experience, link concepts to real world situations, and transfer knowledge from one situation to another.

As discussed earlier, the aging workforce issue has special consequences for the emergency response community. Based on past data, present research, and recent experience in the U.S. mining community, the following measures are suggested for international emergency management policy makers:

1. Assess the emergency response community with respect to the issue of aging and of turnover trends due to an aging workforce.
2. Develop a plan to address the issue in recruitment strategies.
3. Incorporate specific programs aimed at the aging worker such as physical conditioning, real-world simulation training, modified emergency response equipment, technologies such as thermal imaging and light sticks to enhance responder effectiveness, and enhanced personal protective equipment.
4. Develop a method to capture the experience and knowledge of the older responder before it is lost.
5. Encourage mentoring relationships either formally or informally.
6. Rethink jobs to include part-time or flexible hours for the retired emergency response expert.

Further research is needed to determine what specific interventions are effective for older emergency workers and emergency response organizations. The key point, as in any component of successful emergency management, is to adequately prepare for this predicted occurrence.

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