Testimony
Before the Committee on Health, Education, Labor, and Pensions
United States Senate

"Current Mine Safety Disasters: Issues and Challenges"

Statement of

Jeffery Kohler, Ph.D.

Associate Director for Mine Safety and Health Research
National Institute for Occupational Health
Centers for Disease Control and Prevention
U.S. Department of Health and Human Services

For Release on Delivery
Expected at 10:00 a.m.
Tuesday, October 2, 2007

Introduction

Good morning Mr. Chairman and other distinguished Members of the Committee. My name is Jeffery Kohler, and I am the Associate Director for Mine Safety and Health Research at the National Institute for Occupational Safety and Health (NIOSH), which is part of the Centers for Disease Control and Prevention (CDC), within the Department of Health and Human Services. I am pleased to be here today to give you an update on NIOSH's mine safety activities, including those that have been initiated under the Mine Improvement and New Emergency Response Act of 2006 (MINER Act).

The United States is fortunate to have an abundance of mineral resources to power the economy and the highly skilled men and women who work in the mining industry every day are our most precious resource. Mine safety has improved significantly over the years, yet the mine disasters in 2006 and the recent disaster at the Crandall Canyon Mine in Utah serve as painful reminders of the dangers inherent to this industry, and our shared responsibilities to ensure the safety and health of our mineworkers. These tragedies raise serious concerns about coal mine safety among all constituencies of the mining industry. In the wake of a mining disaster, NIOSH is available to assist MSHA and provide technical assistance and support as needed. We have a long and rich history of advancing mine worker safety and health and we remain vigilant to the practices that we recognize work to prevent future disasters.

Under the legislative mandates provided in the MINER Act of 2006, current changes are underway, and represent the most significant improvement in mine safety in three decades. New communications and tracking technologies, Self Contained Self Rescuers (SCSRs), and refuge alternatives are being developed. New and more effective training programs, emergency procedures, and mine safety practices are being designed using innovative risk analysis and management systems. Any one of these alone would improve mine safety, but in combination the effect is expected to be great. The legislative mandates have created an unprecedented environment of partnership among labor, industry, and government.

Progress on NIOSH MINER Act Activities

Under the Mine Improvement and New Emergency Response Act of 2006 (MINER Act) (P.L. 109-236), NIOSH was given the responsibility of conducting research to help develop new technologies for the survival and successful rescue of trapped miners after a mine emergency.

Inside the mine, survival hinges on the availability of safe shelter and breathable air. Above ground, because every hour counts, rescue crews need reliable and precise means of locating and communicating with those who are trying to escape or have become trapped. Specifically, the legislation gave us the responsibility for meeting these needs through research critical for developing new technologies for communication and tracking, safe refuge, and oxygen supply.

Underground mines are uniquely rugged and complex environments. In working to advance beyond current technologies for survival and communications, researchers must test their technical expertise and ingenuity against some basic laws of nature. For example, in seeking improvements in communications and tracking technologies in emergencies, we face fundamental limitations in both types of systems – wired and wireless – that are used for transmitting voices or signals over long distances or through the earth.

Signals sent by wireless systems, such as radio signals, are blocked by rock and other barriers. This poses a basic hurdle, whether the intent is communication from above ground to trapped miners hundreds or thousands of feet below, or communication from the mine opening into a tunnel that has been blocked by rock after an explosion or a mine collapse.

Wired transmissions depend on signals sent along wires and cables. Wires and cables are susceptible to being snapped or damaged beyond use in an explosion or a crushing roof collapse. The breaks or damage may occur at locations that are not readily accessible.

To engage such challenges, we have had to apply a mix of scientific know-how and creativity, our close working knowledge of the underground mine environment, and persistence in working through the technical questions that always come up in scientific studies.

We have also had to design research across several related but different tracks, and to administer contracts and award funds to outside partners with resources and expertise that complement ours. We have moved ahead with a sense of urgency while doing everything we can to assure high-quality research.

Some of the more significant accomplishments include:

- Communications and Tracking technology - We have awarded seven research contracts to outside partners that address key needs for advancing communication technologies. The partnerships join NIOSH's resources and expertise with complementary outside resources and expertise. The projects address several related but separate targets for improving communication systems in emergencies. Among these, three important targets are: (1) a more survivable leaky feeder system; (2) an improved medium frequency capability that is integrated with either leaky feeder or wire mesh systems; and (3) a through-the-earth, two-way voice system. Taken in total, reaching these targets will contribute to the overall goal of significantly improving both the coverage and survivability of emergency communications systems. We expect that combinations of these technological innovations will become available within the timeframes specified by the MINER Act.

- A Subterranean Wireless Electronic Communication System - We achieved a notable milestone in August in the research to improve communication technologies. In tests at two underground mines, transmissions from a wireless system were successfully received over a two-mile distance, despite twists and turns in the mine tunnel and other physical barriers. To date, such barriers have limited two-way wireless communications to much shorter distances. In simplest terms, we tested a system in which a signal would hop along all available conductors such as electrical wires and water lines to get around barriers. The tests have not yielded a final product, but they tell us that it is technologically feasible to develop a system that communicates over much longer distances than existing systems, which was a fundamental challenge that we faced. We are proceeding toward next steps of this research with our partners, to address questions about other key aspects of this promising approach.

- Self-Contained Self-Rescuer (SCSR) - The major goal of the oxygen supply work is to develop a next generation Self-Contained Self-Rescuer (SCSR), which will be "dockable"[1] and will overcome existing performance problems. Under the Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (P.L. 109-234), which provided $10 million to NIOSH for mine safety technology research, the first prototypes of this unit have been designed, built, and evaluated. All of the performance parameters have been achieved. At a

[1] The docking port mechanism is designed to allow the user to plug in additional oxygen units without opening the breathing circuit to the potentially poisonous atmosphere.

meeting with industry and labor representatives, in which they examined the new units, concerns were raised about their shape and the comfort in wearing them. Accordingly, the manufacturer has been directed to re-design the housing to make the units smaller and easier to wear. The new prototypes are expected within the next nine months.

- Refuge Alternatives - All of our work in advancing safe shelter or refuge alternatives is on schedule, and we expect to complete the report required of us under the MINER Act by the deadline set by the Act. In a related project, we have also offered to help the State of West Virginia by developing and conducting a test program for refuge chambers. Although the program has been delayed as we wait for test equipment to be delivered, and it has placed additional demands on our limited number of staff, our stakeholders have emphasized to us that this is an important need, and we agree. We expect to begin testing within a few weeks. Based on findings to date, we anticipate that practical means for refuge or safe shelter can be made available to mines in the near future. However, it will be important to establish appropriate training and other administrative procedures for mines, to ensure that alternatives for refuge become a part of more effective escape and rescue strategies.

We have also pursued a flow of information back and forth with other Federal agencies, with whom we have been collaborating under the Interagency Working Group that was established by the MINER Act. Our Federal partners have made

us aware of technologies currently used in other applications that may be adaptable to our needs in the mining environment, and are helping us to see how they may fit. For example, the Naval Research Laboratory and NASA have offered their knowledge on human performance and survivability in closed systems that protect humans from hostile environments, such as submarines and spacecraft. They have worked with us to see how this knowledge may advance our research on refuge chambers. The U.S. Army and the Department of Homeland Security are leveraging their knowledge and needs in regard to communications and tracking systems with ours. These and other partnerships will save time, resources, and trial-and-error for NIOSH, and we hope that these collaborating agencies will benefit similarly. The partnerships will also help us meet our duties under the MINER Act more quickly and efficiently.

Ground Control in Underground Mining

The recent disaster at the Crandall Canyon Mine in Utah has brought several topics to national attention in the area of ground control in underground mining. The prevention of fatalities and injuries from failures of the roof, pillars or floor has been a priority area of research, development, demonstration, and research to practice activities at NIOSH for many years. Significant safety improvements have been achieved. Coal bumps, bounces, and outbursts have been a longstanding safety hazard in some mines in the Southern Appalachian, Colorado, and Utah coalfields. A coal bump is the sudden and violent failure of highly stressed coal or surrounding strata. Bumps caused many fatalities in past decades, and were the subject of intensive research by NIOSH and its

predecessor agencies. The results of this research were best practices documents and mine planning tools, such as computer models. Over the past decade, for example, many workshops have been conducted and now the NIOSH tools are widely used to improve ground control in the mines.

NIOSH has developed several computer programs to help mine planners design coal pillars. For longwall mining, there is the Analysis of Longwall Pillar Stability (ALPS). For room-and-pillar and retreat mines, there is the Analysis of Retreat Mining Pillar Stability (ARMPS). Both of the programs are widely used throughout the U.S. These programs, along with others developed by industry or academia, provide an excellent methodology for properly designing coal mine pillars for a wide range of mining conditions. Important enhancements to the NIOSH models are the associated databases, which document observed in-mine failures and successes of various designs.

The application of seismic monitoring has been mentioned in recent weeks as a potential technology for predicting coal bumps. For more than thirty years scientists and engineers around the world have invested hundreds of millions of dollars attempting to understand coal bumps and rock bursts, and to develop systems that could predict or warn of impending events. Much has been learned about the events and how to reduce their occurrence through engineering design, but no success has been achieved in prediction. Today, seismic monitoring is used more in hardrock mining, as part of a risk management program, but very infrequently in coal mining. Despite advances in technologies,

such as geophones, signal processing equipment and computers, many of the fundamental barriers that existed 30 years ago remain today.

Notwithstanding, there could be value in applying seismic monitoring at mines with a history of bumps, as part of a larger risk management program, as is done in Australian and many European coal mines.

Conclusion

In closing, NIOSH continues to work diligently to protect the safety and health of mineworkers. The relevance of our past work and continued need for further safety and health research is highlighted by the recent mine disasters. We have made significant improvements in the areas of communication and tracking, oxygen supply, and refuge alternatives. Moreover, our safety and health research program is addressing the critical areas identified by our customers and stakeholders, and through our research, development, demonstration, and diffusion activities, we are enabling a shift to a prospective harm reduction culture in the mining industry. I appreciate the opportunity to present our work to you and thank you for your continued support. I am pleased to answer any questions you may have.