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U.S. Senate Appropriations Labor, HHS, Education Subcommittee
Testimony of Dr. John Howard, NIOSH Director

WASHINGTON, D.Cé . The U.S. Senate Appropriations Labor, Health and Human Service, Education, and Related Agencies Subcommittee on Wednesday held a hearing to assess mine safety progress one year since the deadly coal mine tragedies in West Virginia at the Sago and Alma mines. As part of that hearing, the subcommittee heard testimony from Dr. John Howard, the Director of the National Institute for Occupational Safety and Health. Dr. Howardôs prepared testimony is below.

Good afternoon, Mr. Chairman and other distinguished members of the Committee. My name is John Howard, and I am the Director of 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 accompanied by Dr. Jeffery Kohler, Director of the Office of Mine Safety and Health within NIOSH. We are pleased to be here today with our sister agency the Mine Safety and Health Administration (MSHA) to give you an update on activities that have been initiated under the MINER Act of 2006.

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 everyday are our most precious resource. The mine disasters in 2006 and the double roof fall fatalities in a West Virginia coal mine last month serve as painful reminders of the dangers inherent to this industry, and our shared responsibilities to ensure the safety and health of our mineworkers.

The Office of Mine Safety and Health Research within NIOSH works to eliminate occupational illnesses, injuries, and fatalities through its research and prevention activities. Mining researchers at our Pittsburgh, Spokane, and Lake Lynn Laboratories have a long and successful history of working in partnership with labor, industry, and state and federal agencies to develop and implement interventions that eliminate or control mining safety hazards, or reduce exposure to harmful physical or chemical agents. The work of NIOSH scientists and engineers can be found throughout American mines. This is evidenced by safer design practices, equipment innovations that improve safety or health, technology to improve mine rescue, and improved training programs for miners. Over the years, significant safety and health gains have been achieved through the collective efforts of labor, industry, and government. Yet, more

remains to be done, and additional effort will be required just to maintain the historical gains, as changing mining conditions present new safety and health challenges. Our program of mining safety and health research is driven by a strategic plan with specific performance goals. Our plan, developed with extensive customer and stakeholder input, identifies critical gaps in mining safety and health knowledge and practices and establishes research priorities for filling in those gaps.

While it is still too soon to find visible evidence of major changes resulting from research in underground coal mines since the Sago Mine disaster, changes are underway, and may represent the most significant improvement in mine safety technology and mine safety practices in three decades. New communications and tracking technologies, Self Contained Self Rescuers (SCSRs), and refuge chambers are being developed. New and more effective training programs, emergency procedures, and mine safety practices are being designed using innovative management systems and risk analysis studies. Any one of these alone would improve mine safety, but in combination the effect is expected to be great. The funds from the emergency supplemental appropriation are facilitating more safety technology gains in two years than have occurred in the last few decades. The legislative mandates have created an unprecedented environment of partnership among labor, industry, and government. The safety landscape will be different and vastly improved within three years of enactment of the MINER Act, and important improvements are expected to continue for several years afterwards.

Improving disaster prevention and response continues to be a high priority for NIOSH, and we have several projects to develop technologies and practices to prevent mine explosions, fires, and inundations that existed before the MINER Act was adopted and some new ones triggered by the tragic events of last year. A few weeks ago we released a draft report entitled, *Explosion Pressure Design Criteria for New Seals in U.S. Coal Mines*. Once finalized, this NIOSH report will provide an engineering-science basis for designing mine seals and will assist NIOSH and MSHA in developing new standards for seals in underground coal mines, in this country and around the world.

NIOSH received the Research & Development 100 Award of 2006, recognizing the coal dust explosibility meter, as one of the top technological innovations of the year. Rock dust is applied to coal mine surfaces to prevent coal dust explosions. If sufficient dust is applied, an inert mixture between the two dusts is achieved. The percentage of inert material in the mixture is specified by current regulation. However, a determination of this percentage by an MSHA inspector or mine operator requires taking a sample and sending it to a distant lab for analysis. This can take several days. The coal dust explosibility meter developed and field tested by NIOSH researchers will allow an immediate or real-time determination by mine operators, or an MSHA inspector, of whether an inert ratio has been achieved. A pre-production model is currently undergoing approval testing at MSHA, and commercial production of this life-saving, new technology will begin as soon as it is approved for use in underground coal mines.

New Innovations - Miner Act of 2006 and Supplemental Appropriation

Moving critical safety technologies, for example oxygen supply, emergency communications, and miner tracking devices, from the laboratory into the mine is a high priority for NIOSH, as is adapting technologies from other military or civilian applications to the mining industryôs needs. In addition to the scientific challenges, there are economic ones as wellð since mines represent a relatively small market for sales, the government role in research and development becomes even more important in bringing a promising technology to mine operators.

The Conference Report on H.R. 4939 (**109-494)** Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery provided a $10 million Emergency Supplemental Appropriation (ESA), that will have a very positive effect in increasing the availability of critical oxygen supply, communication and tracking technologies. The goal is to facilitate the adaptation and movement of these technologies from other industries or from prototype stage to commercialization and into the mines, as rapidly as possible, and this is well underway.

First, a high level ñroad mapòfor success was designed, taking into consideration, the availability of technologies, commercial availability of equipment, as well as the technical and logistical difficulties in meeting the schedule and performance expectations of the MINER Act. It was determined that the plan should include improvements to legacy systems as well as the introduction of new technologies. An accurate assessment of the existing technology base was deemed an essential prerequisite to success. The initial challenge for NIOSH was to invest sufficient time in the initial analysis to ensure that the contract efforts are in the areas most likely to yield results, and move new technologies into the mines as expeditiously as possible.

Our effort to award the right mix of contracts quickly consisted of two phases: the technical preparation phase and the contract acquisition phase. The technical phase consisted of significant engineering-science work to develop the scope of work for the contracts, testing of system prototypes in operating coal mines and at NIOSHôs Lake Lynn Experimental Mine, and evaluation of claims from vendors on technologies that were represented as ñsolutionsòfor the mining industry. Stakeholder meetings including the NIOSH Emergency Communications Partnership were held periodically as well. NIOSH also met with Australian labor, industry, and government officials to review findings and the proposed approach, as well as other alternatives. Within three months after the engineering services agreement (ESA) was approved, a consensus was reached among all groups that the available funds were: targeting a balanced set of technologies that address the mining communityôs needs in the critical gap areas; selecting technology subsets that have a higher probability of success in the short term; and meeting the goal of the emergency supplemental appropriation.

Depending on the amount of work involved, it has taken between two and five months to complete the preliminary technical work for each contract. Essentially, this technical preparation phase has helped to ensure that the most promising and critical technologies are being supported under the ESA.

We are now in the acquisition phase, where the statements of work for each technology area have been developed and contract solicitations have been advertised for the purchase of services that will lead to development and demonstration of new technologies to meet the intent of the MINER Act. The Emergency Supplemental Appropriation is subject to the rules and regulations for full and open competition as prescribed by the Federal Acquisition Regulation (FAR) Part 15. Therefore, full and open competition is being pursued.

NIOSH and MSHA have a working group to share information and coordinate activities on refuge chambers. NIOSH has contracted with the National Technology Transfer Center at Wheeling Jesuit University to conduct two pilot studies on refuge chambers, and another contract to determine design, installation, and location parameters is in the acquisition phase. The findings of these contracts combined with our research and testing will be used to prepare the report to Congress on refuge alternatives, and to provide practical guidance to industry and labor on the use of refuge chambers in underground coal mines.

The following table displays the various communication and tracking technology solicitation areas NIOSH is actively pursuing, and the respective anticipated award and completion dates.

Solicitation	Technical Phase Completion Date	Anticipated Award Date	Projected Completion Date
Adaptation of the U.S. Army ñKuttaò System	August 2006	Awarded January 2007 ï work in process	April 2008
Survivable Leaky Feeder	August 2006	April 2007	August 2008
Hardened Mesh/Node System	September 2006	May 2007	September 2008
Communications Practices	November 2006	May 2007	March 2008
Tracking System	December 2006	June 2007	December 2008

Table 1 - Communication & Tracking Procurements

The projected completion dates are based on historical estimates and projections from appropriate organizations, and are directly dependent on the anticipated award dates being met. It should be noted that a number of factors may affect award dates and therefore project completion, such as the number of bidders, the extent of technical clarification or budget clarification meetings necessary, the complexity of the negotiated changes, and the time allotted to prepare best and final offers.

The following provides a brief description of select technologies to be funded.

Adaptation of the U.S. Army "Kutta" System

The U.S. Army Research, Development and Engineering Command, Communications Electronics Research, Development and Engineering Center (CERDEC) currently has a contract with Kutta Consulting to design and develop a subterranean wireless electronic communications (SWEC) system for the military. There is high potential for applying this Department of Defense (DoD) technology to meet the mine communication and tracking requirements. In this procurement action, we are providing funds to the DoD to modify their existing contract with Kutta Consulting, to extend current design and development efforts to a communications system for underground mines. In taking this approach, we hope to build on the proven successes resulting from the application of state-of-art information and communications-electronics technologies to increase the safety level for the military, to achieve similar enhancements for U.S. mines.

Under this contract, Kutta Consulting will develop a digitally networked communications system for underground miners to communicate with each other and with the surface. The approach is to develop a communication system that has a dual-mode of operation. It is envisioned that this system will be capable of maintaining mine-wide operational integrity after an emergency situation such as a mine fire or explosion.

Survivable Leaky Feeder System

Leaky feeder communication systems are currently used in underground mines. During normal mine operations they function very well. However, they are based on a cable backbone that is run throughout the mine that can be damaged in the event of a fire, roof fall or explosion. If the cable is damaged, the system may no longer be operational.

For this procurement action, we want the selected contractor to design, develop, and demonstrate a survivable wireless leaky feeder communications distribution system that is capable of maintaining mine wide operational integrity after an emergency situation such as a mine fire or explosion. The proposed system will be compatible with the leaky feeder systems and mobile radios that are commonly used in mines today.

Hardened Mesh/Node System

Wireless mesh network technology is a multi-hop system in which devices are capable of supporting each other during transmission of voice and data information. They are

used for commercial and public safety applications today. Some of the attributes that they display could be beneficial for use in underground mines. These include: 1) increased probability of any radio being able to communicate with another radio, by providing multiple paths for communications within the mesh network, and 2) peer-to-peer communications network in which every node is a routing relay. The mesh network is capable of supporting communications between members of a group within the mesh network without the support of external networks.

While the introduction of wireless mesh technology in mines does hold potential, there are a variety of challenges that the underground mining environment introduces to realizing the full potential of a wireless mesh network, including: survivability of system components during catastrophic events, range limitations. For this procurement action, we want the selected contractor to design, adapt, construct, install, and evaluate wireless mesh ñpeer-to-peerò communication networks in an underground coal mine that address these challenges.

Mine Location Tracking System

NIOSH has also prepared a request for the procurement of services to evaluate and develop mine location tracking systems. These systems would be particularly useful in locating miners in a post accident situation and respond directly to the requirements of the MINER act.

Our internal research and discussions with vendors have determined that there are several possibilities for providing for the tracking of miners. Therefore, our request for services has been constructed so that there can be several phase one awards during which the accuracy and feasibility of the technology can be assessed. Of the competing phase one awardees, one will be selected for phase two funding for the demonstration and development of their technology.

As a separate initiative, NIOSH and MSHA plan to test a fully functional military mesh communications and location tracking system in an underground mine. While the form factor (back pack size) is totally unsuitable for a miner, it should demonstrate the maximum performance and accuracy achievable through one approach to mine tracking ï the node based radio approach. This is an important input in consideration of future spending of funds in this area.

Lastly, NIOSH and MSHA are working closely together with a technical study panel on belt air appointed by the Congress and the Secretaries of Labor and Health and Human Services to develop recommendations on the utilization of belt air and the composition and flammability of belt materials.

Conclusion

In closing, NIOSH continues to work diligently to protect the safety and health of mineworkers. The MINER Act and supplemental funding for mining research will enable

us to make significant improvements in the areas of communication and tracking. We appreciate the opportunity to present our work to you and thank you for your continued support.

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