RESEARCH PROPOSAL

RE: Funding Opportunity Number: SGA 16-3BS

Submitted to:

Department of Labor
Mine Safety and Health Administration
Brookwood-Sago Mine Safety Grants

Submitted by:

Colorado School of Mines
Golden, CO 80401

Title:

Advanced Mine Rescue Skills Training Using Multiple Modalities

Mines Proposal No. 17-0057

Proposed Starting Date: 09/30/2016
Proposed Duration: 1 Year
Proposed Amount Requested: $250,000

Principal Investigator:
Robert Ferriter, PE
Senior Mine Safety & Health Professional
Mining Engineering Department
(303) 278-0710
rferrite@mines.edu

Administrative Official:
Ralph Brown
Director
Office of Research Administration
(303) 273-3538
rabrown@mines.edu

Co-Principal Investigator:
Michelle Reiher, CIH, CSP
EMCIS Health & Safety Program Manager
Mining Engineering Department
(303) 278-0710
mreiher@mines.edu

Brookwood-Sago Grant Request, Colorado School of Mines
"Advanced Mine Rescue Skills Training Using Multiple Training Modalities"
BUDGET NARRATIVE and JUSTIFICATION
August 15, 2016

The primary objective of this proposal is to enhance the knowledge and skills for mine rescue teams and incident command staff in the areas of technical rescue, communication and decision making during mine emergencies. In support of this goal, Colorado School of Mines (Mines) will provide specialized and hands-on training for 15 to 20 mine rescue teams, providing a variety of mine rescue courses that focus on technical rescue skills as well as communication and decision-making skills, while using an incident command center. In addition, Mines will continue to enhance the Mine Rescue computer simulator and incorporate it into advanced incident command center training. The training sessions may include a combination of classroom sessions, computer simulation training and underground exercises at the Edgar Experimental Mine.

The anticipated expenditures for this proposal are as follows:

1. Labor costs for Mines employees to complete the following tasks:
    - Promote the Mines Mine Rescue Training Program at contests/conferences/meetings.
    - Solicit mine rescue teams to participate in training sessions.
    - Prepare and conduct training for 15 to 20 mine rescue teams.
    - Create and promote advanced incident command center training.
    - MSHA Mine Emergency Operations training support at the Edgar Mine.
    - Analyze evaluation results from training forms.
    - Test enhancements to the mine rescue simulator.
    - Complete administrative tasks associated with the grant.

    Cost estimate is $168,105 (Salary plus fringe).

2. Mine rescue simulator: (See Attachment 2)
    - Develop new coal mine scenarios that include using the new ventilation simulation capacity to include patches and remote training.

    Cost estimate is $10,000.

3. Edgar Mine user fees:
    - User fees will be paid to the Edgar Mine when mine rescue training sessions are conducted at the mine, including MSHA Mine Emergency Operations (MEO) training sessions. These fees help to defray the operating costs of the mine.

      Cost estimate is $15,000.

4. Travel costs for Mines employees to travel for the following activities:
    - Local travel to conduct training sessions at the Edgar Mine or at mine sites.
    - Travel to one or two conferences/contests/mine rescue meetings.

      Cost estimate is $5,308.

Some program income may be generated as a result of project tasks. Mine rescue teams participating in this training may be charged a nominal registration fee for the training. In the past, the program income has ranged between $5,000 and $15,000 for the grant period.

Section 2 – Executive Summary

Applicant: Department of Mining Engineering
Energy, Mining and Construction Industry Safety Program
Colorado School of Mines (Mines)
1500 Illinois Street
Golden, CO 80401-1887

Funding Requested: $250,000

Grant Topic: Advanced Mine Rescue Skills Training Using Multiple Training Modalities – 15-20 mine rescue teams will be trained on technical rescue skills as well as communication and decision-making skills, while using an incident command center.

Program Structure: Annual

Summary of Proposed Project:

Throughout the history of mining, mine emergencies have caused the loss of hundreds of miners, destruction of property, physical and psychological upheaval and enormous financial burden. These mine emergencies can occur at any time and from a number of causes. While we cannot prevent all mining disasters, we can, through well designed mine emergency preparedness, mitigate or minimize their effects. Therefore, we believe that our national interests are best served by having well-trained first responders available for quick response to emergency situations in underground mines. According to training requirements in 30 CFR §49, mine rescue teams are required to participate in advanced mine rescue training as outlined in MSHA guidance documents.

"We ask mine rescue teams to respond to some of our nation's most difficult emergency situations. We owe them the best training, equipment and support to help them be successful and to stay safe." – Joseph A. Main, Assistant Secretary of Labor for Mine Safety and Health, 2016 National Mine Rescue Competition.

To meet these training needs, three mine rescue training organizations have formed a consortium with an objective to offer advanced skills training, including an annual contest designed to evaluate the performance of those skills. The organizations include the Mining Technology and Training Center (MTTC), the Kentucky Coal Academy and the Colorado School of Mines (Mines). The advantages of this consortium are the offering of advanced mine rescue training that is consistent with the objectives of the defined mine rescue training that is conducted by professional trainers and the ability to service multi-geographical areas within the United States.

Additionally, Mines works in collaboration with the Colorado Division of Reclamation, Mining and Safety (CO DRMS) to provide mine rescue contests for industry and collegiate mine rescue teams from a multi-state area.

Since 2009, Mines has offered mine rescue training that focused on developing technical rescue skills and decision-making and communication skills during mine rescue exercises utilizing a command center structure. To date, 81 industry mine rescue teams and 13 collegiate mine rescue teams have participated in training that was supported by these grants. Mine rescue team members and their trainers have provided highly positive comments regarding the training they received. Mines is the only organization in the United States offering mine rescue training that utilizes computer simulations of mine emergencies with a command center.

The overall objectives of this proposed project are: (1) To provide high-quality and specialized training to mine rescue teams that focuses on (a) Improving advanced rescue skills, (b) Improving technical rescue skills needed to respond to serious accidents that often result in single or multiple casualties, and (c) Enhancing communication/decision-making skills of the tram and the staff of the command center during mine emergencies; and (2) To further enhance the mine rescue simulator software. The first objective will be met by offering mine rescue training exercises using computer simulations, field exercises and/or in-mine exercises conducted at the Edgar Experimental Mine; offering training as a combination of classroom and hands-on activities that targets specific advanced technical rescue skills. The second objective will be accomplished by enhancing the simulation software by building on current capabilities and developing additional capabilities such as incorporating ventilation capabilities to the coal model. Mines plans to train at least fifteen (15) to twenty (20) mine rescue teams during the grant period.

Applicant Background:
The Energy, Mining and Construction Industry Safety (EMCIS) Program, located within the Mines Department of Mining Engineering, provides training for the energy, mining and construction industries; government agencies; and branches of the military. The majority of EMCIS staff members are MSHA-approved instructors and technical experts, as demonstrated by academic degrees, certifications/licenses, and experience.

Rite-Solutions, Inc. (RSI) is a privately-held systems development and engineering services company with approximately 150 employees, most of whom are engineers and technically trained personnel. RSI develops robust, secure and highly scalable systems for government and commercial customers.

Section 3 – Technical Proposal

A. PROGRAM DESIGN

Problem Statement:

Throughout the history of mining, mine emergencies have caused the loss of hundreds of miners, destruction of property, physical and psychological upheaval and enormous financial burden. While we cannot prevent all mining disasters, we can, through well designed mine emergency preparedness, mitigate or minimize their effects. Therefore, we believe that our national interests are best served by having well-trained first responders available for quick and effective response to emergency situations in underground mines. Historically, mine rescue training has typically focused on major events occurring in underground mines, involving multiple victims and requiring knowledge of exploration techniques in smoke-filled, hazardous environments. The national and regional mine rescue contests are designed to assess this form of training, however, many skills are evaluated by the rescue team members "saying" and pretending what they would do; rather than "doing" what they need to do. Consequently, rescue team training has not generally focused on learning advanced rescue skills, even though 30 CFR §49 requires mine rescue teams to participate in advanced mine rescue training. It is extremely important for mine rescue teams to know how to perform advanced rescue skills so that they are able to reach victims in a timely manner, and also to know how to respond and administer aid once they locate them.

To meet these training needs, three mine rescue training organizations have formed a consortium with an objective to offer advanced skills training, including an annual contest designed to evaluate the performance of those skills. The three organizations include the Mining Technology

and Training Center (MTTC), located in Prosperity, Pennsylvania; the Madisonville Community College Kentucky Coal Academy, located in Madisonville, Kentucky; and the Colorado School of Mines (Mines), located in Golden, Colorado. The first two organizations will mainly meet the needs of Eastern and Midwest coal mines, while the last organization will meet the needs of Western coal as well as metal and non-metal mines interested in advanced skills training. The advantages of this consortium are the offering of advanced mine rescue training that is consistent with the objectives of the defined mine rescue training conducted by professional trainers and the ability to service all-geographical areas within the United States.

Additionally, Mines works in collaboration with the Colorado Division of Reclamation, Mining and Safety (CO DRMS) to provide mine rescue contests for industry and collegiate mine rescue teams from a multi-state area.

Since 2009, Mines has received Brookwood-Sago Grants to offer technical mine rescue skills training and training that focused on developing decision-making and communication skills during mine rescue exercises utilizing an Incident Command (IC) structure. The later training consisted of both computer simulation exercises and underground exploration exercises conducted in the Edgar Mine. To date, 81 industry mine rescue teams and 13 collegiate mine rescue teams have participated in mine rescue training that was supported by MSHA grants.

Trainers and rescue team members, who have completed mine rescue scenarios via classroom, in-mine or using the Mines computer simulator, have provided positive and constructive comments regarding Mines capabilities and potential learning opportunities offered by Mines. Support

letters from trainers who have participated in training conducted by Mines are provided in Attachment 1.

Mines intends to continue building its technical skills training program in partnership with MTTC, the Kentucky Coal Academy and the CO DRMS to offer advanced mine rescue skills training. Mines would also like to continue the development of its mine rescue computer simulator training, especially to introduce and practice IC training with mine management. As such, the overall objectives of this proposed project are 1) To provide high-quality training to mine rescue teams that focuses on a) Improving advanced rescue skills, b) Improving technical rescue skills required to respond to serious accidents that may involve single or multiple fatalities, and c) Enhancing communication and decision-making skills of the team and the staff of the command center during mine emergencies; and 2) To further enhance the mine rescue simulation software by building on current capabilities and developing additional capabilities such as incorporating ventilation capabilities to the coal model.

The first objective will be met by offering mine rescue training exercises using computer simulations, field exercises and/or in-mine exercises conducted in the Edgar Mine; offering training as a combination of classroom and hands-on activities that targets specific advanced technical rescue skills.

The second objective will be accomplished by enhancing the simulation software by building on current capabilities and developing additional capabilities such as incorporating ventilation into the coal model. Mines plans to market the computer simulator as an integral training tool for

emergency preparedness to those whose responsibilities include decision making during an emergency.

There are no limitations regarding the applicability of this training to either the types of mines (coal, metal or non-metal) or their geographic locations, other than this training would be most useful to underground mines. Much of the technical rescue and IC training would also be applicable to surface mines. This project supports MSHA's goal of providing training and evaluating the delivery of the training using a variety of training approaches and formats. Mines plans to train at least fifteen (15) to twenty (20) mine rescue teams during the grant period. During the 2014-2015 grant year, Mines trained seventeen (17) mine rescue teams, and Mines is on track to train twenty-nine (29) mine rescue teams for the 2015-2016 grant year.

Quality of the Project Design:

Plan Overview

For this project, a variety of training courses will be offered that will primarily be aimed at mine rescue teams; however a few courses will also be for local and regional fire brigades and other mine employees involved with mine emergency response. Mines will continue to employ Rite-Emergency Management Training (EMT)^{TM} software, developed by Rite Solutions, Inc. (RSI) to enhance the capabilities of the training simulator for mine emergencies. The Rite-EMT^{TM} training software is currently used to simulate emergency scenarios applicable to underground coal and metal/non-metal mines. Additional information about the computer mine rescue simulator and the Edgar Mine is detailed in Attachments 2 and 3.

The specific training that will be offered during this project will include:

1. Mine Rescue computer simulation training utilizing an IC (0.5-1.0 day per rescue team)
2. Hands-on, under apparatus Mine Rescue exercises conducted in the Edgar Mine with or without an IC (1-3 days per team trained).
3. Advanced Mine Rescue Skills Training conducted at the Edgar Mine or other mine site (1-5 days per team trained, depending on team focus and preferences):
    a. Confined space entry and rescue for mine rescue teams,
    b. Extrication and heavy lifting using advanced equipment for mine rescue teams,
    c. Technical rope rescue for mine rescue teams,
    d. Advanced incident command for mine emergencies,
    e. Abandoned mine hazard awareness, tactics and strategies,
    f. Tactical emergency casualty care for the mining environment, and
    g. Mine rescue advanced skills contest.
4. Mine firefighting training for Mine Rescue teams and fire brigades (1-2 days per team trained)

The technical rescue courses will be customized to meet the specific needs of the teams taking the training. This approach will allow training opportunities to be tailored specifically to skills the team members need to develop which will better prepare them to respond to emergencies at their specific mines. Furthermore, using the computer simulator along with underground exercises permits a "crawl-walk-run" approach to learning mine rescue procedures. This approach is particularly helpful for novice or inexperienced mine rescue teams and team members.

Activities

1. **Soliciting Participating MR Teams**: Mines will identify candidate mine rescue teams via

notices placed on web pages, personal communications, and ongoing contact with teams planning to use the Edgar Mine. No limitations regarding type or location of mine will be used to select teams. Teams will be asked to pay a nominal registration fee for the training and for all travel expenses, including transportation to and from the training sites, for both the mine rescue team members and for Mines instructors, who travel to mine sites to conduct the training.

2. **Conducting Training**: Mines anticipates at least fifteen (15) to twenty (20) mine rescue teams and/or Fire Brigades will be trained. The training sessions will include a combination of the training courses described above, dependent upon and customized to the specific needs of the mine rescue teams participating in the training. Sample information about the technical rescue courses is presented in Attachment 4. The training will be conducted either at the Mines training facility in Golden, the Edgar Mine in Idaho Springs, or at another mine site.

Table 1. Quarterly Training Projections

	Q1	Q2	Q3	Q4	Total
No of MR Teams Trained	5	0	5	5	**15**
No of People Trained	40	0	40	40	**120**

3. **Evaluating Training**: Written evaluations will be completed by Mines staff as training is conducted and by participants at the end of the training. Evaluation data will be analyzed and summarized in the final report that Mines prepares for MSHA.

4. **Enhancing the MR Simulation Software**: The mine rescue simulation software will be

enhanced to incorporate suggestions and improvements offered by users. Specific upgrades will include continuing to enhance both of the mine models and underlying ventilation capabilities which are important to realistically simulate the spread of fire gases through the model mine. Once enhancements have been completed, the simulations will be tested and problems identified will be corrected. The software vendor will provide ongoing technical support to address operational issues that may occur with the simulation software.

5. **Developing MR Scenarios**: This task will involve developing mine rescue scenarios for underground exercises and the computer simulator based on the training needs of the teams participating in the training. Because Mines trains one or two teams at a time, it is able to customize the training sessions to meet the specific needs of the team members based on skill level, training needs, and mine characteristics. The scenarios will typically address a complex underground emergency with targeted learning objectives or required skills that the teams must address as if it were an emergency at their site. Each scenario will include, as applicable, a description of the incident; a briefing given by the mine manager to the mine rescue team; a list of supplies and materials needed for the scenario; placards identifying hazards and atmospheric conditions; and detailed mine maps. Evaluation forms will be used by instructors to evaluate feedback to teams so that they can develop improvement plans. Mines will also evaluate feedback and critiques from mine rescue team members, coaches and observers in order to continuously improve the quality of its instructors and general training program.

6. **Promoting Training:** Mines will staff exhibit booths to present information about our

mine rescue training program and to conduct demonstrations of the computer simulator. Promotional activities will be conducted at two (2) events, either conferences and/or mine rescue contests.

7. **Complete Project Management Tasks**: Mines project management tasks will include preparing performance reports to MSHA, reviewing work product, and tracking funding use.

All but one of the tasks will be completed by Mines. The contractor, RSI, in cooperation with Mines, will complete Task 4 and provide technical support related to the simulation software. The full proposed project schedule can be found in Table 2 on the next page.

Materials

Written documents, as described above, will be developed for each mine rescue scenario and lesson plans and presentations will be updated for classroom training. The training simulator utilizes four laptop computers (configured as an instructor station and three explorer stations) and the modified Rite-EMT ™ software. Five perpetual Rite-EMT™ seat licenses will be provided to Mines at no cost by RSI. RSI will deliver to Mines new software programs written for the mine rescue scenarios. Rite-Solutions maintains the Intellectual Property and Data Rights to their existing product Rite-EMT™. The modified Rite-EMT™ software permits basic mine scenarios using two mine models, the Mines Edgar Experimental Mine as the metal/nonmetal mine and a generic coal mine model.

B. QUALIFICATIONS OF THE APPLICANT

Applicant Background:

The MINES Office of Research Administration (ORA), under the Vice President for Finance and Operations, oversees contract and grant administration. As a research university, Mines

Table 2. Proposed Project Schedule

Task	Description	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	**Solicit participating MR teams**												
	Advertise training opportunity												
	Contact MR teams												
	Schedule training												
2	**Conduct Training**												
	Complete preparations												
	Conduct training												
	Obtain evaluations from team members												
3	**Evaluate Training**												
	Analyze evaluation responses												
	Prepare report												
4	**Enhance MR simulation software**												
	Complete software enhancements												
	Test enhancements												
5	**Develop MR scenarios**												
	Discuss needs with MR team trainers												
	Develop scenarios												
	Review and finalize scenarios												
	Prepare hard-copy scenarios												
	Load/test applicable computer scenarios												
6	**Promote MR training**												
	Staff exhibit booth at conferences												
	Staff exhibit booth at MR contests												
7	**Complete project management tasks**												
	Conduct project oversight activities												
	Prepare monthly reviews												
	Prepare quarterly reports												
	Prepare final report												

participates in numerous federally funded research and grant programs, and ORA staff is experienced in managing these grants in compliance with federal acquisition regulations. ORA's specific functions and personnel assignments are provided as Attachment 5. Within the Mines Department of Mining Engineering, the Senior Mine Safety and Health Professional of the Energy, Mining and Construction Industry Safety (EMCIS) program, Mr. Robert Ferriter, will serve as the project director and principle investigator. Ms. Michelle Reiher, EMCIS Safety and Health

Program Manager will serve as the co-principle investigator. Both Mr. Ferriter and Ms. Reiher will conduct monthly reviews of all work and expenditures to ensure timely completion of work within budgetary requirements and will submit the required reports to MSHA describing project accomplishments and funds usage.

Administrative and Program Capability:

The Mines EMCIS Program offers several types of training courses including those related to or required by MSHA, mine rescue courses, courses requested by the Department of Defense (DOD) (underground search and rescue), tunnel rescue courses and other specialized courses upon request. During the past six years, Mines has also assisted the CO DRMS (an MSHA State Grants recipient) in conducting their Mine Emergency and Rescue Drills (MERDs). A list of federal grants received over the past eleven (11) years is provided in Attachment 6.

RSI is a privately held systems development and engineering services company with approximately 150 employees, most of whom are engineers or technically trained personnel. Its main office is in Middletown, Rhode Island, and another office in Connecticut. RSI develops robust, secure and highly scalable systems for government and commercial customers. In the government sector, its primary client has been the DOD and the Department of Homeland Security. In the commercial sector, RSI has provided EMT applications to organizations such as the Massachusetts Maritime Academy.

Staff Experience:

The Mines EMCIS Program employs six technical professionals (two full-time and four part-time), one classified employee, one Mines student and several contractors. Collectively, our staff has

over 150 years of mining-related experience and hold designations as Professional Engineers, Certified Industrial Hygienists, Certified Safety Professionals, Fire Fighters, EMT's and/or MSHA-Approved Instructors (Part 48 IS/IU/IN/MM). Under this grant, Mines would like to employ Elias Martinez, a retired firefighter, who has years of experience in IC, emergency management and preparedness, and training that are vital to growing our offerings and attracting and training mine rescue teams. Resumes can be found in Attachment 7.

RSI's Decision Support Systems group has six (6) software engineers with a minimum of a bachelor's degree in Computer Science and at least five (5) years of experience. Mr. Jay Ferguson has a master's degree in Computer Science with 28 years of experience and will serve as the lead technical expert for RSI.

C. OUTPUTS AND EVALUATIONS

The approach Mines takes for mine rescue training is unique in that it addresses the need for skills training related to technical rescue, communications, and decision-making. Developing skills in these areas will improve responses in real emergencies and result in better outcomes by enabling both the IC and mine rescue team to understand their responsibilities during a crisis. The key components stressed during training are communicating essential information to the appropriate parties without errors; learning how to work together before the crisis begins; understand how changing conditions within the mine may impact rescue activities; and providing real-time experience in a simulated mine environment. Additionally, this training is done both in a classroom and a dedicated training mine without production-related concerns. The training can be conducted in an established order that starts with completing a computer

simulation of a specific mine emergency scenario, followed by the same scenario being completed in the Edgar Mine, and then concluding with completing a different scenario in the Edgar Mine. This progression allows the student to immediately take what he has learned and apply it to a familiar problem, and then expand skills to an unfamiliar problem within a mine. The technical mine rescue skills training will include hands-on activities that focus on learning skills meeting or exceeding MSHA guidance documents such as IG 7a and technical rescue skills specific to situations that could be present during mine emergencies occurring at both underground and surface mines.

The training quality will be evaluated utilizing several tools and procedures. Upon completion of the training, all participants (team members and trainers) will be asked to complete a written evaluation. This evaluation will address the clarity and organization of the training, technical accuracy and suitability of the content, the value of the training approach, the applicability of the approach to their specific needs, and their intention to use the training for future training. To assess the effectiveness of the training, Mines staff will evaluate the performance of the mine rescue teams and IC managers by rating the decisions made by both groups in terms of accuracy and timeliness, communication skills and team safety. Evaluation results will be submitted to MSHA as part of the final project report and will also be used to determine any changes needed to improve the training and enhancements for the simulation software.

To ensure that the project is completed within the grant period, monthly evaluations will compare the completed work to the planned work. The PI will take corrective action and communicate with MSHA grant managers if the project falls behind schedule.

ATTACHMENTS

1. Support Letters
2. Description of the Mines Mine Rescue Computer Simulator
3. Mine Rescue Training at the Edgar Mine
4. Descriptions of Technical Mine Rescue Skills Courses
5. Organizational Flow Chart – Office of Research Administration
6. Other Federal Government Grant Funding
7. Resumes
8. Statement of Work from Rite-Solutions

1. Support Letter

Mr. Robert L. Ferriter
Senior Mine Health and Safety Specialist
Colorado School of Mines
Energy, Mining, and Construction Industry Safety Program
1600 Jackson Street, Suite 160B
Golden, CO 80401

August 18, 2016

Dear Mr. Ferriter,

Murray Energy Corporation fully supports the Colorado School of Mines' proposal for the current MSHA grant funding opportunity. Our company has participated in trainings hosted by the College at the Edgar Mine Training Center and we appreciate the level of training, professionalism, technology and support being offered. We understand that previous MSHA grant funds have contributed to the success of the Colorado School of Mines, and this award would help to reinforce the strengths in the program as well as establish new training programs.

The diminishing availability of mine training facilities has certainly become a concern in the West, and the Colorado School of Mines, Mine Safety and Health Program is a great asset to the industry. The training currently being provided by the College and its mine facility undeniably supports the industry's goal of ensuring a safe and healthy workplace.

Murray Energy has established a strong partnership with the Colorado School of Mines and we look forward to participating in any new programs which may be implemented with the assistance of a mine safety grant.

Sincerely,

Jason W. Jeffe

Jason W. Jeffe
Manager of Fire Prevention and Emergency Preparedness
Murray Energy Corporation
46226 National Road
St. Clairsville, OH 43950
(740) 338-3100

BARRICK

August 19, 2016

Mr. Robert L. Ferriter
Energy, Mining and Construction Industry Safety Program
Colorado School of Mines
1600 Jackson Street, Suite 160B
Golden, CO 80401

Dear Mr. Ferriter

This letter is in regards of the training facility at the Colorado School of Mines, the Edgar Mine in Idaho Spring, Colorado. The training that is done there is very beneficial to the training of our UG Mine rescue teams, it also satisfies some of our MSHA training requirements. The team really enjoys the training and they learn a lot from the training that we do there. I have a lot of new members and the training that we do there gives them real life type of training and experience. They come away with a better understanding of what will be involved with an actual situation and they will be better prepared to handle the situation. The instructors are very professional and know what they are doing. They do a very good job at setting up the training to meet our specific needs, without the training it would take a lot longer to get my team members to where I think they need to be as far as experience goes. Everyone that I take there comes away feeling better about theirselves and to be able to handle situation down the road if our services are needed. I hope this letter helps them get there funding that they need to keep up the good work that they are doing there.

Sincerely,

Wade Fruge
UG ERT Supervisor
O - 775-778-8975
C - 775-397-2969
wfruge@barrick.com

2. Description of Mines Mine Rescue Computer Simulator

The Mines mine rescue simulator was developed to focus on promoting both effective communications between the mine rescue team (MRT), fresh air base (FAB) and the Incident Command Center (ICC) and effective decision-making by these three groups. The graphics included in the simulator are not exact replicas of the Edgar Mine's underground environment, but are of sufficient quality for the team to experience being in an underground mine, and to recognize hazards. For example, showing some water in a drift with text on a screen that indicates the water is either ankle deep, knee deep, or waist deep is as effective as making the water different depths over time. Instead of focusing the simulation approach on expensive graphics, Mines has chosen to focus on the ability to build effective training scenarios that can be dynamically changed to challenge the team's decisions makers, and on the ability to record and later evaluate/discuss the decisions, which will result in an improved learning experience for the MRT, FAB and ICC. The simulator uses synthetic vision technology rather than the considerably more expensive virtual reality technology.

The Mines mine rescue simulator consists of four laptops, one configured as the team captain a second one as the team co-captain, and a third computer as either the gas man or map man. The fourth computer is configured as the instructor station, which controls the mine rescue scenario. Other members of the team can view the simulation on either the laptop screen or an additional monitor connected to the co-captain laptop. During the simulation, the captain, co-captain, and gas man can see each other as they progress through the simulation. The simulations are conducted using either a digitized, three-dimensional generic coal mine model or a digitized, three-dimensional model of the Edgar Experimental Mine, which once operated as a gold/silver mine prior to being donated to the Colorado School of Mines for a research and underground training facility.

To start the mine rescue simulation, the scenarios are loaded on the instructor station and then sent to each of the other three computers. As the team advances through the rescue scenario, the progress of the team and some of its actions can be seen on the instructor station and is recorded for playback after the completion of the simulation.

Members of the mine rescue team can open and close air doors and install ventilation curtains at any location within the mine. Hazards that can be abated during the simulation include fires, fallen timbers, broken timbers, unstable roof, and wired detonators. Various objects, such as tools, fire extinguishers, tarps, BG-4s and timbers, can be added to their inventory, or removed when used. Victims can also be picked up and returned to the fresh air base.

During the simulations, an incident command center (ICC) is established in an adjacent room and communications between the ICC and the mine rescue team are conducted with radios or phones. The ICC is in charge of the overall emergency response. The mine rescue team is expected to report locations, required team checks, conditions and hazards encountered, and both proposed and completed actions to the ICC. A Fresh Air Base can also be established if there are sufficient team members available.

Screen shots of the simulation software with descriptions are shown on next page.

Redirection Curtain

This shows the second curtain of a redirection curtain rolled up. The team member may either pick it up and add it to his inventory or simply leave it there. If it's picked up, it can be used to build an airlock or a redirection curtain, which is shown here.

Airlock

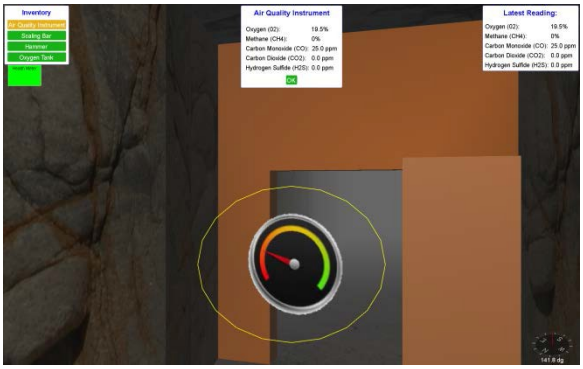
Shown is an airlock that was constructed by the team near an intersection. This can be used to change ventilation, seal off hazardous gas mixtures, or make it safe to proceed through a closed door or barricade.

Fire

A fire is shown with an air quality reading taken at its location. The fire must be extinguished with a dry chemical extinguisher since it's an electrical fire. The air reading shows the expected high CO levels.

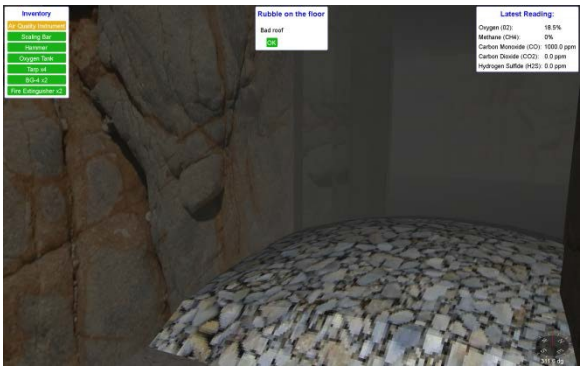
Extinguished

This was the location of the fire (shown above) which has now been properly extinguished by the team.



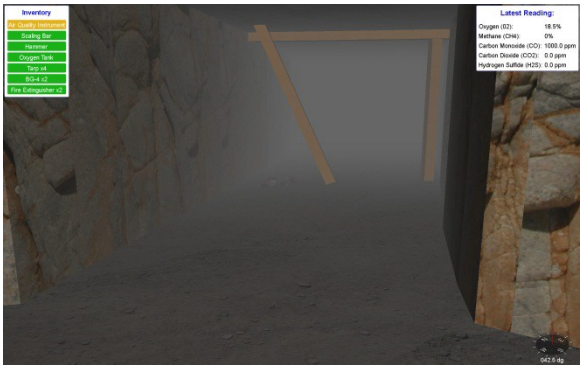
Air quality

This shows a team member using the air quality instrument to check the gas levels at an open door. The current readings will stay in the “latest reading” box until that team member using the air quality instrument again.



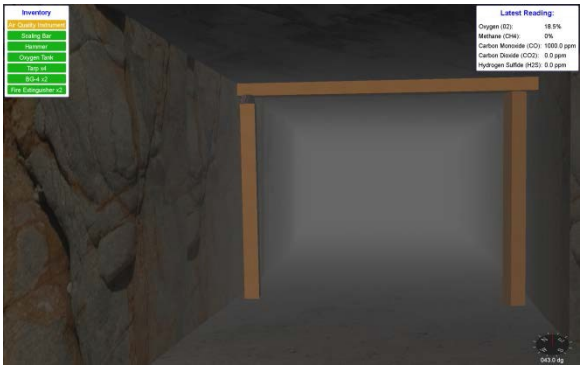
Unsafe roof

This shows rubble on the floor which was caused by the unsafe roof. The team must scale the area to make it safe before proceeding. A team member can only scale this area if they have a scaling bar.



Fallen timbers

The team can see that roof support has fallen and they must re-support the fallen timbers before they can proceed under unsafe roof.

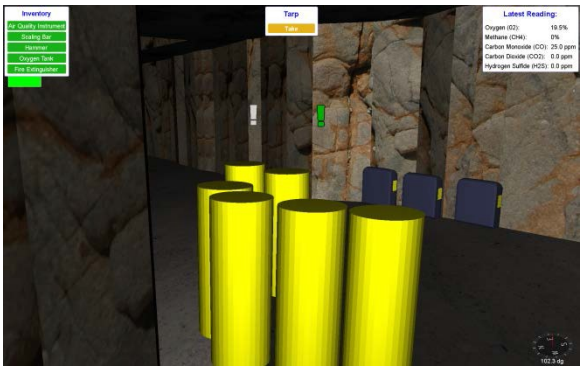


Timbers reset

The team has reset the fallen timbers (shown above) using the hammer that the captain has. If the timber was broken, the team would haave had to find a replacement timber before resetting.

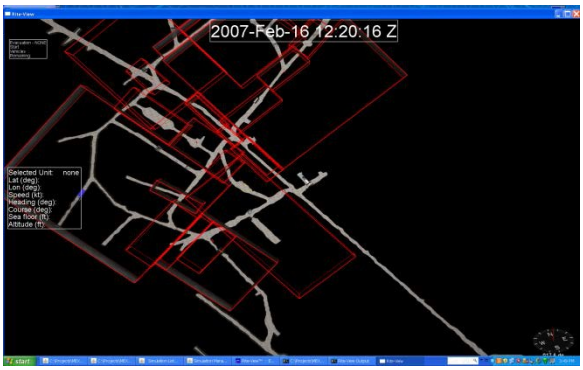
Victim

The team has found a victim and may examine him to see what condition he's in. They may also choose to take him with them to FAB and/or give him respiratory protection with a spare BG-4 that is carried with the team or could have been picked up at FAB.



Tarps and supplies

This is at FAB where the team may choose to pick up tarps and spare BG-4s. There are supplies around the mine that give them that option as well, which include fire extinguishers, timbers, and scaling bars.



Regions

This is what the instructor sees and shows the various regions, hazards, supplies, and victims. The regions determine the air quality and smoke levels.

3. Mine Rescue Training at the Edgar Mine

The Colorado School of Mines (Mines) owns and operates the Edgar Mine as an underground training and research laboratory. The laboratory is located adjacent to the town of Idaho Springs, CO, about 25 miles from the Mines campus. Facilities available at the mine include: a 20-person state-of-the-art built-in-place refuge chamber, a mobile 15-person refuge chamber, 30-person classroom with audio/visual equipment, rope rescue equipment, a confined space training maze, artificial smoke (non-toxic) generating equipment, burn barrels, gas testing equipment, rescue apparatus bench facilities for Draeger BG-4 breathing apparatus, and other specialized mine rescue equipment.

In addition to its use for underground research and student training, the mine is used extensively for mine rescue team training and for underground search and rescue training for military units and fire departments. Mine rescue teams and military units training at the Edgar mine generally schedule three to five days for practicing underground mine rescue exercises. Mines also has a student club that supports three student mine rescue teams that also train at the Edgar Mine. During an average year, 20 to 25 rescue teams are trained at the Edgar Mine. Both coal and metal/nonmetal teams are routinely trained, and MSHA has sanctioned Mine Rescue Team Competitions at the Mine.

In view of the extensive use of this underground facility for both mine and underground rescue team training, it is an ideal mine for use in computer simulation training for mine rescue teams and incident command center (ICC) personnel. Command center personnel work first with their respective teams on the simulator, and then in an actual underground exercise at the Edgar Mine, thus enhancing the training for all involved. The exercise completed underground can be the same exercise as the simulator exercise or it can be different.

4. Descriptions of Technical Mine Rescue Skill Courses

Advanced Mine Rescue Skills

This training will provide instruction on the specific technical skills included in IG 7a, including measuring mine gases, conducting ventilation measurements, building ventilation controls, firefighting, exploration techniques, rescuing victims and first aid. This training will be a combination of classroom and hands-on activities, and will be conducted as either standalone training or be incorporated into other training courses. For example, an underground rescue exercise could be preceded with instruction on building ventilation controls and on removing victims from a refuge chamber, which would then be done as part of completing the underground exercise.

Confined Space

Confined Space training will discuss OSHA confined space entry procedures and include information on the principal hazards that are in confined spaces and how to protect themselves from them, permit/non-permit confined spaces, entry permit preparation, atmospheric testing, ventilation, duties of the entrant/attendant/supervisor, and self/attendant rescue. Rescue team training will consist of three to five days of confined space rescue training taught to NFPA 1670 and 1006 technical rescue standards, tailored to the specific needs of each mine rescue team.

Heavy Lifting with Air Bags

Heavy Lift training will introduce mine rescue teams to the use of heavy lift air bags as used by firefighter technical rescue teams. This course will include the following topics: air bag system components; system setup; equipment and situational safety; operating principles of air bag systems; hazard awareness; situation assessment and lifting tactics; communication and control of lifting operations; and equipment storage, transportation, and maintenance

Mine Firefighting

Mine firefighting training will instruct mine firefighting or rescue teams on the basics of mine fire suppression. Topics will include: mine fire causes and behavior, fire protection standards, firefighting equipment and bunker gear demo, SCBA donning procedures, hose-line management and hose maze, class “B” live burn, suppressing a mine fire with ventilation controls, and emergency communication. Training will include hands on practice exercises conducted in the Edgar mine.

Technical Rope Rescue

Technical rope rescue training will train surface and underground mine rescue teams to conduct vertical rope rescue techniques to NFPA 1670 and 1006 technical rescue standards. Training will include: rescue situation planning, rope rescue equipment, rescue knots, construction of anchor systems, construction of mechanical advantage lifting systems, and victim packaging systems (Yates, Skedco, and stokes litters). Students will participate in multiple hands on rescue exercises held at the Edgar Experimental Mine.

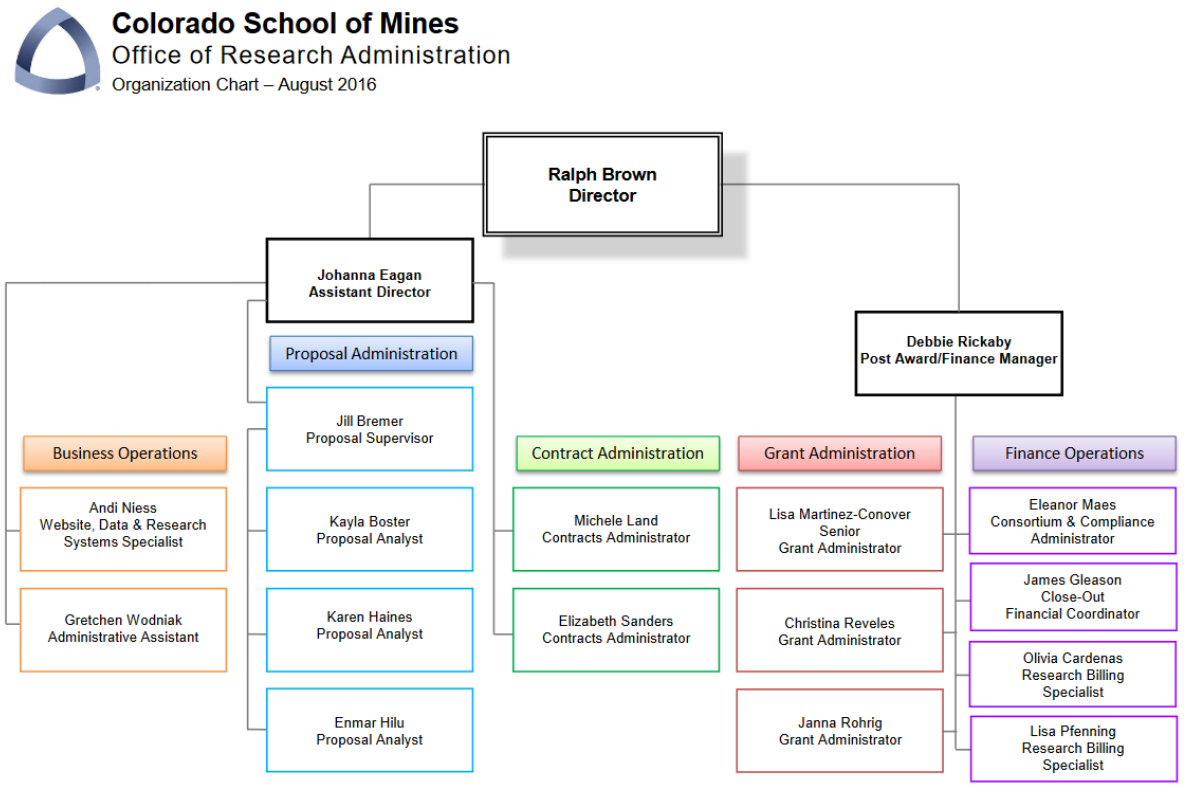
Advanced Incident Command for Mine Emergencies

Advanced Incident Command for Mine Emergencies will train general and command staff the fundamentals of the Incident Command System. Training will include: planning, preparation and resource management for an emergency. This course is based on the FEMA ICS-200 and ICS-300 courses, ICS for Single Resources and Initial Action Incidents and Intermediate ICS for Expanding Incidents.

Tactical Emergency Casualty Care for the Mining Environment

Tactical Emergency Casualty Care (TECC) for the Mining Environment is designed as an advanced first aid course for experience medical providers on management of the seriously injured person in the mining environment. This course would be conducted in cooperation with a local EMS/hospital training center, and is adapted from the National Association of Emergency Medical Technican's Tactical Combat Casualty Care (TCCC) course. This course would teach responders how to care for patients while subject to direct and indirect threats, and stabilize a patient with limited resources and time.

5. Office of Research Flow Chart



Contact information:

Address:
130 Guggenheim Hall
1500 Illinois Street
Golden, CO 80401-1887

Phone: 303-273-3411
Fax: 303-384-2173

Email: ora@mines.edu

6. Other Federal Government Grant Funding

In 2004, the Colorado School of Mines (Mines) partnered with the University of Missouri – Rolla to form the major components of the Western Mining Training and Translational Center. This Center was selected in 2004 to receive a five-year grant from NIOSH. In 2009, this grant was renewed for one year. Mines received the following funding from this grant:

- $416,961 September 1, 2004 to August 31, 2005
- $273,213 September 1, 2005 to August 31, 2006
- $522,696 September 1, 2006 to August 31, 2007
- $368,360 September 1, 2007 to August 31, 2008
- $317,845 September 1, 2008 to August 31, 2009
- $410,000 September 1, 2009 to August 31, 2010

In 2010 and 2014, the Colorado School of Mines received a three-year grant from NIOSH for a Western Mining Training Center. This grant also includes a task to provide mine rescue training using the computer simulator, but does not fund enhancements for the simulation software. This funding will allow Mines to train additional rescue teams above the number specified in this proposal. The funding received from this grant was:

- $537,173 September 1, 2010 to August 31, 2011
- $515,545 September 1, 2011 to August 31, 2012
- $537,653 September 1, 2012 to August 31, 2013
- $387,000 September 1, 2013 to August 31, 2014
- $425,183 September 1, 2014 to August 31, 2015
- $576,160 September 1, 2015 to August 31, 2016

Mines also received Brookwood-Sago Grants from MSHA in 2009, 2010, 2011, 2012-13 (2- year grant), 2014 and 2015. The funding received from these grants was $90,000, $80,000, $90,000, $147,000, $117,000, $183,000, and $224,006 respectively.

7. Resumes/CVs/Open Position Description

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Robert L. Ferriter	Principal Investigator

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Colorado School of Mines	M.S.	1973	Petroleum Engineering
Colorado School of Mines	E.M.	1960	Mining Engineering
Pueblo Junior College	AS	1958	Civil Engineering

A. Personal Statement

Mr. Ferriter has over 40 years of experience in mine safety and health. Mr. Ferriter was the first Director of the Mine Safety and Health Program at the Colorado School of Mines, where he established funding channels and developed a comprehensive safety and health training program for the Western mining industry. Prior to this position, Mr. Ferriter served as the Chief, Ground Support Division, MSHA Denver Safety and Health Technology Center. In this position, he directed and trained technical specialists (mining engineers, geologists and inspectors) engaged in evaluating mining plans and ground stability problems in both coal and non-coal mines throughout the US. He was also tasked with leading the investigations of major mining accidents (disasters) from 1985 thru 1997.

Mr. Ferriter is also a designated MINES representative to respond to news media requests for professional interviews concerning mine disasters and mine safety issues. In this capacity he has appeared numerous times on CNN, Fox News, NBC, CBS and ABC, and National Public Radio.

Since stepping down from the Program Director's position in 2010, Mr. Ferriter has continued to serve the mining industry by co-authoring a Mine Rescue Training Manual (published by SME, 2015), and teaching technical courses offered by the MS&H Program.

B. Positions and Honors

Positions

2010 – Present	Senior Mine Safety & Health Professional, Mine Safety and Health Program, Colorado School of Mines
1999-2010	Director, Mine Safety and Health Program, Colorado School of Mines
1985-1997	Chief, Group Support Division, Denver Safety & Health Technology Center, MSHA, DOL
1981-1984	Chief, Mine Waste and Construction Div., Denver Safety & Health Tech. Center, MSHA
1971-1980	Mining/Civil Engineer, Denver Safety & Health Technology Center, MSHA, DOL

Other Experience and Professional Memberships

Mr. Ferriter conducted numerous coal mine inspections and safety and health training programs for local coal mine inspectors working under the direction of the Minister of Mines, Government of India (2003).

As a consultant, Mr. Ferriter conducted underground mine audits and inspections of gold mines in Siberia for the European Bank for Reconstruction and Development (2004 and 2005).

Chairman, Mine Safety and Health Administration–U. S. Bureau of Mines, Interagency Task Force on Two-Entry Longwall Mining (1985).

Licenses/Certification

License – Professional Engineer, State of Colorado, License # 6500
Certified "International Mine Safety Professional"
Certified as a MSHA Instructor for IS (instructor surface), IU (instructor underground), MR (Mine Rescue), IN (Instructor Training) and (CZ) Impoundment Inspection

Honors

Charles N. Bell Award for Academic Excellence, Colorado School of Mines, 1960
Engineer of the Year, National Society of Professional Engineers, 1984
Meritorious Service Metal, third award U.S. Navy, 1991
Highest Degree of Safety- International Award, International Society of Mine Safety Professionals, 2003

BIOGRAPHICAL SKETCH

NAME: Michelle Reiher

POSITION TITLE: Co-PI

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Colorado School of Mines	BS	1996	Chemistry
Colorado State University	MS	1999	Industrial Hygiene
Regis University	MBA	2003	Finance/Accounting

A. Personal Statement

I am a certified industrial hygienist with 14 years of health and safety experience in general industry and, most recently, the mining industry. At the Colorado School of Mines, I have developed and conducted health and safety training within the MSHA Part 48 New Miner and Annual Refresher Training and specialized health and safety courses for miners in the Western US. My training focus has been on general industrial hygiene concepts, ergonomics, hearing conservation, particulate matter and respiratory protection, hazard communication, and confined spaces. In addition, I have developed and edited health and safety training materials such as ergonomic newsletters, brochures, manuscripts and presentations to better equip miners for hazards they may encounter during normal and emergency mining operations. My previous experience in general industry includes working closely with all levels of the organization from upper management to individual contributors to gain support for and implement global health and safety programs. In addition, I managed the coordination of service delivery worldwide to insure compliance with global and country specific health and safety regulations, developed training programs, conducted health and safety exposure sampling, performed hazard analyses and recommended risk mitigation for environments containing chemical, physical and ergonomic stressors.

B. Positions and Honors

Positions and Employment

2011-Present Training Coordinator, Program Coordinator for Industrial Hygiene, Colorado School of Mines Energy, Mining and Construction Industry Safety

2006-2010 Corporate H&S Manager, Corporate EH&S Manager, Global EH&S Contract Manager, Sun Microsystems

2001-2006 Senior Business Operations Specialist, Storage Technology Corporation

Other Experience and Professional Memberships

American Industrial Hygiene Association – Rocky Mountain Section

Certified Industrial Hygienist (Comprehensive Practice), American Board of Industrial Hygiene

Certified Safety Professional, Board of Certified Safety Professionals

MSHA Certified Instructor -- Limited (Surface and Underground)

BIOGRAPHICAL SKETCH

NAME: Alexander H. Robles

POSITION TITLE: Training Instructor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
University of Hawaii	AS	1995	Construction Mgmt.
National Registry	EMT-B	2005	Emergency Medical Technician

A. Personal Statement

I am a highly personable and professional Safety and Rescue trainer. I have also been a Human Resources Manager. I have over 27 years of experience in technical rescue, construction, safety management, general personnel management, human resources management, human relations, and other administrative functions. I have developed and managed a technical rescue training program, developed safety programs, and written training plans. I also have experience in the planning, organization, and acquisition of resources for government interagency rescue and disaster response training exercises.

B. Positions and Honors

Positions and Employment

2011- Present	Program Coordinator for Mine Rescue, Colorado School of Mines
2008-2011	First Sergeant, 911th Technical Rescue Engineer Company, United States Army
2006-2008	Career Advisor/Assignment Manager, Human Resources Command, United States Army
2003-2006	Operations and Facility Security Engineering Supervisor, United States Army
2001-2003	Platoon Sergeant, 20th Engineer Brigade, United States Army
1998-2001	U.S. Army Recruiter, New England Recruiting Battalion, United States Army
1996-1998	Division Construction Supervisor, Platoon Sergeant, Squad Leader, 82nd Airborne Division, United States Army
1992-1996	Squad Leader, Construction Equipment Supervisor, Training NCO, 45th Support Group, United States Army
1988-1992	Team Leader, Construction Equipment Operator, 82nd Airborne Division, United States Army

Other Experience and Professional Memberships

Apr 2015	Industrial Scientific Operations and Maintenance of MX6 Multigas Meters.
Apr 2013	Drager BG4 Rebreather Level II Benchman (Maintenance) Training
Mar 2013	MSHA Instructor/Train the Trainers Course, Colorado School of Mines, Golden CO.
Jul 2010	Technical Rescue, Bridgemont Community College, Bridgemont WV.
Feb 2009	First Sergeants (Senior Leadership) Course, FT Indiantown Gap, PA.
Nov 2009	Urban Search and Rescue Structures Specialist 1, US Army Corps of Engineers/FEMA, Moffett Field, CA.
Jun 2008	FEMA Structural Collapse Technician NFPA 1670 & 1006, Collapse Rescue Systems INC.
May 2008	Expanded New Miner and Underground Search and Rescue,

	(Includes MSHA Initial 20 hour Mine Rescue) Colorado School of Mines.
Apr 2005	National Registry Emergency Medical Technician Basic, Camp Balad, Iraq.
Feb 2005	Anti-Terrorism Officer Level I and II, U.S. Army, Camp Victory, Iraq.
Mar 2001	Advanced Non Commissioned Officer Course, FT Leonard Wood, MO, U.S. Army
Nov 1997	U.S. Army Recruiters Course, FT Jackson, SC, U.S. Army
Mar 1996	Associate Degree, Applied Trades-Construction Management, University of Hawaii, Honolulu, HI
Mar 1996	Journeyman Construction Equipment Operator, Motor Grader, U.S. Department of Labor.
Aug 1995	Chemical, Biological, Nuclear, and Explosives Course, Schofield Barracks, HI. U.S. Army
Jun 1994	Equal Opportunity Leaders Course, Schofield Barracks, HI, U.S. Army
Aug 1992	Basic Non Commissioned Officer Course, Fort Leonard Wood, MO, U.S. Army
Nov 1988	Primary Leadership Development Course, Fort Bragg, NC, U.S. Army.
Jun 1988	Heavy Construction Equipment Operators Course, Fort Leonard Wood, MO, U.S. Army
May 1988	U.S. Army Basic Airborne Course, Fort Benning, GA.

Honors

2010	C. Haskell Small Award for volunteerism, USO of Metropolitan Washington.
2003	Bronze Order of the deFleury medal, U.S. Army Engineer Association.

U.S. Army awards:

- Legion of Merit
- Bronze Star Medal
- 3 Meritorious Service Medals
- Joint Service Commendation Medal
- 3 Army Commendation Medals
- 4 Army Achievement Medals
- 8 Army Good Conduct Medals
- National Defense Service Medal
- Armed Forces Expeditionary Medal with Arrowhead.
- Southwest Asia Service Medal
- Kosovo Campaign Medal
- Afghanistan Campaign Medal
- Iraq Campaign Medal
- Military Outstanding Volunteer Service Medal
- NATO Kosovo Medal
- Saudi Arabian Medal for the Liberation of Kuwait
- Kuwait Medal for the Liberation of Kuwait
- U.S. Army Parachutist Badge
- U.S. Army Air Assault Badge
- U.S. Army Gold Recruiters Badge with two Sapphire Stars
- German Parachutist Badge
- German Gold Marksmanship Badge

BIOGRAPHICAL SKETCH

NAME: Collin D. Smith

POSITION TITLE: Training Instructors

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Colorado School of Mines	BS	2011	Mining Engineering
Colorado State University	MS	2014	Mining Engineering

C. Personal Statement

I am a currently Co-Director of the Energy, Mining and Construction Industry Safety Program (EMCIS) at the Colorado School of Mines Mining Engineering department, a position I assumed in May of 2016. My career to that point included increasingly responsible positions in the mining industry with responsibilities ranging from mine engineering, to quality control engineering and mine rescue training. As Co-Director of the EMCIS program my responsibility is for the daily operations of the program ensuring that we meet the requirements of our grants for Mine Rescue and MSHA Part 48 training.

D. Positions and Honors

Positions and Employment

2016-Present	Director of Operations, Colorado School of Mines, EMCIS program
2015-2016	Adjunct Professor: Underground Mine Design, University of Alaska-Fairbanks
2015-2015	Senior Mine Engineer, Sumitomo Metal Mining
2011-2013	Rock Mechanics/Quality Control Engineer, Barrick North America
2009-2011	Assistant Mine Rescue Trainer, Colorado Division of Mining, Reclamation & Safety

Other Experience and Professional Memberships

Barrick North America – Mining Engineering Intern, Summer 2010

CONSOL Energy – Mining Engineering Intern, Summer 2009

Lafarge North America – Mining Engineering Intern, Summer 2008

Graduate Projects – Colorado School of Mines – Mining Engineering Department:

- Risk Evaluations for Underground Excavations in Regards to Ground Control, Author
- Ergonomics in Mining: Comparing Contributing Elements of Injury between Face Miners and Support Miners, Author
- The Compounding Effect is Smoking in Regards to Respiratory Disease Risk Elements in Underground Mining, Author

Undergraduate Projects – Colorado School of Mines – Mining Engineering Department:

- Colorado MERD Mine Rescue Contest, Curriculum Development

- “Colorado’s MSHA Approved Mine Rescue MERD/Contest” Technical Paper, Co-Author
- Design and utilization methods of emergency tools for firefighters to conduct primary and secondary searches.

BIOGRAPHICAL SKETCH

NAME: Elias F. Martinez

POSITION TITLE: Training Instructor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Red Rocks Community College	AS	1998	Fire Science Technology
Grand Canyon University	BS	2010	Public Safety Administration
Grand Canyon University	MS	2014	Leadership

C. Personal Statement

I am a highly motivated critical thinker. I have over 34 years of experience in Fire Service, 22 years of Command Experience and 8 years of training experience. My Leadership degree emphasis is in Disaster Preparedness and Executive Fire Leadership. In my role as Training Division Captain I was responsible for the development and delivery of trainings to line Firefighters in addition to the supervision of shift training officers.

D. Positions and Honors

Positions and Employment

2010-2016	Station Commander/Captain HazMat Team, South Metro Fire Rescue
2007-2010	Training Division Captain, South Metro Fire Rescue
2005-2007	Lieutenant Shift Training Officer, South Metro Fire Rescue
1998-2005	Line Lieutenant, South Metro Fire Rescue
1982-1998	Firefighter, South Metro Fire Rescue

Certifications

State Certifications, Colorado Division of Fire Safety

- Fire Officer II
- Fire Inspector II
- Fire Instructor I
- Hazardous Materials Technician
- EMT-Basic/CPR AHA

National Fire Academy, Emittsburg, MD.

- Arson Investigator
- Public Education Specialist
- Fire Department Safety Officer

Federal Emergency Management Agency (FEMA)

- ICS 100,200, 300, 400, IS 700, 800
- IS 235 Emergency Planning
- IS 393 Introduction to Hazard Mitigation
- IS 547 Introduction to Continuity of Operations

BIOGRAPHICAL SKETCH

NAME: James Ferguson

POSITION TITLE: Computer Engineer

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
University of Rhode Island	BS	1988	Electrical Engineering
University of Rhode Island	MS	2001	Computer Science

E. Personal Statement

I am currently the Lead Software Engineer for the Decision Support Systems group at Rite-Solutions, Inc. My experience includes 25 years of engineering experience in design, development, implementation and testing of software/hardware systems for commercial and US Navy customers. This experience includes both software and hardware disciplines, specializing in the integration of COTS hardware and software turnkey solutions. Over the past six years, I have served as the Lead Software Engineer for development of 3D Data Fusion displays focused on Under Sea Warfare including for improved Situational Awareness/Maritime Domain Awareness applications. This includes developing Command and Control (C2) and Tactical Decision Aids (TDA) system that involve environmental/sensor predictions under various DOD & commercial architectures. Application of the 3D data fusion also includes development of a homeland security trainer in support of improved decision making and consequences of decisions made. My experience includes information/data fusion systems to integrate radar, sonar, off board sensors, unmanned vehicles (UV) including interfaces to OMAL/NAVO oceanographic & atmospheric plus NGA terrain/imagery data, to improve the understanding of the operational picture in multiple dimensions versus looking at the individual data elements. These modules and services will be used in several projects including Improved Reconfigurable Combat Information Center (IRCIC), Undersea Perimeter Security Integrated Defense Environment (UPSIDE), Combat System of the Future (CSoF), targeted for implementation in future DOD platforms. Mr. Ferguson has extensive experience in Open Systems Architecture that includes: SOA, C++/Java in a distributed Windows/UNIX/LINUX environment. I have experience in software efforts using ISO9000 and CMM level 3 practices.

F. **Positions**

Positions and Employment

2001-Present Sr. Systems Engineer, Rite-Solutions, Inc.

8. Statement of Work from Rite Solutions

Rite-Solutions, Inc.
Rite Proposal 3562-16

Background: Rite-EMT™ Emergency Management Trainer provides the ability for scenario based distributed training in a 3D immersive environment. The scenarios can be tailored to meet specific training needs and provides the ability to evaluate performance. Current focus has been on metal mines like the Edgar training mine, improved training for coal mines, and a more interactive training experience.

Task 1.0 –Develop New Coal Mine Scenarios for Rite-EMT™ - $7,000

Develop new coal mine scenarios that include using the new ventilation simulation capability in Rite-EMT™

This effort includes:

- Working with Colorado School of Mines (CSM) Subject Matter Experts (SMEs) to determine scenario events to support their training objectives
- Work with SMEs to build the scenarios
- Provide the scenarios to CSM verifying they are working correctly and meeting their training needs

Task 2.0 – Deliver Rite-EMT™ software patches - $2,000

Based on developing new coal mine scenarios there will need to be patches made to the Rite-EMT™ system installed at CSM that include updated 3D models, configuration files, and new executables. These will be provided as required.

Task 3.0 – Provide training remotely on scenarios - $1,000

When the scenarios are delivered to CSM training on them will be provided including how to make changes and update to the scenarios so they can be enhanced by CSM to meet changes in their training objectives.

Total: $10,000