Grant Number: AFCRFP20-111

Title: Minimizing Rib Failure Hazard: Mapping Tool and Demonstration for Low Cost, High Resolution Rib Monitoring

Organization: Colorado School of Mines

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Partnerships: NIOSH, Pittsburgh Mining Research Division

Focus Area: Health & Safety Interventions: Ground Control

Synopsis

Project Goal: Rib falls are the leading cause of ground-fall fatalities in U.S. coal mines, and the proportion of ground-fall fatalities corresponding to "falls of rib or face" has increased in recent years (MSHA, 2019; Mohamed et al., 2020). Accordingly, the Alpha Foundation has identified the reduction of rib failures in coal mines as a key priority. With this goal in mind, we propose to conduct research that aligns with the subtopic "*Assessment of Rib Motion Detection Technologies*" as identified by the foundation. To address this subtopic, we propose to perform a scientific, practical and regulatory assessment of the potential for implementation of low-cost vehicle-mounted laser scanning for rib monitoring and characterization.

Research Approach: With respect to rib motion and hazard detection technologies, our study will focus on an assessment of a low-cost hand-held and/or vehicle-mounted laser scanner and commercial Simultaneous Localization and Mapping (SLAM) software. A critical review of existing technologies will be conducted, including a novel analysis of permissibility considerations. Data will be collected in an experimental underground coal mine, and these data will be used to evaluate accuracy in the context of rib motion detection.

Expected Project Outcomes: Our research addressing the subtopic "*Assessment of Rib Motion Detection Technologies*" will result in an assessment of the feasibility of low-cost hand-held and/or vehicle-mounted laser scanning for rib monitoring in coal mines and guidelines for the transfer of technology to application in the US underground coal mining sector.