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Title: Pathway Controlled Penetration (PcP)

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Intended for: Hard and Deeply Buried Target Program Proposal

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Los Alamos National Laboratory (LANL)

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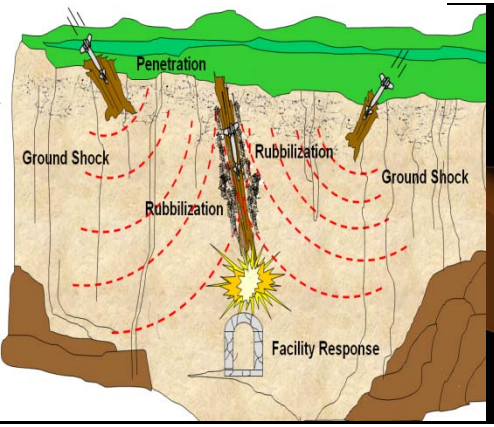

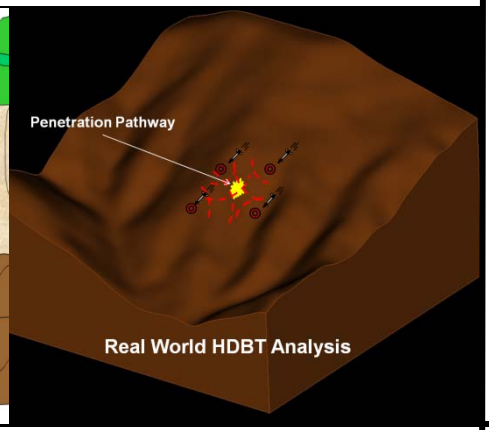

Operational and Performance Capability: PcP uses advanced computer simulations to enhance HDBT functional defeat efforts. Newly developed material models that account for fractural energy coupled with the finite discrete element methodology (FDEM) will provide targeting packages that will create penetration avenues for current or future lethality options. This novel computational approach requires full 3D geologic and structure characterization as well as significant high performance computing capabilities. The goal is to distinctively alter the targeting paradigm by leveraging critical DoD assets along with insitu geologic strata. In other words, assets will utilize underground rock structure to their benefit by creating rubbilization zones that will allow pathway controlled penetration.

Technical Approach: Employ advanced computational simulation tools to demonstrate how current assets can destroy RWK-RFI-12-0001's HDBT, a tunnel complex with two portals built into the base of a granite mountain. The granite over layer is assumed to be 60 meters thick over both portals and 80 meters over the facility's mission space. Key S&T is the completed development of a highly innovative visco-plastic fracture material model, 3D parallel gas-fracture capabilities into FDEM, and a stochastic handling of the material properties.

Phase I: Develop and validate code simulation tools

- Develop, incorporate and validate AZ_Frac material model for granite
- Develop and incorporate gas-driven-fracture modeling into LANL's FDEM MUNROU code
- Develop and incorporate stochastic features into FDEM modeling

Phase II: Conduct PcP analysis on above HDBT

- Acquire HDBT design data, develop simulation model
- Evaluate and select most promising defeat alternative

Phase III: Deliver code, train Service target analysts, and conduct simulations against real world HDBTs

ROM Cost and Schedule:

Phase I: ROM $1M, 18 months - Exit criteria: Service review of a fully validated and verified experimental calculation; experiment would be DOE's Source Physics Experiment (SPE) (granite medium)

Phase II: ROM $250k, 6 months - Exit criteria: Service review of modeling and analysis results

Phase III: ROM $750k, 12 months – Exit criteria: DoD modelers successfully apply model and methodologies against real world HDBTs

Deliverables:

Phase I: Prototype MUNROU code with AZ_Frac provided to applicable DoD agency; modeling and analysis results of SPE

Phase II: PcP Modeling and Analysis Report for selected HDBT

Phase III: MUNROU/ISF delivered and appropriate training provided to applicable DoD agency

Submitting Organization Information:

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