Assessment of Critical Infrastructure Pre- and Post-Event

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Assessment of Critical Infrastructure Pre- and Post-Event

- Introduction
  - Underwater Bubble Jetting effects on Infrastructure presented by Dr. James O'Daniel (Pre-Event Focus)
- Problem
  - Determine the effects of bubble jetting loads from an underwater explosion. Current engineering models cannot accurately predict loading due to bubble jetting
    - Under what conditions will a bubble impart a jet on a structure?
    - What is the total force imparted by a bubble jet on a structure?
    - What is the structural response to bubble jet loading?
- Potential Solutions
  - Test effect of parameters on and loading from the jet and structural response, use and validate numerical simulations
    - Very small-scale tests to observe bubble jetting
    - Larger underwater blasts to determine loads on vertical structures
    - Larger-scale experiments to measure effects on structural deformation

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- Challenges
  - Considerable work needed to transfer results expected predicted responses in actual structures
  - Analyzation of mitigation schemes effectiveness in reducing loading and/or structure response is needed
- End Users
  - Bridge/Levee/Damn Owners and Operators, Disaster Management Officials
- Discussion and Conclusion
  - The research quantifies non-shock UNDEX loading and develops simplified methods for vulnerability engineering-level codes providing quick approximations to structural vulnerabilities in UNDEX attack

Assessment of Critical Infrastructure Pre- and Post-Event

- Introduction
  - Bridge Security Motivation and Challenges presented by Dr. Eric Williamson
- Problem
  - Bridges vulnerability to terrorist attack
  - ID and prioritize bridges needing fortification and determine and develop best methods
  - Bridge protective design deficiencies
- Potential Solutions
  - Historic targets, recently identified targets, or bridge “importance”
  - Improved design guidance
  - Improved retrofit techniques for hardening bridges

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- Challenges
  - Identification not straight forward
  - Non blast effects focused research is insufficient
  - Research-to-Practice cycle is lengthy
- End Users
  - Engineers, Emergency Managers, Transportation Planners, Owners/Operators
- Discussion and Conclusion
  - A way ahead for mitigation of blast effect on bridges is needed to enhance the nation's resiliency as the current situation presents a weakness

Assessment of Critical Infrastructure Pre- and Post-Event

- Introduction
  - Bridge Security Motivation and Challenges presented by Dr. Richard Christenson
- Problem
  - Assess bridge load carrying capability following an earthquake or blast
    - Solution not needing extensive pre event data and information
    - Devices easily attained and used by first responders
    - Quick assessment
- Potential Solutions
  - Use only vibration measurements to determine stability of components and bridge load-carrying capacity
  - Use a moving load (shakers, impact hammer) along the bridge and measure the frequency responses
  - Use developed tools as a foundation for new technology of rapid and robust bridge load-carrying capacity evaluation following disasters

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- Challenges
  - Baseline measurements/healthy models for many bridges in the US do not exist
  - Existing structural health monitoring methods require large numbers of embedded sensors and powerful computing facilities
  - Require a simple robust bridge dynamic model allowing analysis of load-carrying capacity of partially damaged bridges
- End Users
  - First Responders, Local, State, and Federal transportation infrastructure owners and managers, Federal and Local Government Agencies responsible for emergency response and recovery, public and users of the critical infrastructure systems
- Discussion and Conclusion
  - Analytical studies indicate using only vibration measurements CAN identify structural characteristics. Failure modes can be assessed by observing stiffness changes with different added masses. Rapid assessment given the constraints of first responders is possible within the proposed framework