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B83 Fracture Modeling

Amanda Dropkin

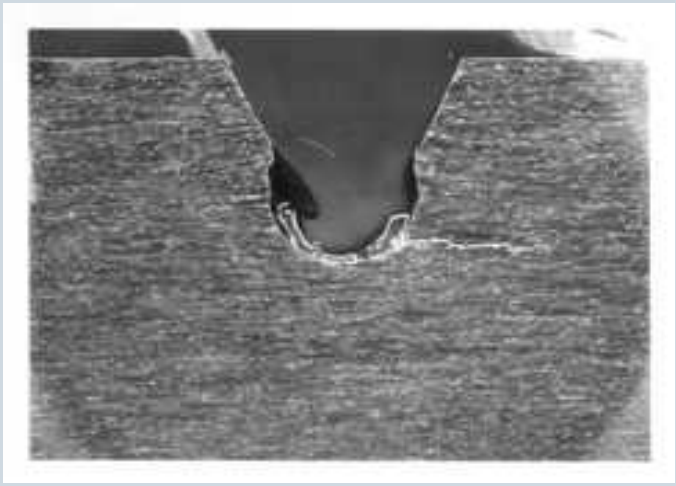
Org. 8774

Cornell University '08

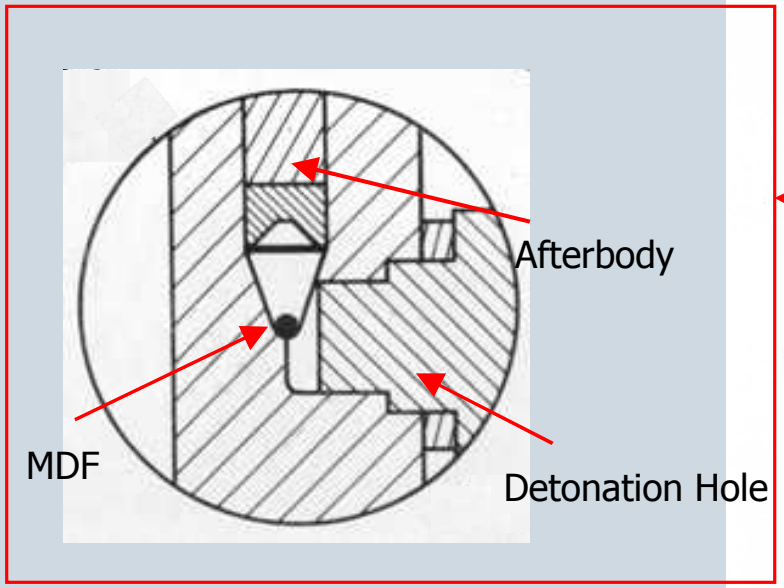
Sandia National Laboratories

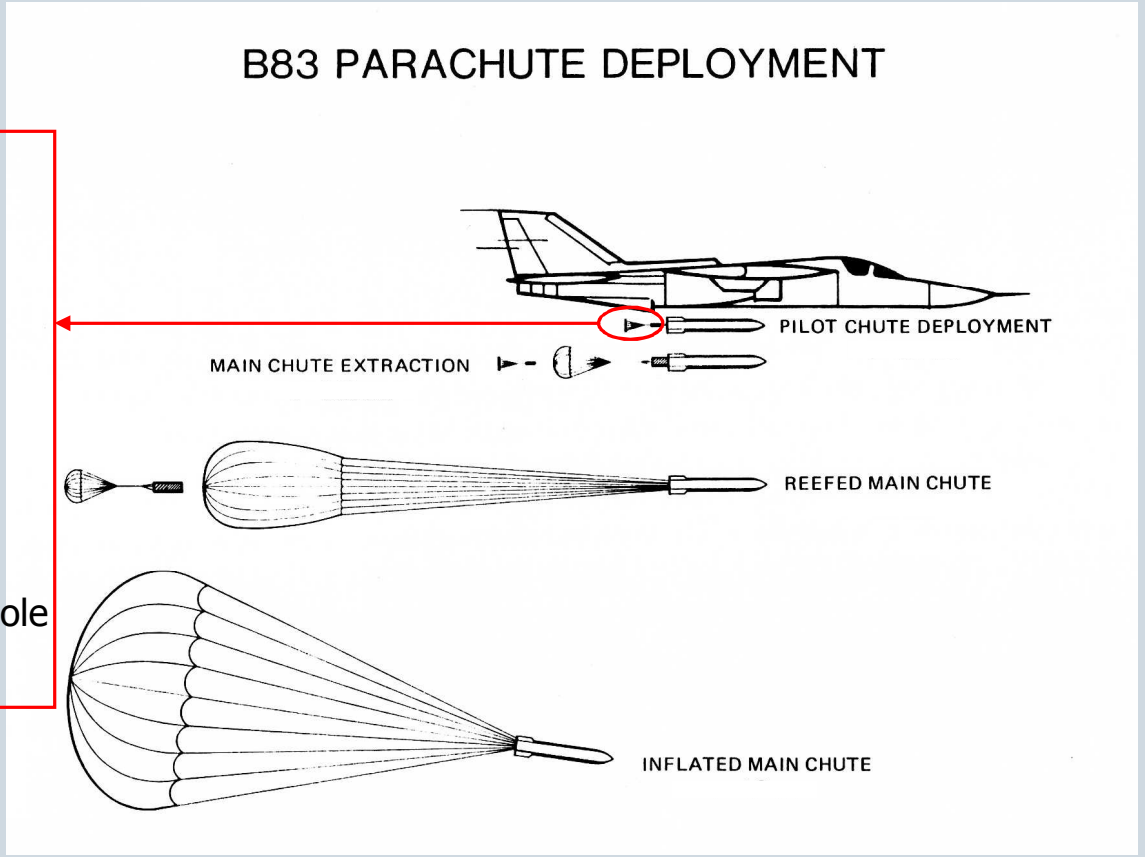
Outline

- Modeling as verified by experiments
  - Problem
  - Load Conditions
  - Strain-Based Approach
  - Cohesive Zone Approach
  - Ultimate Goal
  - Future Work
  - Acknowledgements



Background


Afterbody
MDF
Detonation Hole


B83 PARACHUTE DEPLOYMENT
PILOT CHUTE DEPLOYMENT
MAIN CHUTE EXTRACTION
REEFED MAIN CHUTE
INFLATED MAIN CHUTE

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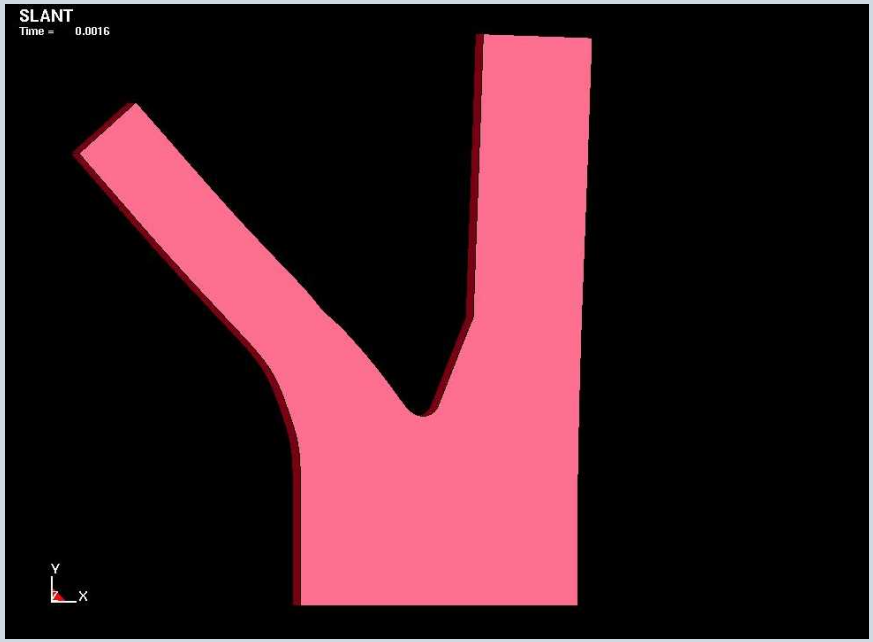
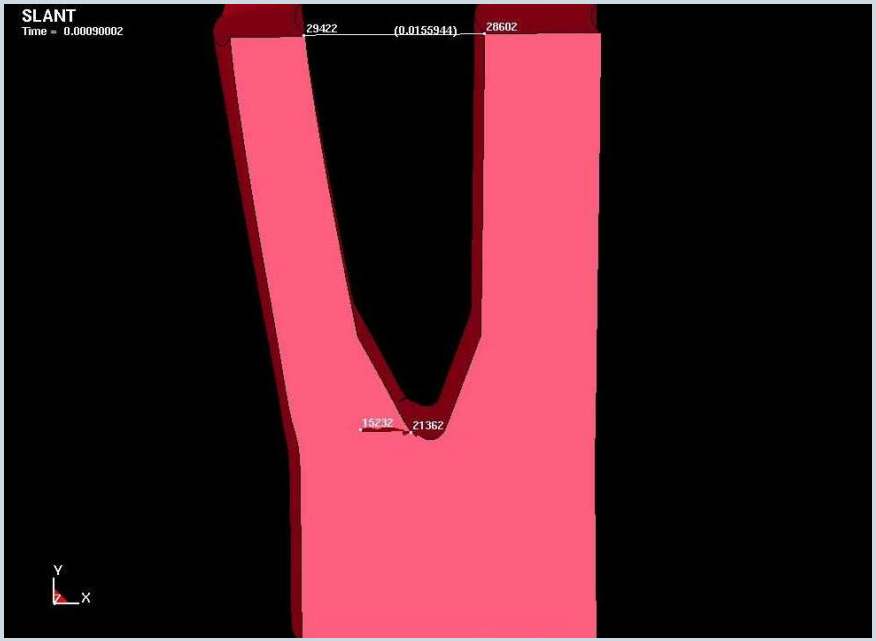
Problem:

- Use pressures from simulations of the explosion to create a model that agrees with the experimental crack and groove width data.





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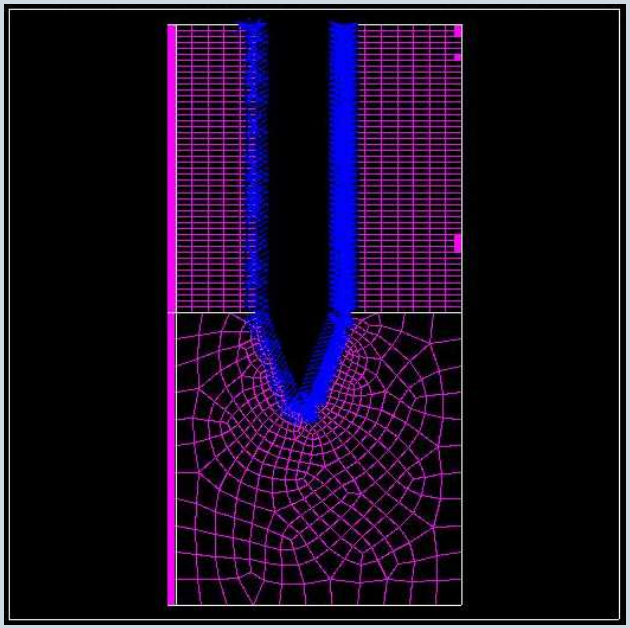
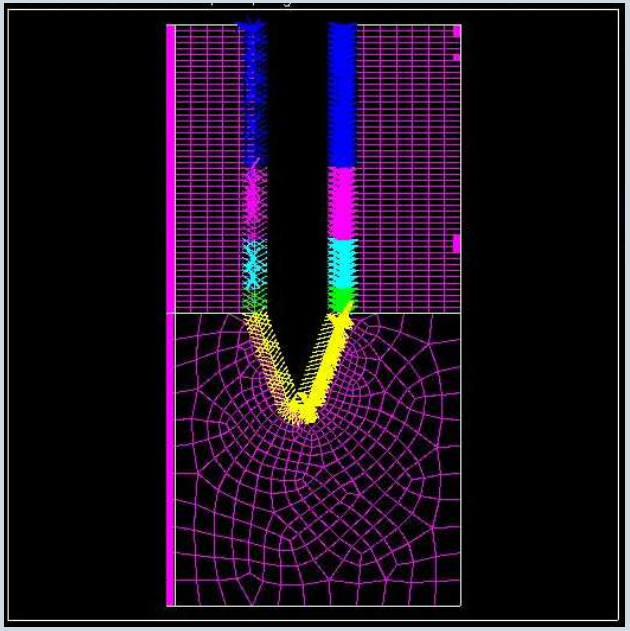
Load Conditions

- How is Blow-by applied?



Total Blow-by



Gradual Loading

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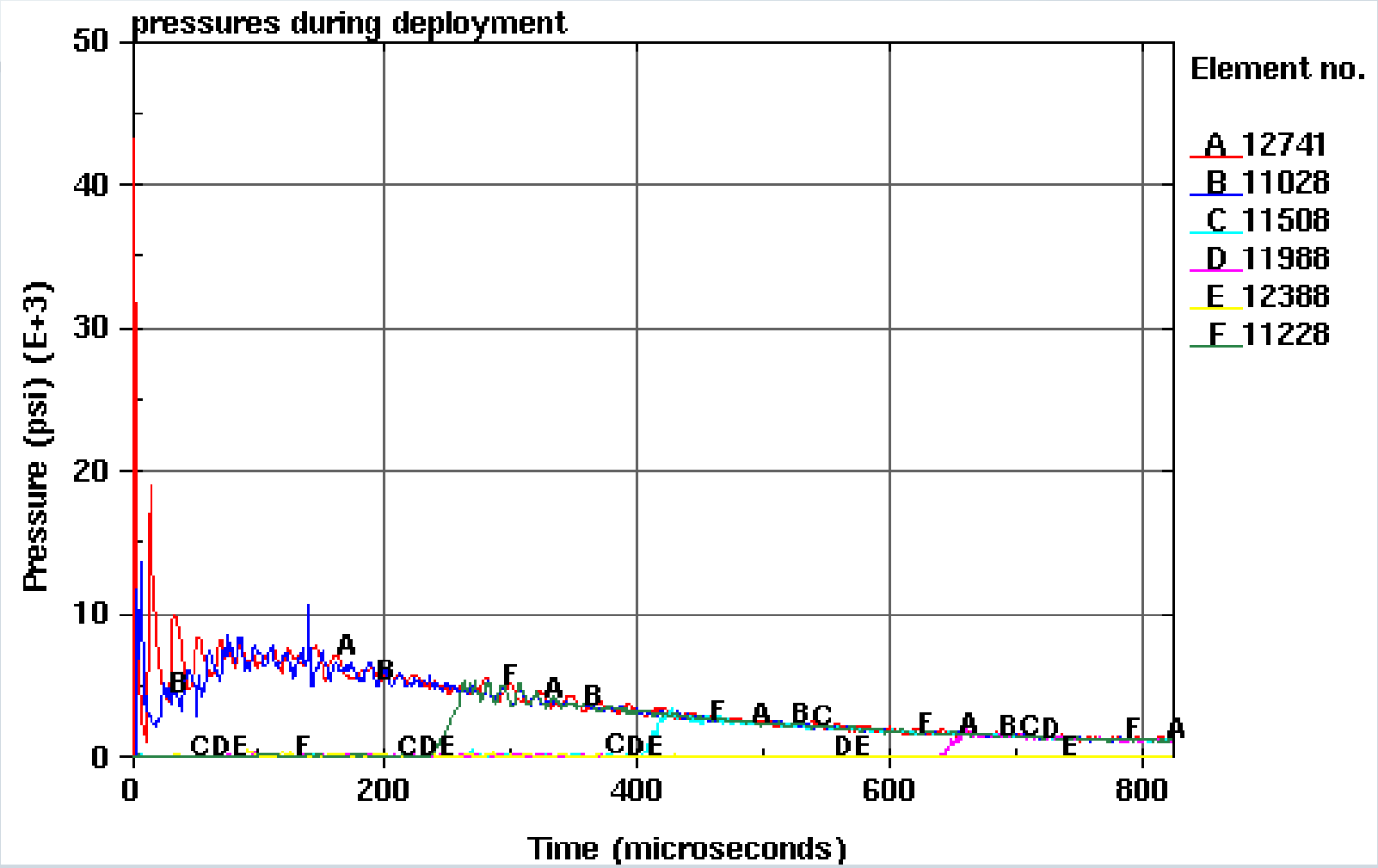
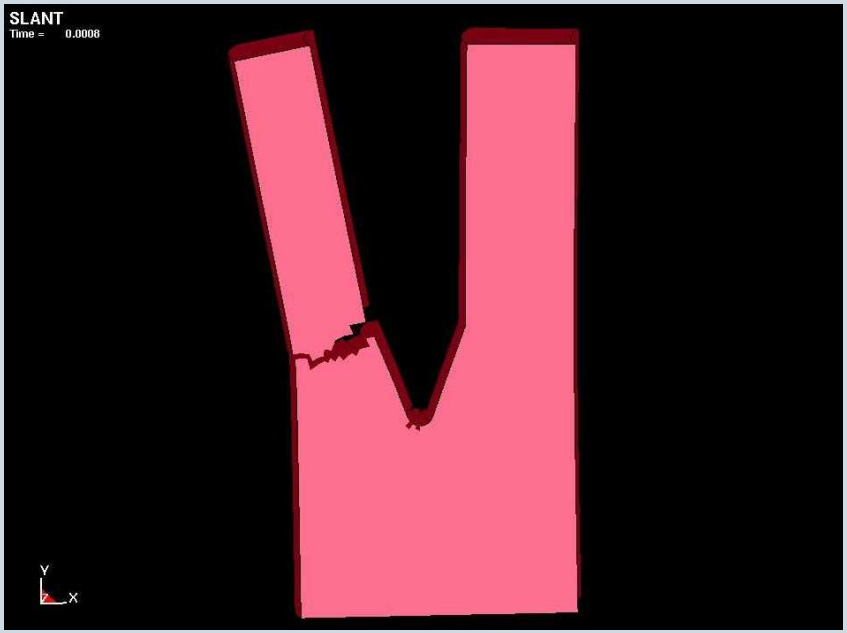
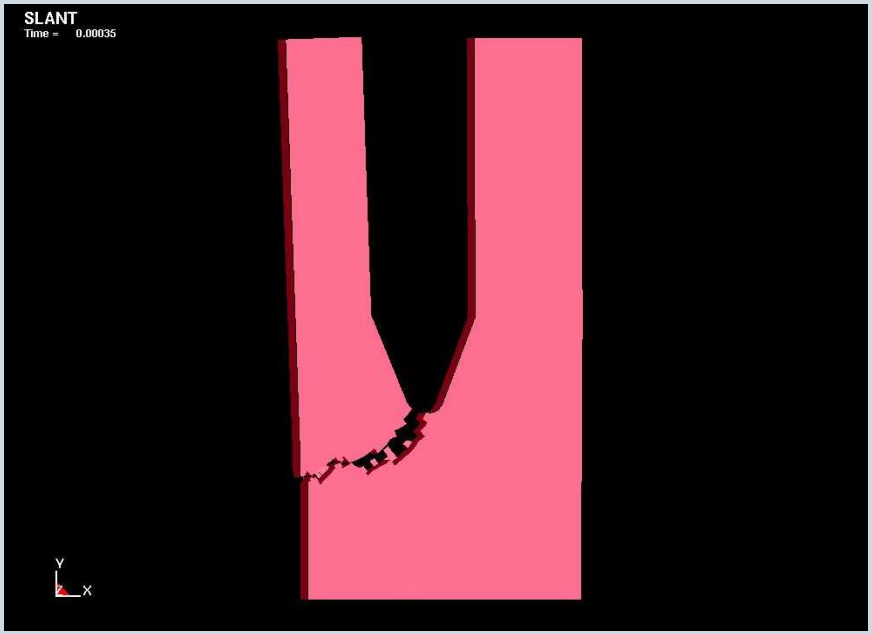
ALE Simulation Assumes no Blow-by



Impact of Criterion

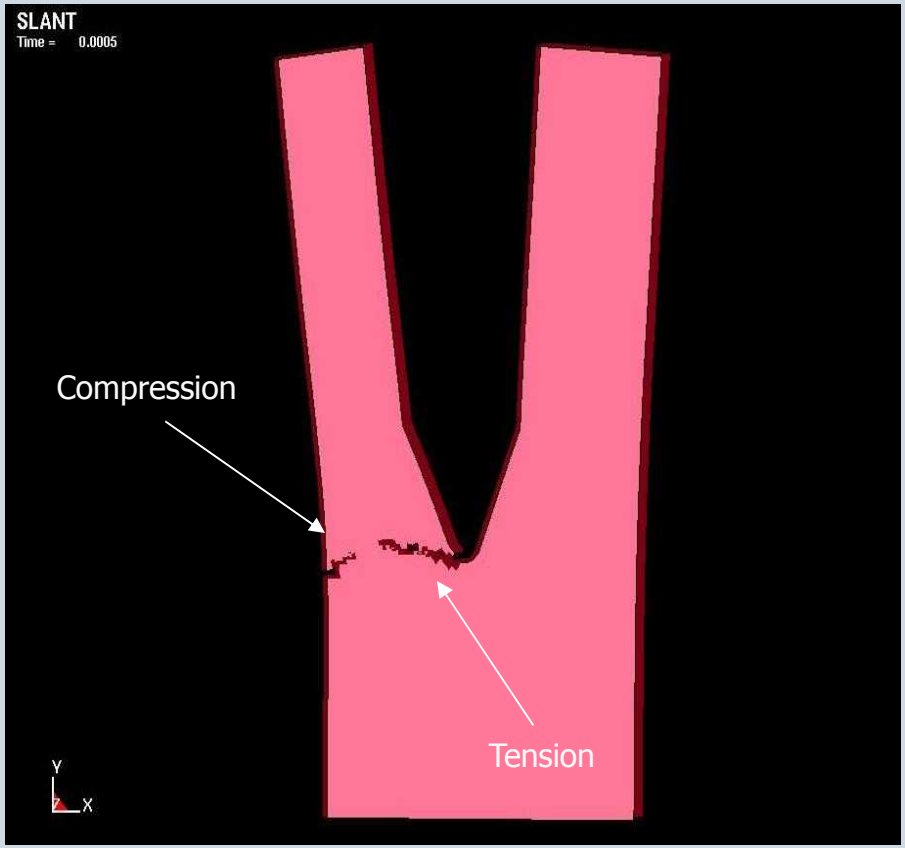
- Depending on how the loading conditions are specified, where, when, and to what extent the x-section will fracture can be altered.





Strain-Based Approach

- Advantages
  - Cost effective
  - Can use physical measurable parameters
- Disadvantages
  - Mesh dependent
  - Relies entirely on strain, rather than fracture toughness



Strain will cause it to crack in tension and in compression

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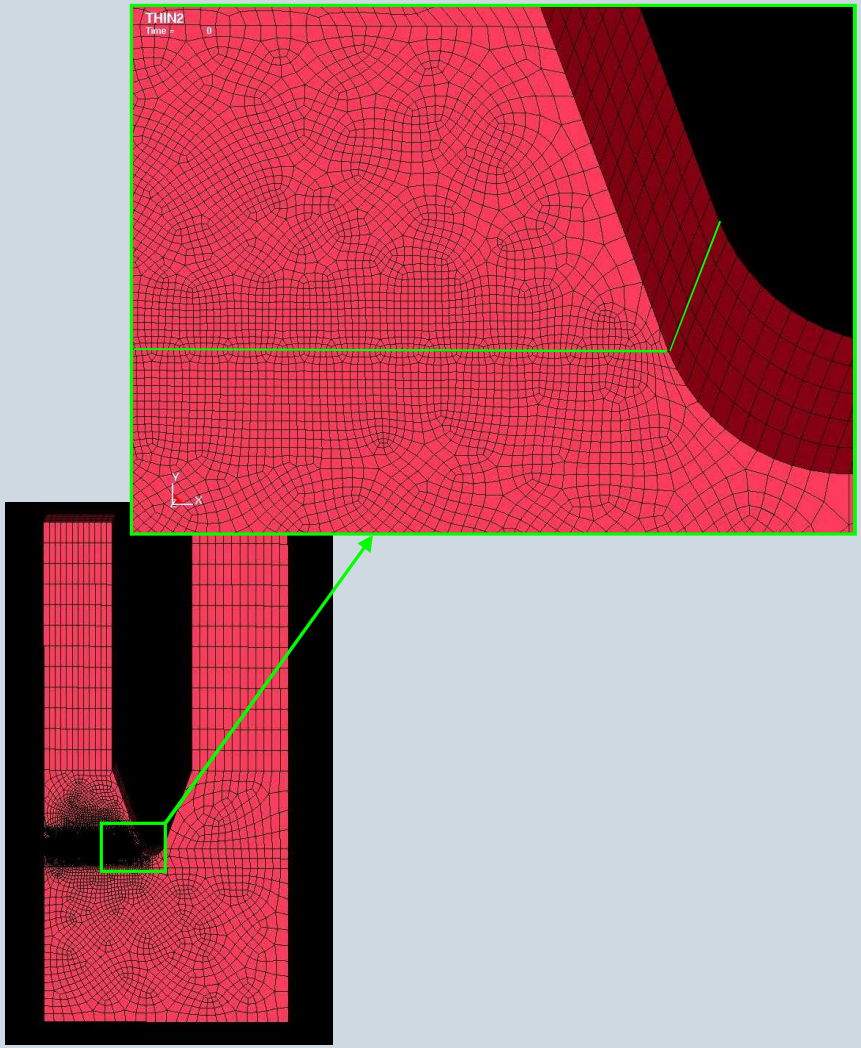
Cohesive Zone Approach

- Advantages
  - Non-mesh dependent
  - Uses fracture parameters
- Disadvantages
  - Meshing codes not set up to create cohesive zones
  - Very costly
  - Lots of iteration is needed to find parameters that cannot be physically measured
  - Direction of crack needs to be predetermined



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Ultimate Goal- Future work

- Be able to use the aforementioned model to create a probability distribution for fracture based on:
  - Load
  - Initial material properties
  - Initial distribution of cracks

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Acknowledgements

- Jay Dike
- Jay Foulk
- YR Kan
- Mike Chiesa
- John Korellis

Any Questions?