OSU – Parameters used in Progressive Damage Models

- Abaqus

- Same model for tension and compression (matrix). May not be accurate for compression

- Specimen identified material behaviors under compression
    - Initiation – propagation (A & B specimen geometry dependent, B& C material behavior

- Compression – load is carried by wake, so constant G is not reasonable

- Experiemental methods
    - Coupon isolated matrix compression
    - Compact Compression with 0875" notech length.
    - Repeated until tensile failure
    - Testing procedures established
    - Area methods for fracture toughenss
    - Results > 8.8 times larger than used
    - Fmc wave functional relationship
    - More tests are conducted

- FEA
    - Use new material model for compression and compare with Hashin
    - Simulate the compact compression experiemnts (1. Hashin and 2. new material motel)
    - Simulate the new material model to a generic layup lamindate
    - Input for the model: geometry, material properties, mesh and element type, explicity solver

- Q) shouldn't you use new materials model as part of verification of the modeling?

- Q) what verification task was conducted? Stiffness slope being different

- Q –Lyle) COH element -> notch modeling is mesh dependent.

- Q- Hamid) Layup. Strain softening law. Bilinear relationship may help.

- Q) Repeatability and reproducibility of the testing procedure. Can this test procedure be used for other material systems?

UoU – Building block for crashworthiness testing of composite

- Erin Blessing

- Vehicle can protect the occupancy

- Composite cargo floor, stanchion #3, primary crush member, 6g vertical loading

- IM7/8552 unitape, C-channel, Hard laminate (50/25/25), 16 plies, 0.115" thicknes

- Flat-cupon crush testing, tailor laminate to cheive stable crush, high energy absorption, mini round robin

- Uncupported testing for flat sections, pin-supported for curved sections, measure SEA and crush stress for both

- Failure modes, fragementation, brittle fracture, fiber splaying

- Tested hard and hybrid hard laminates

- Based on coupon doe fabricated C channel with 025" corner radius, 0.114" average thickness. Made with NCAMP specifications. ~1.5% difference in thickness

- 300 in/sec, 150 in/sec, quasi-static impact tests for crush simulation

- Stanchion also looked at

- Crush initiator: ply drops, machined holes. Machined holes selected

- Numerical modeling: Czone – Abaqus Explicity addo-on, developed by Engunity LTD
    - 14 different analysis teams – CMH17, common set of material properties, flat coupon test results provided
    - Master / slave surface -> crushing stress, crushing force is calculated and uniformely distributed

- Q) Assuming the coupon tests are good indicator and carry over to the higher level building block. Shouldn't you verify the performance difference or similarities carry over to the higher building block?

- Q) verification steps for the computational code?

- Q) What is your success criteria for this building block exercise? Coupon test based performance accurately predicts the higher level failure

- Q) How is the computational team using this coupon data? Failure mode prediction same as crush loading?

- Q-Kaz's question / all coupon types-> what were the failure mode -> desirable failure modes would be fragementation in the bulk laminate

- Q – general) considered more combined loading testing? Vertical + horizontal testing may be?

- Q – Mark) where is the crack initiator?

UW – Safety and Certification of Discontinuous Fiber Composite Structures

- Recyclability related projects
- Platelets-based composite
- Narrow configuration tends to initiate outside the notch
- Use the model to provide design guides and develop analysis framework
- Platelete size and thicnkenss effect
- Multiple size coupons tested
- Transition from strength to energy driven fracture
- Morpholage and the structural size affect the scatter and the performance of the chopped fiber
- Q) RVE to allow random distribution. RVE as a function of platelet size. Thickness sufficient to achieve RVE. Test methods used for traditional CFRP may not be adquate
- Q) Based on the work, a design manual to determine which configuration will make the failure within the notch would be helpful.
- Q-general) aspect ratio of the platelet size: used the commercial vendor and scaled up and down
- Q-general) what would be the recommendation on deisgn and size. Good physics based model should be able to aid the sizing. If you have morphology prediecting software.
- Q-Lyle) thermal effect included in the computation?

Feedback – Evaluation of Parameters used in Progressive Damage Models (OSU)

- Experimental and computational investigation on matrix failure under compression loading

- Feedback/Questions
  - Verification steps on the modeling. Stiffness slope being different
  - Repeatability and reproducibility of the testing procedure. Can this test procedure be used for other material systems?
  - COH element. Mesh sensitivity for notch
  - Strain softening law. Bilinear relationship may help.

Feedback – Development of a Building Block Approach for Crashworthiness Testing of Composite

- Experimental and computational investigation on crashworthiness building block

- Feedback/Questions
  - What is your success criteria for this building block exercise? Coupon test based performance accurately predicts the higher level failure?
  - Assuming the coupon tests are good indicator and carry over to the higher level building block. Shouldn't you verify the performance difference or similarities carry over to the higher building block?
  - Verification steps for the computational code?
  - Considered more combined loading testing?

Feedback – Safety and Certification of Discontinuous Fiber Composite Structure

- Physics based investigation of DFC
- Feedback/Questions
  - RVE to allow random distribution. RVE as a function of platelet size. Thickness sufficient to achieve RVE. Test methods used for traditional CFRP may not be adequate
  - Based on the work, a design manual to determine which configuration will make the failure within the notch would be helpful.
  - Aspect ratio of the platelet size: used the commercial vendor and scaled up and down
  - Good physics based model should be able to aid the sizing. Morphology predicting software.
  - Thermal effect included in the computation?