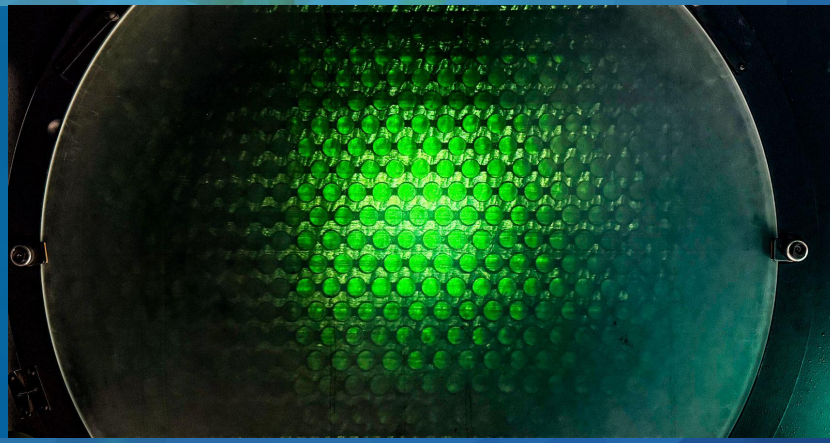
Barrel Imaging Calorimeter

BIC Sector Engineering Status Update



Sylvester Joosten
Argonne National Laboratory
on behalf of the BIC DSC

Ad-hoc Engineering Meeting
April 3, 2026

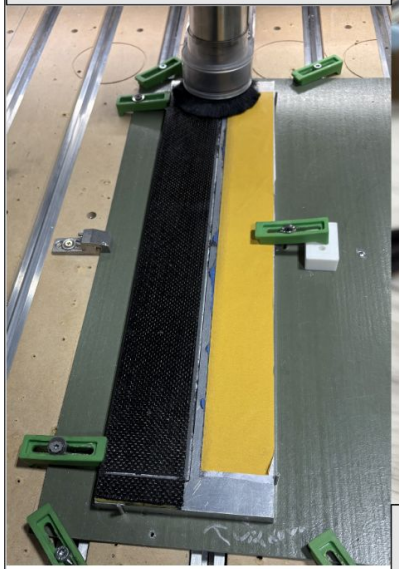
OUTLINE

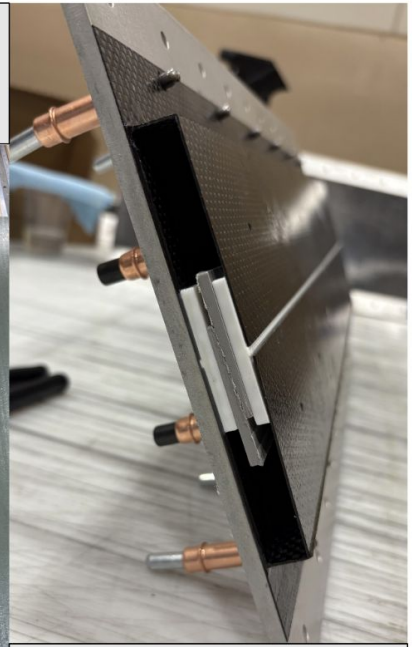
- Test article status
- Structural testing program (DCB, ENF, peel)
- FEA simulation update
- Sector handling
- Open items and timeline

Test article status

4-part drawer manufacturing

Cs and flat plates machined on table router





Bonding part 1: Outer flat plate + Cs

Bonding part 2: Gray spacers/hole guides + inner flat plate

Final bonded drawer

Changes for next part:

- Add plies to reach nominal thickness
- Use peel ply for better bonding surface
- Tool shape compensation for spring in
- Add something to keep inside faces clean
- Nondestructive bend test
- Send to ANL

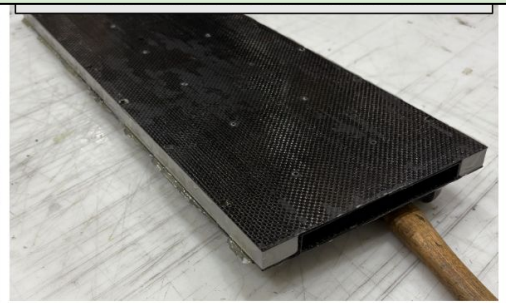
Test article status

4-part drawer manufacturing

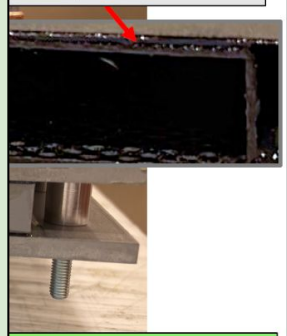
- New four-part drawer complete (Purdue)
- Extra-wide top/bottom plates with side alignment blocks
- Current iteration: below nominal thickness -- bond-line gaps
- Next: add plies + peel ply, measure spring-in, order new tooling
- **Tooling ETA: late April** (~11-day lead time after layup)

Cs and
machine
ro

Bonding part 1:
Outer flat plate + Cs



Gap from less than
minal part thickness



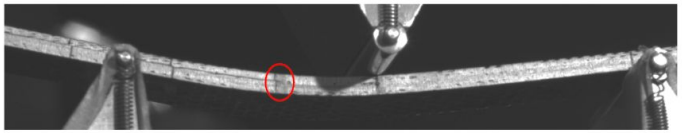
s for next part:
plies to reach
nominal thickness

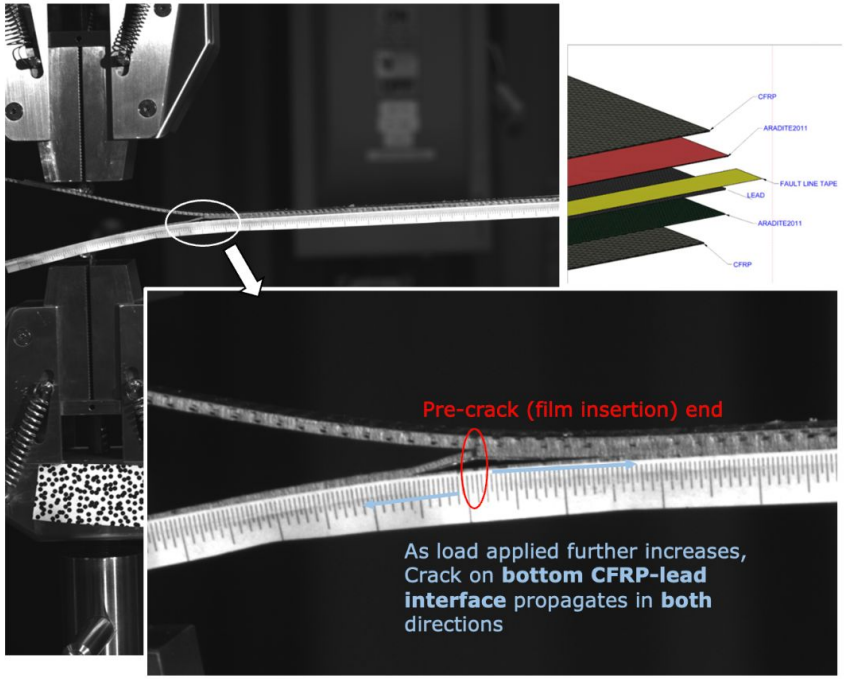
- Use peel ply for better bonding surface
- Tool shape compensation for spring in
- Add something to keep inside faces clean
- Nondestructive bend test
- Send to ANL

PURDUE UNIVERSITY | Jung Research Group Purdue Silicon Detector Labs | CMSC Composites Manufacturing & Simulation Center

EIC BIC Destructive Testing – 04/01 Update

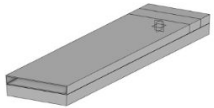
- **Determine Bonded Interface Properties for Simulation**
- New series of tests in progress
  - More data points and compare cleaned VS oxidized lead
  - CFRP-Pb-CFRP and Al-PbScifi-Al samples
- DCB (double cantilever beam) test for “peel”
  - Still some anomalous behaviors (see right)
  - Pull tabs breaking off (sample is stronger!)
    - New pull tab adhesive
  - Matching simulation in progress to validate model properties – see next slide
- ENF (end notch flexure) test for “shear” (below)



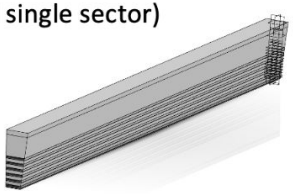


Contact Delamination Simulation & Verification

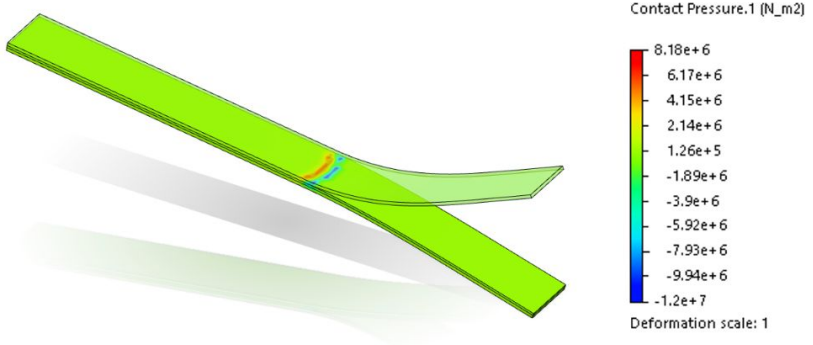
- **Match the simulated response to the Real DCB test data**
- Finalize cohesive contact characterization/matching
  - MAX Nominal/Shear Stress (Damage initiation)
- Expand simulation geometry
  - Drawer (0.5m / PbScifi + CFRP)
    - Verify results with Deflection test & Peel test

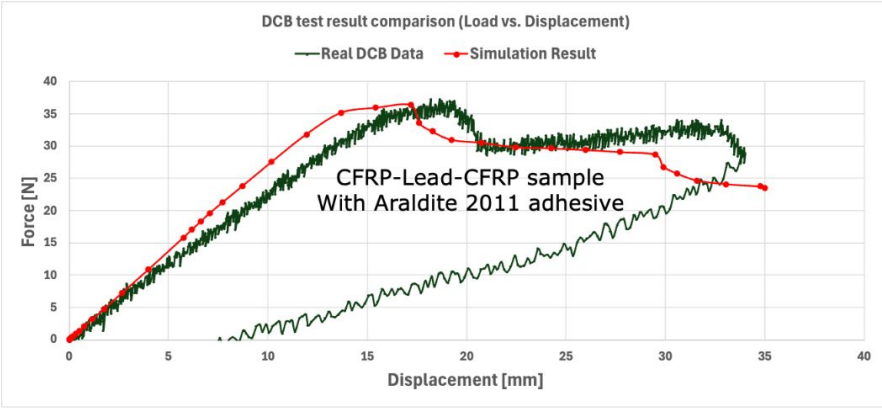


  - Sector (Fully layered single sector)



  - Full Sector





Testing Plan for BIC Sector Handling

- When does failure occur in the “3 O’clock” handling position?
  - What we have:
    - Lead/Scifi + Drawer (1 piece) 0.5m long
    - Lead/Scifi + Drawer (4 piece) 0.5m long
  - How we plan to test:
    - “Bending” along part length
      - Less critical since shear is stronger than peel
      - Could do a non-destructive proof load to max expected
    - “Peel” Mode I failure
      - Preferred - Cut into (~9) 50mm long slices each, bond pull hinges
      - Alternative – bond threaded plate on each side and hang increasing weights
  - Information needed: planned constraints/handling of sectors
    - Will “C” clamps be fixed relative to each other? Or act as “pick points” only