

DURABILITY OF ADHESIVELY BONDED JOINTS FOR AIRCRAFT STRUCTURES

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Research Tasks

I. Composite bond surface characterization

II. Composite bond integrity and long-term durability testing of composite bonds

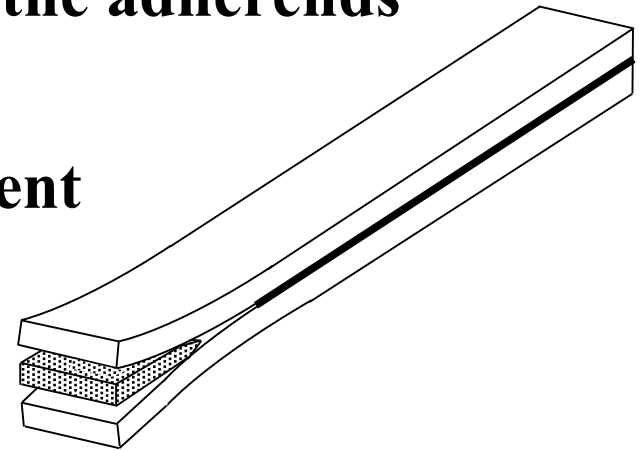
➔ III. Revising the ASTM D 3762 metal wedge crack durability test

Background:

Metal Wedge Crack Durability Test

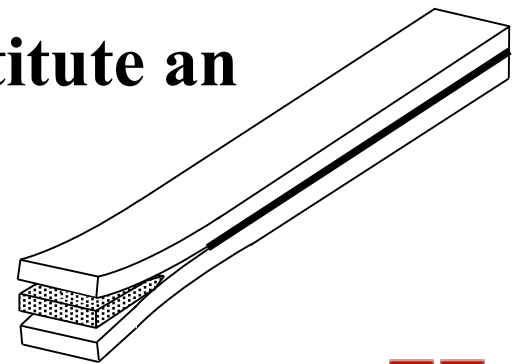
ASTM D 3762, "Standard Test Method for Adhesive-Bonded Surface Durability of Aluminum (Wedge Test)"

- Bonded aluminum double cantilever beam specimen is loaded by forcing a wedge between the adherends
- Wedge is retained in the specimen
- Assembly placed into a test environment
 - Aqueous environment
 - Elevated temperature
- Further crack growth is measured following a prescribed time period

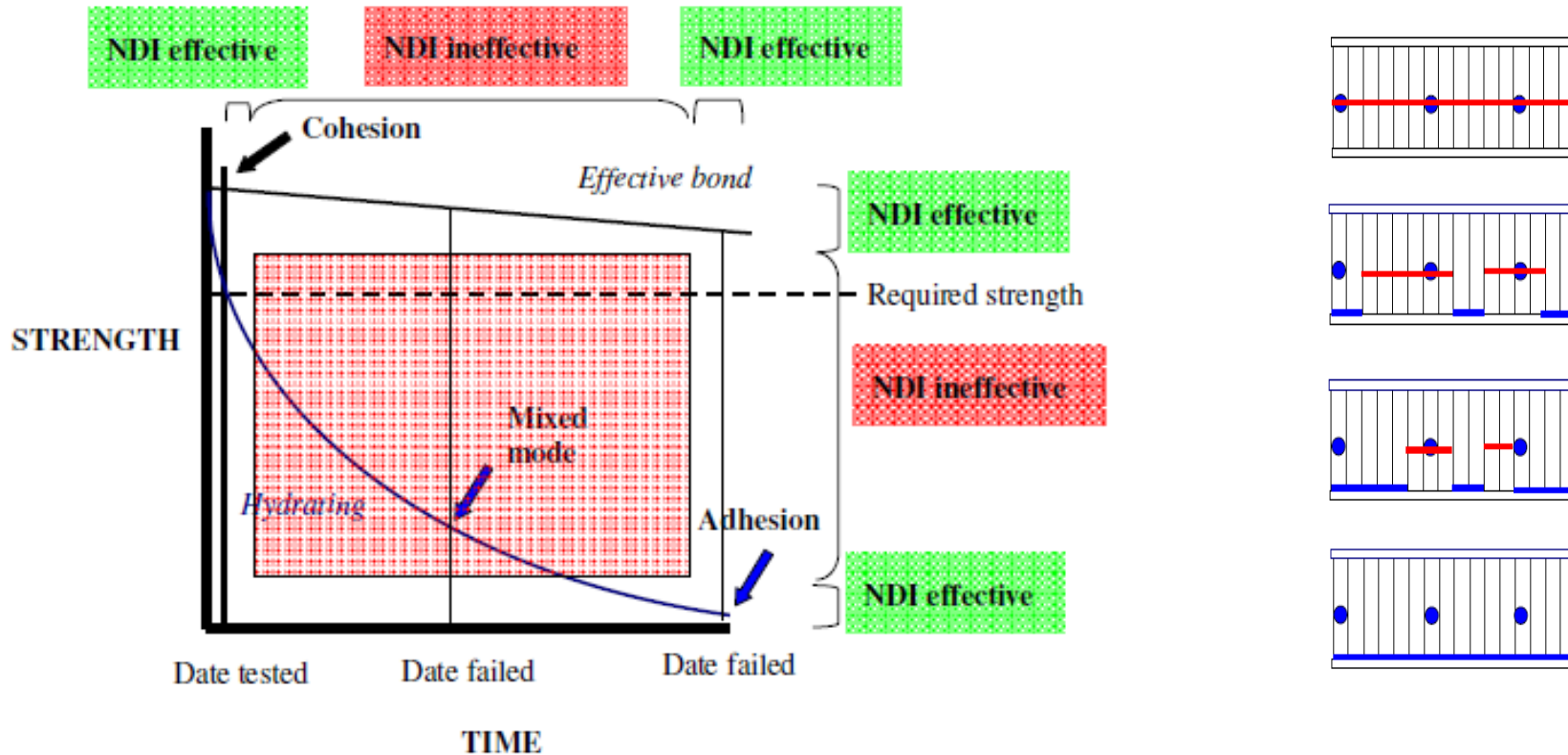


Perceptions of Current ASTM D 3762 Standard

- **Well-suited test methodology for assessing bond durability**
- **Standard includes a good description of test specimen and fabrication procedures**
- **Acceptance criteria stated in the standard is not adequate**
- **Lacking sufficient guidance regarding conditions and requirements that constitute an acceptable metal bonded joint**



Area of Concern: Reduction in Bond Strength Through Hydration



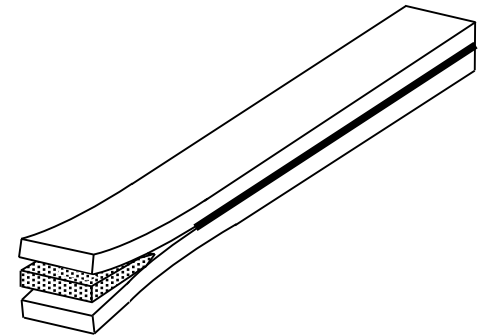
Davis, M.J., and McGregor, A. "Assessing Adhesive Bond Failures: Mixed-Mode Bond Failures Explained," ISASI Australian Safety Seminar, Canberra, 4-6 June 2010.

Goals of Investigation

I. Provide specific guidance on how to successfully develop criteria for a wedge crack durability test

Possible revisions to ASTM D 3762 standard:

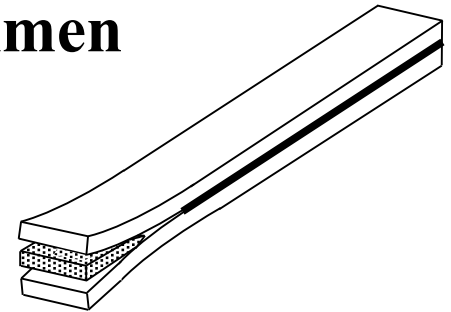
- Proposed exposure environments
- Pass/fail criteria
 - Crack extension
 - Failure modes



Goals of Investigation

II. Production of “Adhesive Bonding Educational Module”

- For use in assessing the durability of metal bonded aircraft structures
- Designed to supplement the ASTM D 3762
- Provide detailed instructions on test specimen preparation
- Insights into proper test procedures
- Details of pass/fail criteria
- Illustrative examples of interpretation of test results



Project Status

- **Project officially started on October 1st**
- **Co-PI Larry DeVries attended ASTM D 14 Committee Meeting on Adhesives**
 - October 11-12th, San Antonio, TX
 - Briefed committee on project
- **Co-PI Dan Adams met with Kay Blohowiak (Boeing) during SAMPE Technical Conference in Salt Lake City**