

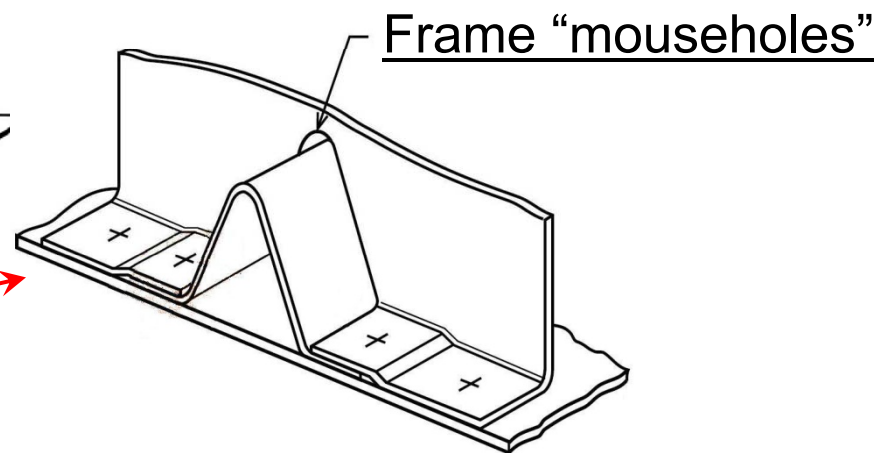
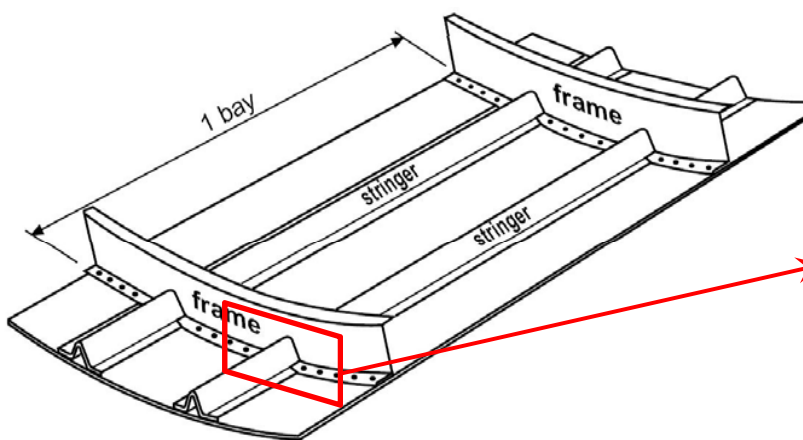
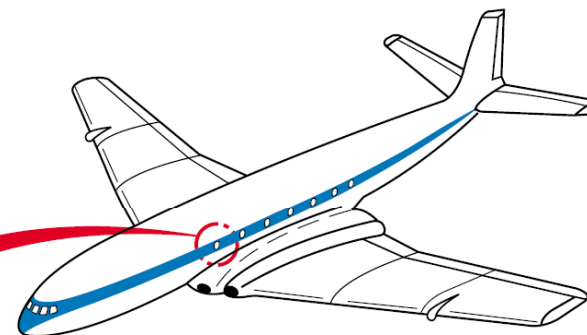
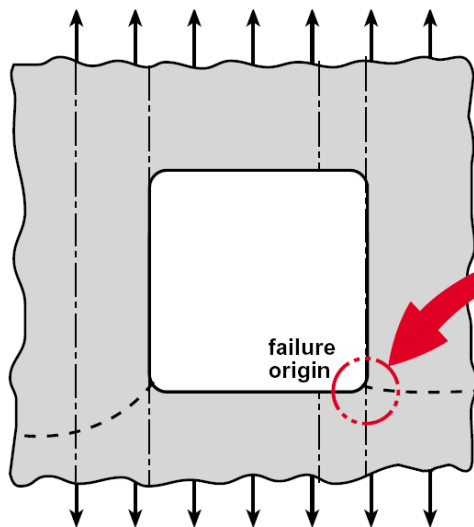
**Quantification of Fatigue Cracks
at Cutouts in Thin Plates Using a
Built-in Acousto-Ultrasonic System**

James Rose

Background

Potential cutout
fatigue crack sites:

Window
cutouts



**Geometric cutouts need to be
monitored for crack growth.**

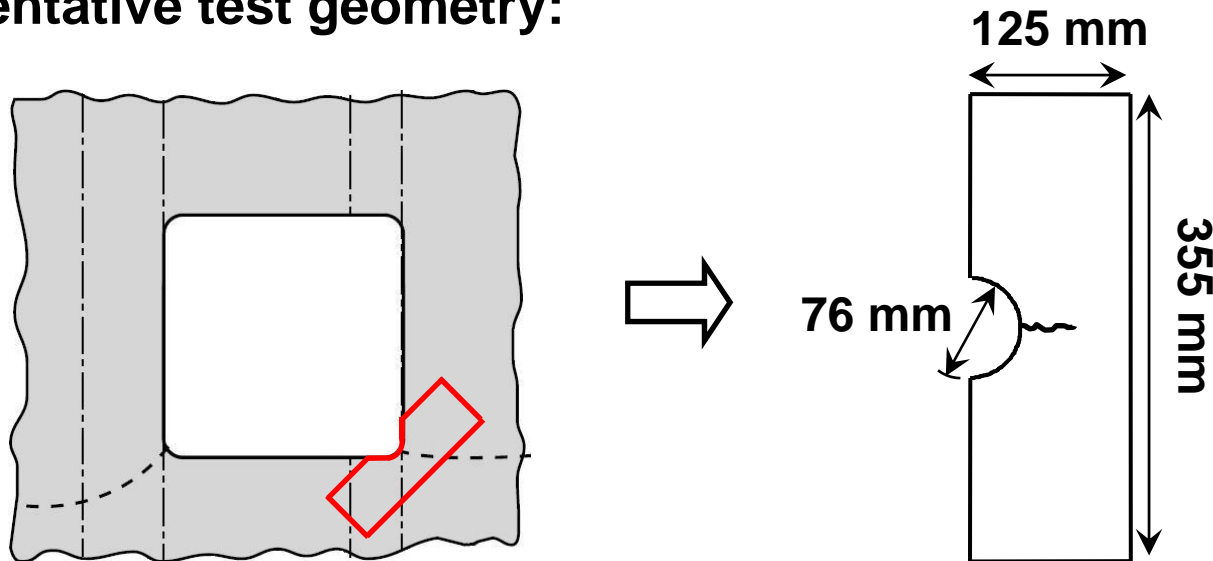
Source of images: NLR-TP-2002-521

Problem Statement

Given a single fatigue crack propagating from a circular cutout in isotropic metal sheet:

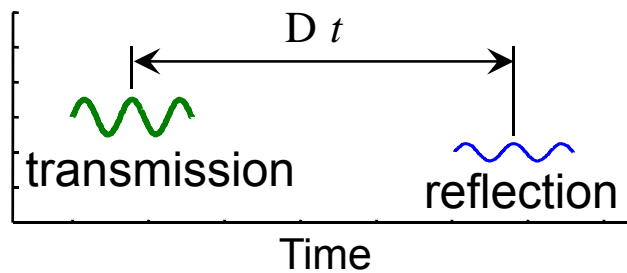
Quantify the crack via echo-location using a built-in piezoelectric acousto-ultrasonic system.

Representative test geometry:

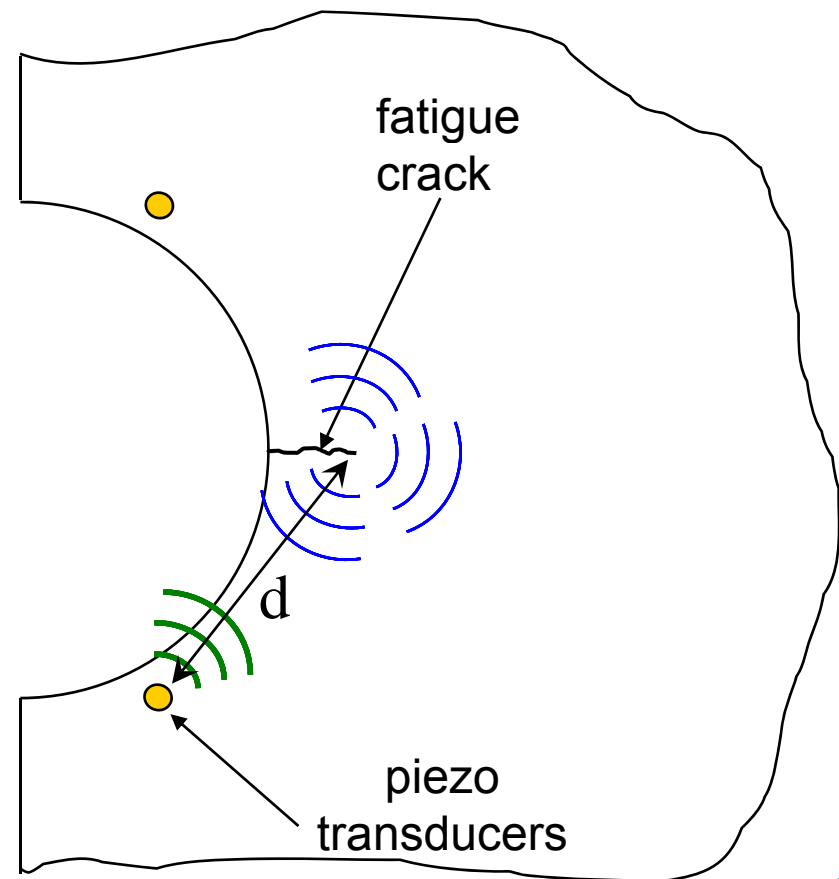


Method of Approach

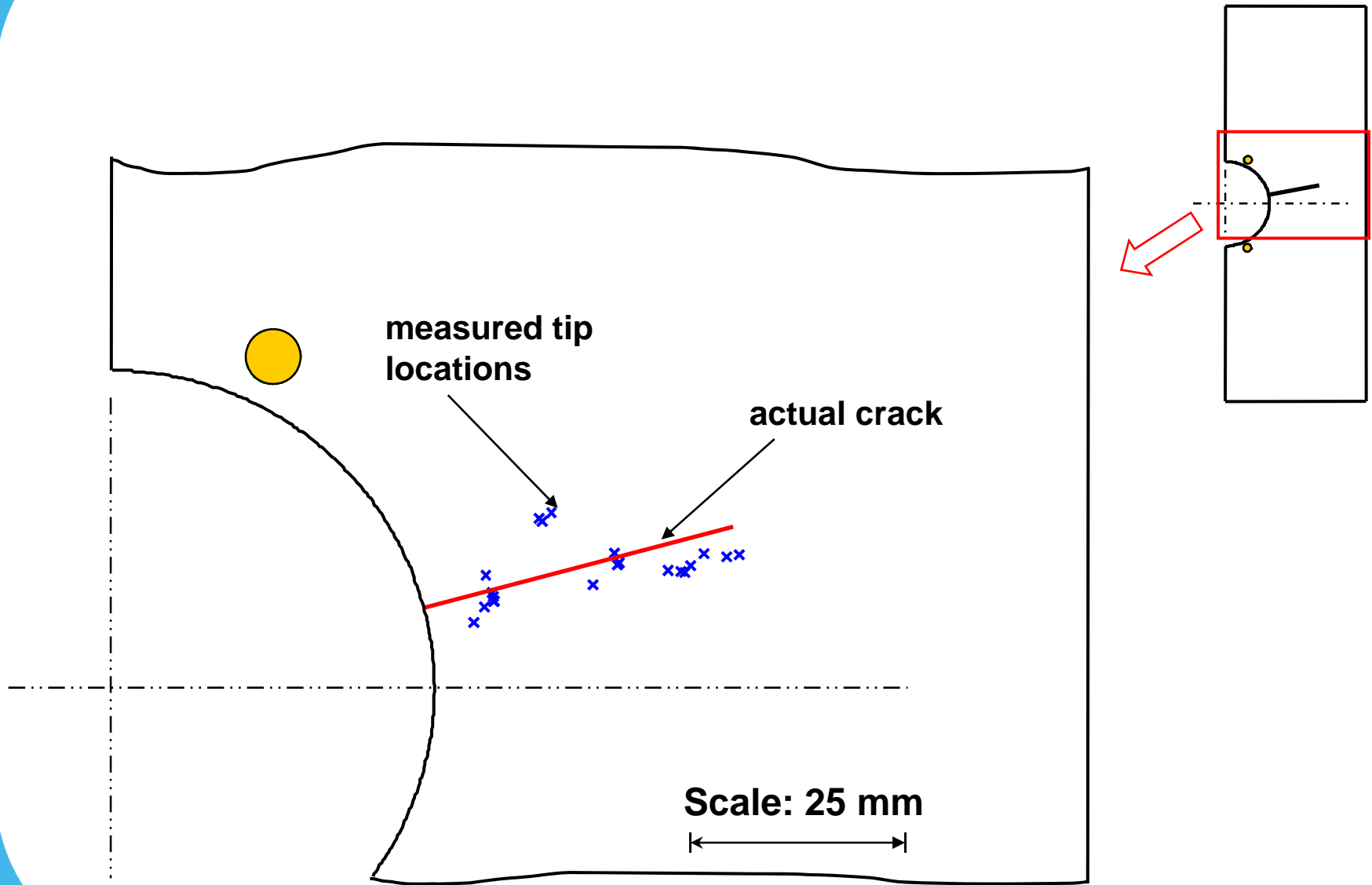
- Echo-locate crack tip using reflections.
 - Wave speed, v , must be known
 - Time-delay, Δt , gives distance to crack tip.



$$d = \frac{1}{2} D t \times v$$



Cutout Crack Measurements



Bio

James “Jim” Rose



Education:

B.S. Aerospace Engineering – U. of Cincinnati

M.S. Aero Astro – Stanford University

Experience:

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